Evolutionary Behavioral Sciences

Sex Differences in Victimization and Consequences of Cyber Aggression: An Evolutionary Perspective

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Cyber aggression is a pervasive problem, yet evolutionary psychologists have been slow to address this area of research. We utilize an evolutionary perspective to provide a theoretical framework to address research that has found that women are more vulnerable to negative effects of cyber aggression. Studies of intrasexual competition suggest that men and women adopt different strategies to derogate competitors that target fitness-relevant characteristics. We explore the possibility that cyber aggression follows the same principles and propose that sex differences in cyber aggression are more nuanced than previous research suggests. Study 1 replicates the finding of previous research that women are more upset by cyber aggression than men. Study 2 provides qualitative insight into sex differences in content of cyber aggression, demonstrating that women experience online posts derogating their physical appearance more often than men, while men experience online posts derogating their status more often than women. The discussion focuses on future directions for the application of evolutionary psychology to cyber aggression.

Public Significance Statement
These studies advance evolutionary perspectives of online aggression by providing a theoretical framework for understanding gender differences in online aggression. Although women tend to perceive online aggression as more hurtful than men do overall, we demonstrate that this effect depends on the content of online aggression.

Previous research suggests that cyber aggression[1] is quite common; 50% of college students have experienced cyber aggression, defined by the use of electronic communication intended to inflict harm on a victim (Brody & Vangelisti, 2017; Grigg, 2010; Kowalski, Giumetti, Schroeder, & Reese, 2012; Sabella, Patchin, & Hinduja, 2013; Selkie, Kota, Chan, & Moreno, 2015). There has been a proliferation of studies examining cyber aggression in the last decade (e.g., Hinduja & Patchin, 2007; Patchin & Hinduja, 2011; Sabella et al., 2013; Ybarra & Mitchell, 2007). Although the majority of research has focused on middle school and high

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[1] We use the term cyber aggression rather than cyberbullying throughout the manuscript out of an abundance of caution. While some of the studies cited used the terminology "cyberbullying," there is considerable debate among researchers as to what constitutes cyberbullying, and not all research cited that used the term cyberbullying fit with the strictest definitions of cyberbullying. Cyber aggression is a broader term that includes cyberbullying, and researchers have begun to urge people use the term cyber aggression rather than cyberbullying because mapping of traditional bullying to online contexts is restrictive (see Corcoran, McGuckin, & Prentice, 2015).

school students, it is clear that cyber aggression is also prevalent in college students and continues to negatively affect adults by increasing rates of depression, alcohol use, and stress (Brody & Vangelisti, 2017; Selkie et al., 2015; Zalaquett & Chatters, 2014). The pervasiveness of technology-mediated social interactions and the negative consequences of cyber aggression testify to the importance of understanding the psychology underlying these aggressive behaviors.

There are mixed results for gender differences in cyber aggression in children and adolescents. Some studies find no sex difference in victimization (e.g., Li, 2006), others that girls are victimized more (Li, 2007; Zalaquett & Chatters, 2014), and still others find that boys are victimized more (Aricak et al., 2008). Some studies find that boys are more likely to be cyberbullies than girls (e.g., Li, 2006), while others find no sex differences (Beckman, Hagquist, & Hellström, 2013; Patchin & Hinduja, 2006). Studies with college-student samples found that women were significantly more likely to be bullied than men (Zalaquett & Chatters, 2014; but see MacDonald & Roberts-Pittman, 2010), and women tend to report more distress from being a cyber aggression victim than males (Bauman & Newman, 2013). We suggest that an overarching theoretical framework will help make sense of this contradictory pattern of results.

An evolutionary approach provides a valuable theoretical framework to understand the perpetration and negative consequences of cyber aggression. Before delineating our predictions, we briefly discuss the underlying evolutionary logic behind sex[2] differences in mate preference. Next, we describe how these sex differences result in different competition strategies. Lastly, we propose that the sex differences in mate preferences and competition can be applied to cyber aggression.

Sex Differences in Mate Preferences

An evolutionary model of intrasexual mate competition (Buss, 1987, 1988, 1989a, 1989b) posits that asymmetries in sexual selection pressures faced by men and women predict sex-differentiated mate preferences. According to Parental Investment Theory (Trivers, 1972), the sex that invests more in offspring is the "choos-

ier" sex. In humans, women face greater minimal obligatory investment than men. However, human males invest heavily in long-term relationships, which lowers the discrepancy in parental investment, rendering human men more "choosy" than less investing species.

Ancestral females who preferred mates that displayed cues historically correlated with the ability and willingness to provide resources and parental investment presumably tended to have greater reproductive success (e.g., in the currency of more surviving children). Because men are unconstrained by an energetically costly minimum obligatory parental investment, men's reproductive success has historically been limited by access to fertile and willing mates (Symons, 1979, Trivers, 1972; Williams, 1975). Fertility in women is observable through physical and behavioral cues historically correlated with fertility (e.g., clear smooth skin, full lips). Additionally, an adaptive problem faced by men, but not women, is paternity uncertainty. Investing in offspring to whom one is not genetically related expends parental effort at the expense of mating effort, and was historically associated with lower reproductive success. As a result, men who preferred long-term mates who exhibited cues to fidelity (e.g., lack of prior sexual experience), on average, experienced less cuckoldry and greater reproductive success.

Intrasexual Competition for Mates

Because humans have mutual mate choice, men and women compete with one another for the most desirable mates (Darwin, 1871). Men and women compete to make themselves more desirable to the opposite sex than their competitors. There are two forms of instrasexual mate competition: increasing one's own desirability (Buss, 1988) and decreasing a rival's desirability. By rendering a rival as less desirable to the opposite sex, one increases one's own relative mate value (Buss & Dedden, 1990).

One way to decrease rivals' mate value is through indirect aggression (sometimes called social or relational aggression; Archer & Coyne, 2005), which involves behaviors like

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[2] Sex is used instead of gender when discussing evolutionary theories that specify that asymmetries in recurrent adaptive problems between the biological sexes produce sex-specific psychological mechanisms.

gossip and social exclusion to manipulate the reputation of others or to exclude others from social groups (Archer & Coyne, 2005). Features of indirect aggression include targeting of same-sex peers (Gallup & Wilson, 2009; Vaillancourt & Sharma, 2011), targeting of characteristics attractive to members of the opposite sex (Buss & Dedden, 1990; Dijkstra & Buunk, 2002; Vaillancourt & Sharma, 2011), and effectively diminishing rivals' attractiveness (Fisher & Cox, 2009), suggesting that indirect aggression is an effective intrasexual competition strategy (Vaillancourt, 2013).

Indirect aggression is often focused on characteristics valued by the opposite sex. As predicted from an evolutionary perspective, Buss and Dedden (1990) found that people rated derogating a rival's personal appearance and promiscuity—dimensions that are highly correlated with women's mate value—as more common and more effective derogation strategies for women than for men. They also found that derogating a rival's physical formidability and financial resources—dimensions that are highly correlated with men's mate value—was rated as a more common and more effective strategy for men than for women. Men and women also report more jealousy when rivals are high in characteristics valued by the opposite sex: Women report more jealousy when a rival is high in physical attractiveness, while men report more jealousy when a rival is high in social dominance, physical dominance, and social status (Dijkstra & Buunk, 2002). Jealousy may motivate men and women to use indirect aggression against formidable rivals. For example, women are more indirectly aggressive to attractive women who are dressed provocatively than conservatively (Vaillancourt & Sharma, 2011), and attractive women are more often targets of indirect aggression than their less attractive peers (Leenaars, Dane, & Marini, 2008).

Successful competitor derogation may diminish a rival's perceived status on dimensions relative to their mate value. Studies suggest that when women derogate the attractiveness of rivals, it negatively influences men's ratings of rivals' attractiveness (Fisher & Cox, 2009). A longitudinal study found that peer-nominated indirect aggression positively predicted dating status one year later, even when controlling for age and attractiveness (Arnocky & Vaillan-

court, 2012). Women who reported engaging in indirect aggression toward peers had sex at earlier ages than women who reported being victims of indirect aggression (White, Gallup, & Gallup, 2010).

Application to Cyber Aggression

The mixed results for gender differences in cyber aggression could be due, in part, to the lack of content-specificity in the cyber aggression literature. For example, women may be targeted more often than men by cyber aggression incidents (e.g., comments, posts, messages) derogating their attractiveness and promiscuity, and these cyber aggression incidents may be perceived as more hurtful by women than men. Men may be targeted more often than women by cyber aggression incidents derogating their physical prowess or financial resources, and these incidents may be perceived as more hurtful by men than women.

To our knowledge, no studies have examined cyber aggression from an evolutionary perspective. Previous findings, however, support predictions derived from an evolutionary perspective. For example, Brody and Vangelisti (2017) found that women were more likely to be targeted with cyber aggression incidents derogating their physical appearance, while men were more likely to have their skills and talents derogated that could be correlated with their resource provisioning potential. Furthermore, cyber aggression is significantly more likely to be perpetrated by members of the same sex than by members of the opposite sex (Brody & Vangelisti, 2017), which fits with an intrasexual competition perspective. Perhaps sex differences in the content of cyber aggression can explain some of the mixed findings in the literature.

The present research applies evolutionary theory to cyber aggression. We posit that sex differences in the perceived harm of cyber aggression are context-dependent. Study 1 aims to replicate the findings that women are more upset by cyber aggression (e.g., Bauman & Newman, 2013; Ozden & Icellioglu, 2014). Study 2 aims to dive deeper by gaining a qualitative understanding of sex differences in the content of cyber aggression. We hypothesize that men and women will be more upset by posts derogating dimensions more relevant to their mate value. We predict that women will be targeted

more by posts derogating their promiscuity and physical attractiveness than men and that men will be targeted more by posts derogating their physical formidability and resource provision potential than women.

Study 1

Study 1 aims to examine gender differences in perceived hurtfulness of cyber aggression. In Study 1, we include a wide age group and use measures adapted from similar studies examining cyber aggression in adults (MacDonald & Roberts-Pittman, 2010; Selkie et al., 2015). In an era in which many findings in the literature have failed to replicate (e.g., Open Science Collaboration, 2015), we felt it important to find additional evidence for sex differences before testing a more specific hypothesis.

Method

Participants. One hundred and thirty-one participants (87 women) recruited from Mechanical Turk (M_{age} = 39.63, SD_{age} = 12.60, Range = 18–72) completed the survey. Participants were compensated with a one-time payment of $0.10 upon completion.

Materials. Cyber aggression was measured with self-reports of participants' past experience with cyber aggression similar to that used by Selkie et al. (2015). Participants were given 21 different cyber aggression incidents and asked to report whether they had ever witnessed, experienced, and/or participated in a similar incident ("Check all that apply"). Five aggression topics were adapted from Selkie et al. (2015); the remaining 16 were added in an attempt to make items more specific (e.g., derogating facial attractiveness, body attractiveness) and broader (e.g., derogating financial status). The cyber aggression incidents ranged in topics such as "posting an embarrassing picture on social media," "commenting about someone's financial situation," and "excluding a friend from a friend list on social media." The response scales were adapted from MacDonald and Roberts-Pittman (2010), with each item rated from 1 (*never*) to 4 (*very frequently*).

To measure the impact of cyber aggression, participants were asked to rate their agreement from 1 (*strongly disagree*) to 5 (*strongly agree*) on the following three items: "People I know

engage in cyberbullying often," "Cyberbullying is very hurtful," and "Cyberbullying can easily damage someone's reputation."

Procedure. After agreeing to participate, all participants were asked to report their age and sex. Next, they were asked to answer the questions about their experience with cyber aggression and the impact of cyber aggression. The order of the aggression items was randomized, and all participants received all 21 items.

Results

Descriptive statistics. A composite cyber aggression variable was created by averaging responses across all 21 items (see Table 1 for item-level descriptives). Floor effects were especially pronounced for reporting having participated in any form of cyber aggression (M = 1.19, SD = 0.23) and reporting having ever experienced any form of cyber aggression (M = 1.31, SD = 0.41). The distribution for having witnessed any form of cyber aggression (M = 1.92, SD = 0.74) was also positively skewed. Interestingly, despite the low rates of reporting witnessing, experiencing, or participating in cyber aggression, participants rate cyber aggression as very hurtful (M = 4.54, SD = 0.76), with a negatively skewed distribution indicating a ceiling effect.

Inferential statistics. Below we present results from linear regressions and report bootstrapped betas with a resampling of 1,000 when the assumption of normality was not met. All analysis were conducting in R (R Core Team, 2016). Participants were more likely to report experiencing than perpetrating any form of cyber aggression (t(113) = 9.60, β = 0.67, p < .001; B = 1.07, 95% CI [0.83, 1.31], R^2 = 0.45, 95% CI [0.32, 0.58]). Participants were significantly more likely to report witnessing cyber aggression than participating in cyber aggression (t(114) = 4.65, β = 0.40, p < .001; B = 1.04, 95% CI [0.62, 1.69], R^2 = 0.16, 95% CI [0.04, 0.28]). Lastly, participants were more likely to report witnessing than experiencing any form of cyber aggression (t(116) = 8.40, β = 0.62, p < .001; B = 1.10, 95% CI [0.86, 1.42], R^2 = 0.38, 95% CI [0.24, 0.51]).

Sex differences. There was no sex difference in reporting how often participants believe

Table 1
Percent Reporting at Least One Incidence of a Negative Post in Study 1

Item	Participated		Experienced		Witnessed	
	Men	Women	Men	Women	Men	Women
Hurtful comments regarding someone being "scrawny" or lacking muscles	11.36	6.90	13.64	11.49	47.73	41.38
Hurtful comments regarding someone's facial attractiveness	18.18	8.05	27.27	19.54	63.64	51.72
Hurtful comments regarding someone's body attractiveness	9.09	5.75	25.00	19.54	68.18	52.87
Hurtful comments regarding someone's body as lacking "curves"	13.64	5.75	20.45	17.24	45.45	42.53
Posting comments about someone being promiscuous	11.36	14.94	18.18	21.84	59.09	58.62
Posting an embarrassing picture	29.55	24.14	38.64	35.63	65.91	65.52
Posting an unflattering picture of someone	29.55	20.69	34.09	39.08	59.09	65.52
Posting hurtful comments regarding someone's overall attractiveness	13.64	16.09	22.73	24.14	72.73	59.77
Posting hurtful comments regarding someone as being overweight	11.36	11.49	20.45	20.69	63.64	56.32
Posing comments about someone's sexual status or sexual orientation	9.09	9.20	18.18	14.94	47.73	59.77
Posing comments about someone's health status	11.36	12.64	13.64	13.79	40.91	44.83
Creating groups or websites making fun or harassing someone	9.09	4.60	13.64	11.49	43.18	40.23
Hacking into another person's online accounts	15.91	6.90	27.27	20.69	47.73	49.43
Threatening to disclose someone's personal information, secrets, or photos	6.82	3.45	22.73	9.20	47.73	24.14
Sending embarrassing messages via social media, email, text	22.73	19.54	38.64	32.18	59.09	57.47
Posting comments about someone's financial situation	4.55	9.20	15.91	12.64	38.64	47.13
Posting explicit pictures without consent	9.09	5.75	15.91	9.20	52.27	37.93
Copying and pasting or taking a screen shot of a conversation without consent	52.27	57.47	27.27	29.89	20.45	24.14
Posting an embarrassing story about someone on social media	18.18	16.09	29.55	19.54	68.18	62.07
Excluding a friend from friend list on social media	47.73	51.72	31.82	50.57	56.82	65.52
Taking a phone picture to embarrass someone	20.45	22.99	36.36	31.03	63.64	56.32

other people engage in cyber aggression, $t(129) = 1.23$, $p = .22$ nor in how often participants engage in cyber aggression themselves, $t(129) = -1.23$, $p = .22$. However, women rated cyber aggression as being significantly more hurtful ($M = 4.66$, $SD = 0.73$) than men did ($M = 4.32$, $SD = 0.77$; $t(129) = 2.45$, $\beta = 0.21$, $p = .02$), but this effect was very small ($R^2 = 0.04$, 95% CI [0.00, 0.11]). There was a marginal trend toward women rating cyber aggression as being more likely to damage a woman's reputation ($M = 4.53$, $SD = 0.75$) than a man's reputation ($M = 4.27$, $SD = 0.82$; $t(129) = 1.80$, $\beta = 0.16$, $p = .07$; $B = 0.26$, 95% CI [-0.02, 0.55], $R^2 = 0.02$, 95% CI [0.00, 0.08]), but this effect was very small.

Age. Age negatively predicted reporting how often participants believe that others engage in cyber aggression ($t(129) = -4.42$, $\beta = -0.36$, $p < .001$; $B = -0.03$, 95% CI [-0.04, -0.02], $R^2 = 0.13$, 95% CI [0.03, 0.24]). Age marginally positively predicted perceived harm of cyber aggression ($t(129) = 2.18$, $\beta = 0.19$, $p = .03$; $B = 0.01$, 95% CI [0.00, 0.02], $R^2 = 0.04$, 95% CI [0.00, 0.10]).

Discussion

In line with previous research on cyber aggression, women rated cyber aggression more hurtful than men did (e.g., Bauman & Newman, 2013; Ozden & Icellioglu, 2014). The floor effects of self-reported experience and participating in any form of cyber aggression were quite dramatic. A score of 1 indicated that they had never experienced or participated in a similar form of online aggression; the average score for experience was 1.31 and for participating was 1.19. In contrast, people report that cyber aggression is quite hurtful. A score of 5 indicated strongly agreeing that cyber aggression is hurtful, and the average score for this item was 4.54. It is unclear whether this should be interpreted to mean that cyber aggression is rare but hurtful, or that participants were unwilling to report involvement with cyber aggression. Because cyber aggression is socially undesirable, it could be that people did not want to report their involvement, that cyber aggression happens to many people but only

rarely, or merely that the specific cyber aggression themes used in our study were not commonly occurring.

Study 2

Low self-reported rates of cyber aggression in Study 1 gave us little insight into the content of cyber aggression. Therefore, Study 2 was designed to examine sex differences using a free-response, qualitative approach. In a recent study, Brody and Vangelisti (2017) asked participants to write about a time someone they knew was targeted by hurtful messages on Facebook. The present study takes a similar approach but asks participants to report about their own experiences with cyber aggression and includes other social media outlets in addition to Facebook.

Method

Participants. A total of 298 participants recruited from Mechanical Turk and the psychology subject pool at a large southwestern public university (mTurk: 133 (89 women, M_{age} = 35.60, SD = 11.62; undergraduates: 156 (128 women, M_{age} = 18.71, SD = 1.40) completed the study. Responses from mTurk and the undergraduate sample pool were combined before coding. During coding, participants who did not report any posts or who did not follow instructions (e.g., writing their grocery list) were removed. Many participants did not comply with instructions, and 81 were removed. The remaining 208 participants (157 women, M_{age} = 26.27, SD = 11.02, age range = 18–63) were coded.

Materials and procedure. Cyber aggression was measured using an Act Nomination procedure (Buss & Craik, 1983). The act nomination instructions were as follows: "Please think of your experiences with social media (e.g. Facebook, Twitter, Instagram) and how members of your **same sex** have treated you. Please provide 2–5 examples of social media posts, comments, or uploads that angered, irritated, annoyed you or hurt your feelings. You may copy and paste comments that a member of the same sex as you posted that upset you. You may also choose to describe the social media situation that occurred." In order to properly code responses, we also asked participants to

include the context relating to their post in case it was necessary to derive the content or intent of the post. For example, "nice picture" could either be a compliment or a sarcastic comment, depending on the context. Similar retrospective self-report methodology has been successfully used in previous studies of bullying (Rivers, 2001) and cyber aggression (Brody & Vangelisti, 2017).

Coding procedure. One of the researchers and a collaborator not associated with the project coded the responses. Both coders were blind to the sex, age, and sexual orientation of the participant during coding. After coding individually, the researchers then compared their codes. Coders agreed on 93.32% of the items. The researchers discussed the 46 items that they did not have the same codes for. After discussing the items, the coders agreed on 36 of the items. The remaining 10 items were removed for being too ambiguous.

Previous research has found that women report seeing more posts derogating other women's sexual activity, whereas men reported seeing more posts derogating other men's sexual orientation and talents or skills (Brody & Vangelisti, 2017). Therefore, we coded for posts about promiscuity, sexual orientation, and talents or skills. However, we also included a coding category of physical attractiveness because previous research on competitor derogation has demonstrated that women derogate women on physical attractiveness more than men do (e.g., Buss & Dedden, 1990). We expected to find the same sex difference in cyber aggression. Because our predictions concerned sex differences, the coders were blind to the sex of the participant. While coding for the categories mentioned above, the coders noted only one post about someone's sexuality. There were, however, posts that would be considered homophobic in general (but not about one's own sexuality); therefore, we created a new category that we will refer to as homophobic posts. The coder also noted several other commonly occurring categories, which were coded (posts about religion, politics, and social exclusion). If a post fell under more than one category, it was given a code for both categories. For example, a post about homophobia would also fall under politics if the post mentioned gay marriage (gay marriage had been legalized in a decision by the

United States Supreme Court during the period of data collection).

Examples of posts coded as physical attractiveness include "You're ugly," "you're looking way too skinny," and "you look like a praying mantis." Posts that were coded as homophobic include examples such as "Why are you so gay," "I am tired of gays talking about getting married," and "gays are going to hell." Other examples of nominations include "slut", "stfu fat hoe", "you're a hoe" (promiscuous posts); "believing in GOD is old news," "you say you have no religion. You are nothing" (religion); a post to a link "about how feminism and feminists are really annoying these days," "Only a fool would believe that the democrats have any positive intentions here" (politics); and "you always ignore me," and "why didn't you invite me? I thought I was your friend?" (social exclusion).

Results

Coding. The present study coded for cyber aggression topics found by Brody and Vangelisti (2017) through inductive analysis that were sex-differentiated. Topics relating to sexual activity (i.e., promiscuity), attractiveness, and skills/talents were coded. Unlike Brody and Vangelisti (2017), we combined weight with physical appearance. As in Brody and Vangelisti (2017), politics, racism, and religion were common themes and were included in coding. Furthermore, unlike Brody and Vangelisti (2017), our participants did not nominate posts derogating their own sexual orientation, but did nominate posts that were derogatory of nonheterosexual orientations; we will refer to this category as homophobic posts. One hundred and fifty-seven women nominated a total of 509 posts, and 51 men nominated a total of 180 posts.

Analysis.

Preliminary analysis. Prior to conducting item-level analyses, we first tested for sex and age effects on the number of valid posts reported (i.e., posts that followed instructions) as the proportion of posts that were coded (i.e., derogations that fell into one of our categories over the total number of valid posts). There was not a significant effect of age or sex on the number of derogatory posts. There was also not

a significant effect of age or sex on the ratio of posts that were coded.

Physical appearance. Eighty-seven women, or 55.41% of all women, reported at least one post about appearance. When considering multiple posts per person, 136 posts by women, or 26.72% of all posts nominated by women, were related to physical appearance. In contrast, 18 men (31.58%) reported at least one post about appearance. A total of 30 posts, or 16.67% of all posts nominated by men, were related to physical appearance. To test the significance of the sex difference in appearance derogation, we ran logistic regression testing whether or not a participant had nominated a post about physical appearance as the outcome variable while controlling for age. Indeed, the results show that women were significantly more likely to nominate posts derogating their physical appearance, $z = 2.31$, $\beta = 0.68$, $p < .05$. Age significantly negatively predicted nominating posts about their appearance, $z = -2.83$, $\beta = -0.86$, $p < .01$. Next, we tested for the effect of participant's mate value on nominating appearance posts. There was not a significant effect of self-perceived mate value when controlling for sex and age, $z = 1.16$, $p = .25$. Because mate value is more strongly correlated with age for women, we tested for an interaction with age and sex controlling for self-perceived mate value. There was a marginally significant interaction between age and sex, $z = -2.08$, $\beta = -0.07$, $p = .04$. As predicted, older women were less likely to report posts derogating their appearance, but there was no effect of age for men.

Skills, talents, and achievements. Because Brody and Vangelisti (2017) found that men more frequently reposted comments derogating their skills and talents, we coded for this in our data: Comments relating to "sucking" or "losing" were coded. Eight men (18.60%) and 11 women (7.53%) nominated at least one post about losing at something, sucking at something, or being a loser or sucking in general. As expected, there was a significant sex difference, with men nominating significantly more posts about losing than women, $z = -2.10$, $\beta = -1.61$, $p < .05$. There was a marginal negative relationship with age, $z = -1.90$, $\beta = -2.76$, $p = .06$. However, there was no sex difference in reporting comments derogating their intelligence, $z = -0.71$, $p = .48$.

Promiscuity. No men reported any posts derogating their promiscuity (0%). In contrast, 12 women (8.28%) reported at least one post derogating their promiscuity. Because no men reported any posts derogating their promiscuity, we conducted a chi-squared test of independence to test if the observed values differed significantly from the expected null values. There was a trend that women were more likely to nominate derogatory comments relating to promiscuity than men, $X^2(1) = 3.41$, $p = .06$. However, this should be interpreted cautiously because men had no observed values for reporting promiscuity. Using a logistic regression controlling for age, there was not a significant effect of sex, $z = 0.01$, $p = .99$.

Other derogations. The next most common themes behind physical appearance (homophobic comments, social exclusion, politics, and religion) were examined for sex differences using logistic regression controlling for age. A total of 22 women (16.29%) reported at least one post about homophobic comments. A total of 7 men (15.91%) reported at least one post about homophobic comments. There was no sex or age effect in reports of homophobic comments ($p > .05$). Fourteen men (37.84%) and 24 women (18.05%) nominated posts relating to politics. There was a marginal sex difference in nominated posts about politics, with men nominating more posts than women, $z = 1.83$, $\beta = -0.80$, $p = .07$. There was a significant positive effect of age; older participants were more likely to nominate posts about politics, $z = 2.97$, $\beta = 1.26$, $p < .01$. Four men (8.51%) and 12 women (8.45%) reported at least one post about social exclusion. There was no effect of sex, but a there was a negative relationship with age, $z = 2.12$, $\beta = 1.26$, $p < .05$. Four men (8.51%) and 11 women (7.53%) reported at least one post about religion; neither sex nor age predicted nominations of posts relating to religion.

Discussion

Overall, Study 2 supports our hypothesis that women are targeted with posts derogating their physical attractiveness more often than men. The interaction between sex and age in reporting comments derogating appearance is quite interesting. Previous research has found that attractive women are more likely to be targets of same-sex aggres-

sion than less attractive women (Vaillancourt, 2013). Because age is more strongly correlated with attractiveness for women than men, it makes sense that younger women were more likely to report being targeted with posts derogating their appearance. Massar, Buunk, and Rempt (2012) found that younger women had a higher tendency to gossip than older women and that this effect was mediated by self-perceived mate value when participants were primed with a mating scenario. We did not find a mediation effect of mate value in our study, as mate value alone did not predict nomination of appearance posts, but we did not induce a mating competition, as Massar and colleagues (2012) did. Future research using experimental methods should examine this further.

Over 8% of women but 0% of men reported posts derogating their promiscuity. This finding reflects previous research examining sex differences in derogation tactics. Women are more likely to report derogating other women's sexual promiscuity than men (Buss & Dedden, 1990). Men were more likely to nominate posts about their skills/talents/losing at something than women. This is in line with previous research that had found men derogate other men's achievements (Buss & Dedden, 1990).

General Discussion

The present studies provide initial support for intrasexual mate competition theories of indirect aggression in an online context. Study 1 replicated the effect that women rate cyber aggression to be more harmful than men do. Using a qualitative approach, Study 2 suggests that women derogate other women's promiscuity and physical attractiveness on social media more than men do, while men derogate men on their abilities more than women do.

The results of the present studies suggest that, while prevalence of online aggression may decrease with age, feelings of hurt from cyber aggression do not decrease with age. In fact, Study 1 found that age positively predicted hurtfulness of cyber aggression. Study 2 found that content of cyber aggression shifts with age. While there was no change in number of posts reported with age, older women were less likely to report posts derogating their physical appearance. For many topics, older adults were less likely to nominate offensive comments. However, older adults were more likely to nominate

comments relating to politics. Evolutionary theory can provide theoretically rich predictions of content of cyber aggression and age. For example, women in middle adulthood may be more vulnerable to comments derogating their parenting skills or decisions. We were unable to test for this due to low base rates, but we did find three posts derogating parenting skills; all three posts were directed at women between the ages of 30 and 53. Obviously, this is not enough to determine that women in middle adulthood are more vulnerable to attacks regarding their parenting behaviors and skills, but this may be a promising area for future research.

An evolutionary perspective also predicts that age may be an important factor in rates of perpetration and vulnerability to cyber aggression. Sexual selection theory predicts that the use of intrasexual competition tactics should be the highest in age and sex classes that experience the most reproductive competition (Wilson & Daly, 1985). This is most clearly demonstrated by age trends in violent crimes and same-sex homicide in men. Because men have had greater variability in reproductive success over evolutionary history, intrasexual competition takes the form of especially risky tactics: Same-sex homicide perpetrators are overwhelmingly young males (Wilson & Daly, 1985). Less risky forms of intrasexual competition (i.e., indirect aggression) also vary with age, spiking in peak reproductive years. For example, younger women are more likely to gossip about a rival than older women who have lower mate value (Massar et al., 2012). If cyber aggression is a manifestation of intrasexual competition mechanisms, we should see similar developmental trends. Although the present study looked at the effects at age, it was not designed to account for differences in base rates of social media use that may confound age trends in cyber aggression with age trends in technology usage. Future research should address developmental trends in cyber aggression.

Previous research has found that women are more upset by cyber aggression than are men. However, by not considering the content of cyber aggression, these studies cannot address whether this sex difference is due to (1) cyber aggression incidents derogating characteristics relevant to women's mate value (e.g., promiscuity) being a more prevalent form of cyber aggression or (2) a true main effect of sex, with women being more

sensitive to cyber aggression. An evolutionary perspective can provide insight here, too. Some dimensions of mate value are more or less demonstrable. Less demonstrable dimensions, such as promiscuity, are more difficult to defend against derogation than observable dimensions like physical formidability, which is demonstrable through physical appearance (e.g., muscles, height), reputation for history of fighting, and through use of physical aggression (Sell, Tooby, & Cosmides, 2009; Sell et al., 2009). Theoretically, the demonstrability of the dimension should predict the sensitivity to cyber aggression. We are unable to answer this with the present findings, but future research should empirically tests these predictions.

There were several limitations to the present studies. First, there were far more women in our samples than men, so our results should be interpreted cautiously. It is possible that a wider range of types of cyber aggression would be observed if we had more men in our sample. That said, we believe that there are enough men in the sample overall to draw solid preliminary conclusions. Future research would benefit from including a larger proportion of men when testing sex differences in cyber aggression.

Second, although we used an established measure of cyber aggression in Study 1, participants reported very low incidence of cyber aggression. However, previous studies have demonstrated similarly low incidence. For example, 78.1% of participants reported never being cyberbullied, with only 0.5% reporting being bullied very frequently in a study using the same response scale (MacDonald & Roberts-Pittman, 2010).

Third, people were more likely to say they witnessed than experienced or perpetrated online aggression, suggesting reporter bias. A multi-informant approach would be valuable in studying cyber aggression. Accessing real comments from social media sites such as Facebook would allow for unbiased reporting and larger sample sizes.

Conclusion

Among adults, cyber aggression victims disproportionately suffer from anxiety and depression, and are more likely to have contemplated, planned, or attempted suicide (Cunningham et al., 2015; Schenk & Fremouw, 2012). In order to prevent or to mitigate the effects of cyber aggression, we must first understand the psychological

and social constructs that regulate this behavior. The present research demonstrates how looking at the content of cyber aggression attacks may help researchers make sense of when sex differences in cyber aggression will and will not be observed. The present studies were the first to demonstrate that an evolutionary perspective can provide valuable theoretical insight and predictive value to cyber aggression research, and we encourage evolutionary psychologists to investigate cyber aggression.

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