

Jealousy mediates the relationship between attractiveness comparison and females' indirect aggression

STEVEN ARNOCKY,^a SHAFIK SUNDERANI,^a JESSIE L. MILLER,^a AND TRACY VAILLANCOURT^{a,b}

^aMcMaster University, Canada and ^bUniversity of Ottawa, Canada

Abstract

Indirect aggression is considered an evolutionarily adaptive mechanism that can improve female mating success. It has been hypothesized that indirect aggression toward romantic partners and peers is used more frequently by females who make appearance-based comparisons and that these relationships are mediated by jealousy. Females ($N = 528$) currently in romantic relationships were surveyed. Results confirmed females who made more frequent appearance comparisons aggressed more often toward partners and peers. Low-comparing females reported being more frequent targets of peer indirect aggression. Jealousy partially mediated the relationships between making frequent attractiveness comparisons and indirect aggression. Results are discussed as effort allocated toward deterring partner defection and fending off rivals, and the role of emotion as a motivational influence for aggression.

Throughout human evolutionary history both males and females have had to contend with threats to their reproductive success. Owing to concealed ovulation and the internal fertilization process of reproduction, a female's infidelity translates into paternity uncertainty for males (Buss, 2004). Although females are not faced with this particular dilemma,

a partner's infidelity can lead to the undesirable division of financial, social, and emotional resources (Buss & Shackelford, 1997a). Infidelity can also lead to termination of the relationship equating to a loss of investment, resources, and parenting assistance (see Buss, 1994/2003; Fisher, 1992, for reviews). For these reasons, both males and females have a vested interest in attempting to retain a desirable mate. Buss, Shackelford, Choe, Buunk, and Dijkstra, (2000) suggested the successful retention of one's mate hinges on two important factors: (a) preventing a partner's attempts at defection and infidelity and (b) fending off rivals who may be interested in mating with that partner.

One manner by which these goals may be satisfied is through the strategic use of aggressive tactics. Empirical findings support the hypothesis that aggression directed toward one's mate and/or potential competitors is employed as a form of mate retention in response to reproductive threat (Buss, 1994/2003; Daly & Wilson, 1988). Hitherto research on the use of aggressive tactics within the context of intimate pair bonds has

Steven Arnocky, Department of Psychology, Neuroscience, & Behaviour, McMaster University, Hamilton, Canada; Shafik Sunderani, Department of Psychology, Neuroscience, & Behaviour, McMaster University, Hamilton, Canada; Jessie L. Miller, Department of Psychiatry, McMaster University, Hamilton, Canada; Tracy Vaillancourt, Department of Psychology, Neuroscience, & Behaviour, McMaster University, Hamilton, Canada and Faculty of Education and School of Psychology, University of Ottawa, Ottawa, Canada.

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Correspondence should be addressed to Steven Arnocky, Department of Psychology, Neuroscience, & Behaviour, McMaster University, Hamilton, ON L8S 4K1, Canada, e-mail: arnocksa@mcmaster.ca or Tracy Vaillancourt, Faculty of Education and School of Psychology, University of Ottawa, Ottawa, ON, Canada, e-mail: tracy.vaillancourt@uottawa.ca.

focused disproportionately on males' use of aggression as a mate-retention tactic. This focus reflects an androcentric bias toward perceiving females as victims of aggression and, by extension, as targets rather than perpetrators of mate retention efforts. This bias is likely perpetuated by the field's initial focus on physical aggression, which males have been shown to perpetrate more ruthlessly and with greater consequence than females (see Archer, 2004; Archer & Côté, 2005; Card, Stucky, Sawalani, & Little, 2008). Yet in situations of adult interpersonal conflict, physical aggression seems a rare exception (Bjorkqvist, 1994). Conversely, when the perpetration of indirect aggression is considered, the female role has been elucidated as more than one of passivity and unprovoked victimization (see Bjorkqvist, 1994; Campbell, 1999; Hess & Hagen, 2006, for review). This study breaks from the tradition of conceptualizing females as victims by exploring female jealousy and the perpetration of indirect aggression as predicted by the frequency with which participants compared the quality of their physical appearance to the appearances of other females.

Indirect aggression is conceptualized as a form of aggression in which a perpetrator attempts to harm the target while concurrently trying to obscure their intent (Bjorkqvist, Lagerspetz, & Kaukianen, 1992; Hess & Hagen, 2006). Indirect aggression is prevalent in peer relationships (e.g., Bjorkqvist, 1994; Richardson & Green, 2006). Related to this construct is romantic relational aggression. Romantic relational aggression has been identified as a form of aggressive behavior that causes harm by damaging romantic relationships or feelings of acceptance and love (Linder, Crick, & Collins, 2002). These behaviors are often (but not necessarily) indirect in nature. An example of romantic relational aggression is flirting with another person to make one's partner jealous. Although the behavior is salient, the intent may or may not be obscured by the actor.

Several researchers have called for the use of the umbrella term *indirect aggression* to describe indirect and relational aggression (also social aggression; Archer & Coyne,

2005; Bjorkqvist, 2001; Vaillancourt, 2005). This suggestion is supported by empirical work demonstrating that indirect aggression and relational aggression are more similar than different and should be considered from an integrative framework (Archer & Coyne, 2005). In this study, we use the term *indirect aggression* for the ease of reading but highlight that when discussing aggression directed at a peer, the type of aggression assessed was indirect and when directed at a romantic partner the type of aggression assessed was relational.

In contrast to physical aggression, indirect aggression is unique in that females engage in these behaviors as often as males (Bjorkqvist, 1994; Linder et al., 2002). Similarly, some males report being victimized at rates equal to or exceeding the victimization of females (Linder et al., 2002). As Bjorkqvist (1994) noted, being physically weaker than males, females must develop indirect modes by which to achieve their goals. In this way, indirect aggression may be an evolutionarily adaptation (Campbell, 1999; Vaillancourt, 2005). Indirect aggression is functional because it poses less danger to the perpetrator than physical aggression and yet is effective in its ability to inflict harm on the victim. Indirect aggression has the added benefit of being difficult to detect and therefore one can more easily evade social and even legal consequences (Bjorkqvist 1994; Campbell, 1999; Vaillancourt, 2005), making it a potentially useful mate-retention tactic. Indeed, there is already some existing evidence that suggests that indirect aggression may be perpetrated against romantic partners and peers as an attempt to facilitate mating success.

Evolutionary rationale for indirect aggression toward partners

Aggression toward one's romantic partner can serve the evolutionarily adaptive function of mate retention (Buss & Shackelford, 1997b). Although most research in this area has focused on physical violence, importantly, this theory does not limit itself solely to physical aggression. For instance, Buss

(1994/2003) argued that the primary function of psychological aggression toward one's romantic partner, which conceptually includes direct and indirect behaviors (Doherty & Berglund, 2008), is to cause a partner to feel less valuable, to reduce self-perceived mate value, and to make the victim feel fortunate to have secured their current partner in an attempt to reduce the chances of the partner leaving the relationship. How might indirect aggression accomplish this? Indirectly aggressive behaviors (e.g., flirting with another person in front of one's partner, threatening to terminate the relationship) convey disinterest in the current relationship and belief that there are better alternative mates available, which would likely reduce the victim's perception of their own value as a mate. Relational victimization is known to relate to both lower self-esteem (Prinstein, Boergers, & Vernberg, 2001) and depression (Linder et al., 2002), both of which are indicative of reduced perceptions of own mate value (Brase & Guy, 2004; Kirsner, Figueredo, & Jacobs, 2003). Furthermore, the Mate-Retention Inventory, a measure of various tactics used by males and females to retain a mate, measures some behaviors that are consistent with indirect aggression such as telling others terrible things about one's partner so that they would not like him or her.

Typically, the frequency with which one engages in mate retention efforts (especially cost-inflicting efforts such as aggressive behavior) can be predicted by low mate value of the perpetrator (Miner, Starratt, & Shackelford, 2009). Indirect aggression has not yet been considered in this light. However, evidence suggests indirect aggression might serve the same function as other forms of partner-directed aggression: to promote depression, low self-esteem, and other mental states that might counter extrapair mating attempts (Buss, 1994/2003).

Evolutionary rationale for indirect aggression in peer relations

Indirect aggression toward peers has been related to mate competition behavior in females, with the ultimate goal being to increase

reproductive opportunity and eliminate threats to reproductive success (Campbell, 1999; Fisher, 2004; Griskevicius et al., 2009; Leenaars, Dane, & Marini, 2008; Vaillancourt, 2005; Vaillancourt, Miller, & Sharma, 2010). For instance, an earlier onset of sexual behavior has been observed in aggressive females (White, Gallup, & Gallup, 2010).

Moreover, females more frequently use indirectly aggressive tactics to derogate physically attractive female competitors (Fisher, 2004; Leenaars et al., 2008). For instance, Vaillancourt and Sharma (2008) showed that almost all females (> 90%) randomly exposed to an attractive female confederate dressed in provocative (sexy) clothing, engaged in "bitchy" behavior toward the confederate compared to those exposed to the same confederate dressed in nonprovocative attire. Ultimately, the consequences of frequent indirect attacks by other females might result in a reduction in mate value of the target and subsequently a reduced desire for the target female by potential suitors. Obtaining a romantic partner does not necessarily signify an end to intrasexual competition. Interlopers abound (e.g., Schmitt & Buss, 2001), and females who perceive other females as a significant threat to their relationship should act in accord with an intrasexually competitive strategy. As we have outlined above, this threat likely equates to the perpetration of indirect aggression toward peers.

Given that perpetual attempts at retaining one's mate would have detracted from other important functions in ancestral times (Graham-Kevan & Archer, 2009), it should be expected that humans who could approximate the necessity for mate retention activities based on the likelihood of their partner's infidelity and/or defection would have been more reproductively successful (Buss, 1988). Several studies show that the presence of attractive intrasexual competitors represents such a threat to fidelity. For instance, males who are exposed to physically attractive females rate their satisfaction with their current relationship lower compared to males exposed to average targets (Kenrick, Neuberg, Zierk, & Krones, 1994). Considering this differential rating, one factor that should indicate the

necessity of mate retention effort is the ability to assess one's own value as a mate relative to intrasexual competitors.

Evaluations of one's own physical attractiveness can be influenced via social comparison mechanisms (e.g., How attractive am I compared to other females?), and such comparisons aid in determining one's relative value within the local mating market. Making social comparisons relates to self-reported intrasexual competition in females (Buunk & Fisher, 2009). Moreover, when a competitor is evaluated as being more desirable than oneself on an important mate-value characteristic, the associated reproductive threat becomes salient and mate retention effort may be activated in the threatened partner (e.g., Buss et al., 2000). We hypothesize that females who more frequently make attractiveness-based comparisons will behave more aggressively toward others. Moreover, we believe that this link will be mediated by jealousy.

The existing literature suggests that the link between attractiveness comparison and mate retention effort should be mediated by (an) affective trigger(s). Emotions promote motivations by acting as a signal of specific problems or goals that need to be addressed (Maner et al., 2005). Social comparisons can affect females' self-perceived attractiveness, and these females tend to exhibit increased levels of jealousy (Buss & Haselton, 2005; Dijkstra & Buunk, 1998). For instance, in multinational samples, Buss and colleagues (2000) found that females were significantly more distressed over rivals who surpassed them on facial and bodily attractiveness. The authors suggest that jealousy might be related to relevant domains of self-evaluation such as physical attractiveness and contend that this self-evaluative process may be critical to determining emotional reactions to rivals.

It has been suggested that romantic jealousy may have evolved to alert the individual of the need to engage in mate retention behaviors (Buss, 1988, 1994; Daly, Wilson, & Weghorst, 1982; Symons, 1979). Similarly, in males, jealousy (possessiveness, jealousy over a partner's casual interactions with others) increases alongside risk of partner

infidelity (Haselton & Gangestad, 2006). In considering this research, we expect that jealousy/possessiveness will mediate the relationship between one's orientation toward attractiveness comparison and the perpetration of indirect aggression toward partners and peers.

This study examines heterosexual, dating females' attractiveness comparison in relation to their use of indirect aggression toward their romantic partner and peers. We elected to focus the present study on females because: (a) individual differences in the use of mate-retention tactics by females is a neglected area of research and (b) in terms of attracting mates, the aforementioned literature clearly demonstrates that physical attractiveness matters more for females. Furthermore, because many romantic relationships may be mutually aggressive (Anderson, 2002) and because victimization by a romantic partner can also incite jealousy (Buss, 1994/2003), consideration was given to controlling for the effects of victimization in our analyses. Specific hypotheses are delineated below.

Hypotheses

- H1: *Females in heterosexual dating relationships who report greater physical attractiveness comparison will be more likely to perpetrate indirect (relational) aggression toward their romantic partner.*
- H2: *Females who report greater physical attractiveness comparison will be more likely to perpetrate acts of indirect aggression outside of the romantic relationship (i.e., toward peers) compared to females who make fewer attractiveness comparisons.*
- H3: *Romantic jealousy will mediate the relationship between attractiveness comparison and indirect aggression toward one's romantic partner.*
- H4: *Romantic jealousy will mediate the relationship between attractiveness comparison and indirect aggression directed toward peers.*

Method

Participants

Our sample consisted of female respondents who were currently in heterosexual romantic relationships ($N = 558$). Participants ranged in age from 16 to 29 years ($M = 20$ years, $SD = 2.68$). To avoid a selection bias by study major (i.e., only 1st-year introductory psychology students), participants were recruited from the university student center and were compensated \$5.00 for participation. Less than 5% of the females approached to take part in this study declined to do so.

Measures

Social comparison of physical attractiveness

Comparison of one's own physical attractiveness to the attractiveness of intrasexual competitors was assessed using the Dieting Peer Competitiveness (DPC) scale (Huon, Piira, Hayne, & Strong, 2002). Participants were instructed to report on their tendency to compare their physical attractiveness in an upward manner to same-sex others. The DPC scale is beneficial in that it is specifically designed to capture overall attractiveness as well as body weight and shape comparisons in female participants. The 5-point Likert scale is anchored at 1 (*not at all like me*) and 5 (*extremely like me*). The original measure consisted of two distinct factors: (a) body shape and weight social comparisons and (b) food intake (Huon et al., 2002). For the current research, only the first subscale consisting of five items was used. The specific items in the comparison subscale of the DPC are: "I do not like wearing a swimming costume because I don't think I look as good as the other girls," "When I look at my slim friends I wish I could look just like them," "Before going to a party I spend a long time worrying about whether I will look as attractive as some of my friends," "I feel happier about my figure when I am with someone who is larger than myself," and "I look at other girls' figures to see how well I measure up." In this study, the measure was internally consistent

($\alpha = .83$). The DPC has been shown to relate strongly to body dissatisfaction (Huon et al., 2002), suggesting that the comparisons measured are likely upward (rather than downward) in nature.

Indirect (relational) aggression and victimization in the romantic relationship

Items from the Measure of Aggression and Victimization (Linder et al., 2002; Morales & Crick, 1998) were employed to assess self-reported jealousy, relational aggression, and physical and relational victimization along a 5-point Likert scale from 0 (*never*) to 4 (*always*). This scale is the only known measure of relational aggression in romantic relationships. Importantly the items comprising this measure address issues of context sensitivity and normative/non-normative behavioral distinctions that are common to alternative measures of aggression in romantic relations (see Follingstad, 2007).

Relational aggression ($\alpha = .70$) was assessed by averaging participant responses to the following five items: "I try to make my romantic partner jealous when I am mad at him," "I have cheated on my romantic partner because I was angry at him," "I give my romantic partner the silent treatment when he hurts my feelings in some way," "If my romantic partner makes me mad, I will flirt with another person in front of him," and "I have threatened to break up with my romantic partner in order to get him to do what I wanted." As opposed to alternative measures of direct psychological aggression in romantic relations that often include more mundane and normative behaviors such as "my partner was insensitive to my feelings" to which most people are exposed (Follingstad, 2007), the items used in this study: (a) represent more serious indirect violations of the relationship (e.g., cheating and flirting out of anger, relationship termination threats meant to incite desirable partner behaviors) and (b) provide a *context-specific* rationale for the relationally aggressive action engaged in; two factors that are important for the accurate assessment of psychological forms of aggression and that many other scales lack (Follingstad, 2007).

Given that victimization relates strongly to the perpetration of aggression in romantic relations, relational and physical *victimization* were included as control variables. The following four items¹ were used to assess indirect victimization ($\alpha = .75$): “My romantic partner tries to make me feel jealous as a way of getting back at me,” “My romantic partner has threatened to break up with me in order to get me to do what he wants,” “My romantic partner doesn’t pay attention to me when he is mad at me,” and “When my romantic partner wants something, he will ignore me until I give in.” Physical victimization/threat of physical victimization ($\alpha = .81$) was assessed using three items: “My romantic partner has pushed or shoved me in order to get me to do what he wants,” “My romantic partner has tried to get his/her own way through physical intimidation,” and “My romantic partner has threatened to physically harm me in order to control me.” Of particular interest was the assessment of physical intimidation, which is considered critical to physical partner violence by victim advocacy groups (Pence & Paymar, 1986). Both fear of violence and the experiences of violence have negative effects on victims (Golding, 1999) and so were included as control variables.

Indirect aggression and victimization in peer relations

Indirect aggression and victimization were assessed using the Indirect Aggression Scale–Aggressor and Victimization versions (IAS–A, IAS–V; Forrest, Eatough, & Shevlin, 2005). Each version of the IAS consists of 35 items. The IAS–A measure was designed specifically to assess frequency of indirect aggression within interpersonal relationships. The respondent’s average score

across the IAS–A items is a representation of one’s level of indirect aggression perpetrated within the social environment. The scaling consists of a 5-point Likert scale anchored at 1 (*never*) and 5 (*always*). Example items are: “talked about others behind their backs,” “excluded others from a group,” “made other people not talk to others,” “been bitchy toward others,” and “snubbed others in public.” This study found the total indirect aggression score to be internally consistent ($\alpha = .94$). The IAS–V was included as a control measure to partial out any effect of social victimization that might otherwise lead to the use of this form of aggression. Items in the IAS–V are identical to the IAS–A, only presented with the participant as the target of each act rather than the perpetrator. In the present sample, the IAS–V was internally consistent ($\alpha = .90$).

Romantic jealousy

Romantic jealousy was assessed using two items from the Measure of Aggression and Victimization (Linder et al., 2002; Morales & Crick, 1998) using a 5-point Likert scale from 0 (*never*) to 4 (*always*). Given that this study is the first to examine the mediating role of jealousy to the relation between perceived mate value and aggression, we employed an indicator of jealousy that is (a) known to exist in college dating relationships (Hansen, 1985) and (b) has been shown to fluctuate alongside relationship threat (Haselton & Gangestad, 2006). Specifically, jealousy/possessiveness was assessed by averaging participant responses to the following two items: “It bothers me if my romantic partner wants to spend time with his friends” and “I get jealous if my romantic partner spends time with his friends, instead of just being alone with me.” The item-correlation was $r = .78$. We were particularly interested in jealousy as distress over time spent with others because college students often expect romantic partners to give up close friendships, especially with others of the opposite sex (Hansen, 1985), and time spent with others outside of the romantic dyad is a particular situation that may

1. We omitted a fifth item “When my romantic partner is mad at me, he won’t invite me to do things with our friends” from the subscale as we believed it would confound with the indicator of jealousy over time spent with friends outside of the relationship. Principal components analysis using a varimax rotation and no fixed number of factors confirmed that the four items utilized comprise a single victimization factor with loadings between .76 and .85.

directly or indirectly promote extrapair mating opportunities.

Results

Descriptive findings

Descriptive statistics and bivariate correlations for each measure are provided in Table 1. Indirect victimization by peers correlated negatively with the use of indirect aggression toward peers. Although jealousy was significantly correlated with both perpetration and victimization, the strongest correlations were with the perpetration of indirect aggression toward romantic partners, followed by indirect victimization.

Analytic approach

We examined the simple effects of attractiveness comparison on indirect aggression toward both partners (H1) and peers (H2) as well as the role of jealousy in mediating these relationships (H3 and H4, respectively). For each analysis, we used bootstrapping procedures as outlined by MacKinnon, Lockwood, Hoffman, West, and Sheets (2002). The mediated (*indirect*) effect is the reduction of the

effect of the predictor variable on the criterion upon inclusion of the mediating variable. Thus, the indirect effect is equal to the initial effect of X on Y (*the total effect*) minus the effect of X on Y with the mediator included in the model (*the direct effect*; Baron & Kenny, 1986). Preacher and Hayes (2008) suggest the bootstrapping method is superior to alternative methodologies because it does not enforce the assumption of a normally distributed sample. Bootstrapping procedures might also relate to increased power and reduced Type I error rate (MacKinnon et al., 2002). For each analysis in this study, 1,000 bootstrapping samples were derived. These results are reported in the first four columns of Table 2 (rows 1 and 2). We next explored whether these results held upon the inclusion of victimization control variables, and these results can be found in columns 3 and 4 of Table 2. All coefficients reported herein are unstandardized.

Attractiveness comparison and perpetration of aggression toward romantic partner

To test jealousy as a mediator of relationships between attractiveness comparison and aggression, we first had to determine if

Table 1. Descriptive statistics and bivariate intercorrelations among variables

	1	2	3	4	5	6
1. Attractiveness comparison: <i>M</i> = 1.85, <i>SD</i> = 1.06, range = 4.00	—					
2. Jealousy: <i>M</i> = 1.90, <i>SD</i> = 0.91, range = 5.00	.28**					
3. Indirect aggression toward partner: <i>M</i> = 1.79, <i>SD</i> = 0.70, range = 4.50	.26**	.53**				
4. Indirect aggression toward peers: <i>M</i> = 1.89, <i>SD</i> = 0.46, range = 2.86	.19**	.24**	.37**			
5. Indirect victimization by partner: <i>M</i> = 1.51 <i>SD</i> = 0.72, range = 5.00	.17**	.43**	.54**	.30**		
6. Physical victimization by partner: <i>M</i> = 1.17, <i>SD</i> = 0.48, range = 4.67	.13**	.33**	.47**	.22**	.59**	
7. Indirect victimization by peers: <i>M</i> = 1.23, <i>SD</i> = 0.71, range = 3.00	-.25**	-.15**	-.22**	-.38**	-.25**	-.14*

p* < .05 (two-tailed). *p* < .01 (two-tailed).

Table 2. *The mediating effects of jealousy on the relationship between attractiveness comparison and indirect aggression perpetrated against partners and peers*

	Indirect aggression to partner (without controls)		Indirect aggression to peers (without controls)		Indirect aggression to partner (with controls)		Indirect aggression to peers (with controls)	
	1. Total effect model	2. Mediation model	3. Total effect model	4. Mediation model	5. Total effect model	6. Mediation model	7. Total effect model	8. Mediation model
1. Attractiveness comparison	0.18**	0.08*	0.08**	0.05*	0.03**	0.01	0.04*	0.01
2. Jealousy		0.37**		0.11**		0.24**		0.09**
3. Indirect victimization by partner					0.28**	0.29**		
4. Physical victimization by partner					0.24**	0.25**		
5. Indirect victimization by peers								
Total explained variance (R^2 adj)	.07	.29	.03	.07	.34	.43	-.034**	.17

Note. Unstandardized regression coefficients are reported. * $p < .05$ (two-tailed). ** $p < .01$ (two-tailed).

females who made more frequent attractiveness comparisons were indeed more likely to report jealousy. Results indicated that attractiveness comparison significantly predicted jealousy, $b = 0.25$, $p < .001$.

Each mediation model was first tested while excluding the victimization covariates. The hypothesis that more frequent attractiveness comparisons would predict perpetration of indirect (relational) aggression toward romantic partners was examined and results are shown in row 1 of Table 2 (H1). We found that attractiveness comparison had a total effect on indirect aggression toward romantic partners of $b = 0.18$, $p < .001$. However, when we included jealousy in the model, we found that the direct effect of attractiveness comparison on indirect (relational) aggression was reduced, $b = 0.08$, $p < .01$. Jealousy significantly predicted indirect aggression toward one's romantic partner, $b = 0.37$, $p < .001$. Jealousy partially mediated the link between attractiveness comparison and indirect aggression, Sobel test: $z = 3.93$, $p < .001$, bootstrapping: 95% CI [0.015, 0.043] partially supporting H3. The mediation model contributed .29 toward explained variance (R^2 adj).

Attractiveness comparison and perpetration of aggression toward peers

Next, we explored the effect of attractiveness comparison on the perpetration of indirect aggression toward peers (H2). We found that attractiveness comparison had a significant total effect in predicting indirect aggression toward peers, $b = 0.08$, $p < .001$. With jealousy included in the model, the effect of attractiveness comparison was reduced, $b = 0.05$, $p < .01$. Jealousy significantly predicted indirect aggression toward peers, $b = 0.11$, $p < .001$. Jealousy acted as a partial mediator of the link between attractiveness comparison and indirect aggression toward the romantic partner (Sobel test: $z = 5.91$, $p < .001$; bootstrapping: 95% CI [0.014, 0.029]) partially supporting H4. The mediation model contributed .07 toward explained variance (R^2 adj).

Attractiveness comparison and aggression controlling for levels of victimization

Next, we ran each set of analyses while controlling for victimization. Attractiveness comparison scores were entered simultaneously with physical and indirect victimization as control variables in predicting indirect aggression toward one's romantic partner. Both physical ($b = 0.24$, $p < .001$) and indirect victimization ($b = 0.28$, $p < .001$) predicted the perpetration of indirect aggression by females. Controlling for physical and indirect victimization, we found that attractiveness comparison significantly predicted the perpetration of relationally aggressive acts toward one's romantic partner, $b = 0.03$, $p < .001$, again supporting H1. In this model, jealousy was predictive of the perpetration of indirect (relational) aggression toward the romantic partner, $b = 0.24$, $p < .001$ (Table 2, column 6, row 2). With jealousy included in the model, the relationship between attractiveness comparison and perpetration of indirect aggression toward the romantic partner was significantly reduced from $b = 0.03$, $p < .001$ to $b = 0.01$, $p < .05$, providing evidence of partial mediation (Sobel test: $z = 4.69$, $p < .001$; bootstrapping: 95%, CI [0.006, 0.016]), partially supporting H3. The mediation model contributed .43 toward explained variance (R^2 adj).

We again examined the relationship between attractiveness comparison and perpetration of indirect aggression toward peers, this time controlling for indirect peer victimization. We found that being indirectly victimized by one's peers negatively predicted the perpetration of indirect aggression, $b = -0.34$, $p < .001$, suggesting that females who were victims are not likely to self-report perpetrating indirect aggression toward peers. As predicted, attractiveness comparison significantly predicted perpetration of indirect aggression against others, supporting H2 ($b = 0.04$, $p < .05$). Jealousy was then included as a mediator to the relationship between attractiveness comparison and indirect aggression

toward peers. In this model, jealousy was predictive of the perpetration of indirect aggression toward peers, $b = 0.09$, $p < .001$. With jealousy included in the model, the relationship between attractiveness comparison and perpetration of indirect aggression was significantly reduced from $b = 0.04$, $p < .05$ to $b = 0.01$, *ns*, providing evidence of full mediation (Sobel test: $z = 3.43$, $p < .001$; bootstrapping: 95%, CI [0.010, .037]) and supporting H4. The mediation model contributed .17 toward explained variance (R^2 adj).

We also tested whether females who made fewer attractiveness comparisons were more likely to be indirectly victimized by peers. Controlling for perpetration, females who were lower in attractiveness comparison were more likely to be indirectly victimized by peers, $b = -0.02$, $p < .001$. This finding indicates that females who least frequently make physical attractiveness comparisons are more often the targets of indirect aggression from peers and supports an evolutionary hypothesis of indirect aggression as the targets female competition are most likely those who pose the greatest threat to the perpetrators (e.g., Leenaars et al., 2008).

Discussion

This study was designed to investigate several evolutionarily informed hypotheses regarding social comparison of physical attractiveness and indirect aggression. We hypothesized that females who frequently compare their physical appearance to attractive others would utilize indirect and relational forms of aggression more frequently (e.g., Campbell, 1999; Vaillancourt, 2005; Vaillancourt et al., 2010).

We found that females who made more frequent attractiveness comparisons were more likely to engage in aggressive behaviors toward their romantic partners and their peers, supporting H1 and H2, respectively. This finding remained when we included relevant victimization control variables. The observation that high attractiveness comparison females engaged in greater indirect aggression is not surprising given that the making of such comparisons is highly correlated with body dissatisfaction (Huon et al., 2002).

These females might perceive themselves as being low on the mate value characteristic of physical attractiveness, meaning that the proportion of higher value competitors is greater.

The finding that these females aggressed against their partners (H1) appears to be consistent with findings by Graham-Kevan and Archer (2009), who found that low-mate-value females were more likely to be physically aggressive and to control their partners. We suggest that females who might perceive themselves as being of low mate value will perceive greater threat to their relationship because there are more appealing alternatives for their mate to potentially choose from. Even females with a relatively low-mate-value partner should still have a vested interest in guarding their male partners against female rivals. Parental investment theory (Trivers, 1972) suggests that females are obligated to invest a considerable amount of time toward pregnancy and lactation in order to increase the chances of their child surviving. Males, conversely, are able to invest more effort toward attracting additional mates, which can ultimately lead to desertion. Indeed, human males appear to engage in infidelity more often than females (e.g., Blow & Hartnett, 2005; Greeley, 1994; Schmitt, 2003; Wiederman, 1997). Although in general males are known to become more distressed by sexual infidelity than are females (Daly & Wilson, 1988), it remains in the best interest of the committed female to prevent these sexual infidelities because of the related risk of redirection of time, parenting effort, and resources as well as defection away from the original dyad. Indeed, it has been proposed that a female's jealousy varies with the threat that she perceives in a male partner's infidelity (Harris, 2003), and this jealousy would not be so if male extra-pair mating had no deleterious effect on his partner.

Similarly, we found that females who make attractiveness comparisons were more aggressive toward peers (H2). Our results support the hypothesis that females who may perceive themselves as being of lower mate value tend to engage in intrasexual competition with other females. It has been hypothesized that

these acts of indirect aggression aid in retaining access to a desirable mate by reducing the mate value of the target (Vaillancourt, 2005; Vaillancourt et al., 2010). This mate retention can be accomplished by using indirectly aggressive methods to reduce the social standing of the target (e.g., spreading rumors about promiscuity; Buss & Dedden, 1990; Leenaars et al., 2008) and by reducing the rivals' willingness to compete because of the negative symptoms associated with indirect victimization, such as depression or social anxiety (Vaillancourt, 2005).

The use of indirect aggression can also be employed to increase standing within the social hierarchy (Leenaars et al., 2008; Vaillancourt & Hymel, 2006). Indirect aggression is associated with future perceived popularity (Zimmer-Gembeck, Geiger, & Crick, 2005), and social status is inextricably tied to competition for mates (see Vaillancourt, 2005). Presumably, increasing one's social standing can often result in decreasing a rival's social standing, granting the aggressor greater access to "better pickings" within the mating market. In line with this, we also found that females who do not frequently make attractiveness comparisons were more likely to report being indirectly victimized by their peers, suggesting that females who see themselves as being of higher value may be more frequently targeted. Thus, females likely aggress against those who pose the greatest threat to their relationship. This is an interesting avenue for future research to explore.

To the best of our knowledge, this is the first study to test romantic jealousy as a mediator to the relationship between attractiveness comparison and mate retention efforts. We hypothesized that jealousy would account for the links between attractiveness comparison and aggression toward both partners (H3) and peers (H4). We found that the observed relationship between social comparisons and aggression perpetrated toward both romantic partners and peers was partially mediated by romantic jealousy. Over human evolutionary history, females risked the loss of a monogamous partner by way of infidelity or defection from the relationship. Because males place

considerable value on the physical attractiveness of females (Fisher, 2004), the perception that intrasexual competitors are of greater physical attractiveness is a salient cue to incite greater jealousy among females. Thus, jealousy prompted by perceiving a threat to the relationship seems to be an adaptive function that initiates behaviors meant to prevent a mate's infidelity or defection from the dyad (Buss et al., 2000). Attractiveness comparison was associated with a fairly small effect size (R^2 adj = .03–.07) before including jealousy in the model, upon which explained variance increased (R^2 adj = .07–.29). Moreover, inclusion of the control variables further increased the effect sizes (R^2 adj = .17–.43). Although in general females compete most readily on the mate value characteristic of physical attractiveness (Fisher, 2004), there are other desirable traits that females may compete on (e.g., interpersonal responsiveness) that would likely increase the total explained variance.

Limitations

This study was limited by our focus on female participants. We elected to study a large sample of females because indirect forms of aggression are preferentially utilized by females. Moreover, little research has focused on the mate retention efforts of females, especially in regard to aggressive behavior. However, adult males also utilize indirect aggression, and future research should address the ultimate causes of these behaviors in males. We suspect that males making frequent comparisons with intrasexual competitors will also be more likely to engage in these behaviors. However, the focus of comparison might differ because females place less emphasis on male physical attractiveness (e.g., Buss, 1994/2003). We suggest that males will likely place a greater emphasis on status comparisons (money, job, athletic ability comparisons).

Another limitation, which is characteristic of most studies on indirect aggression toward peers, is that the measure we employed did not explicitly measure aggression toward *only* same-sex peers and thus cannot be

considered solely as a measure of intrasexual competition. This limitation is true of other empirical studies that have tested evolutionary hypotheses of female indirect aggression as an indicator of intrasexual competition using scales developed for the peer relations field (e.g., Leenaars et al., 2008; White et al., 2010). This said, the benefit of using a well-validated measure seems to outweigh this particular cost given that a strong body of evidence suggests that most peer aggression is directed toward same-sex individuals, and we would suspect a similar pattern of results had we instructed participants to only report on aggression toward other females. For instance, Gallup, O'Brien, White, and Wilson (2009) found that 85% of peer aggression is directed toward those of the same sex.

This study is the first to test jealousy as a mediator of the link between relationship threat and mate retention effort. To do so, we used an indicator of romantic jealousy that focused on the partner spending time with others outside of the relationship, which has previously shown to be a good indication of jealousy in college dating relations (Hansen, 1985). However, jealousy is a complex and multifaceted construct. To evaluate the robustness of these initial findings, future research might explore potential relationships between various types of jealousy such as reactive, preventive, and anxious jealousy (Buunk, 1997) as well as evaluate potential differences in the effects of emotional versus sexual jealousy (see Buss, 2000; Harris, 2003). The use of a more sophisticated, broader measure of jealousy would likely relate to a greater mediating effect on the attractiveness comparison–aggression relationship. Future research might also consider the role factors such as attachment style in affecting this relationship. We suspect that females who are insecurely attached to their partner might be more attentive to threats to the romantic dyad, especially those of the anxious-preoccupied type.

Conclusion

Females preferentially use indirect and relational tactics to aggress against their romantic

partners and peers (Bjorkqvist, 1994; Linder et al., 2002; Vaillancourt, 2005). However, little empirical research has addressed the potential reasons behind female aggression. Following human evolutionary psychology, we contend that females who make more frequent physical attractiveness comparisons might perceive themselves to be at particular risk of partner infidelity or defection from the relationship because of the saliency of higher quality intrasexual competitors. It follows that these females experience a greater amount of jealousy and mate retention efforts, arguably because of an inherently greater level of relationship threat that is associated with these comparisons. Although the focus of this study was indirect aggression, it would be interesting for future work to consider positive-inducement forms of mate retention (e.g., gift giving, providing sexual favors, and attempts at appearance improvement) in relation to attractiveness comparison and jealousy.

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