



Coping with Relationship Loss by Denial and Acceptance: Direct and Indirect Associations with Engagement in Post-Relationship Pursuit Behaviors Among College Men and Women

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Abstract

Purpose Prior research has indicated that several theories might be incorporated to understand perpetration of post-relationship pursuit behaviors (PPBs). However, difficulties coping with relationship loss have not been directly assessed as potential predictors of PPB perpetration, despite their potential relevance. Thus, the present study tests an integrative model to assess whether acceptance or denial-based coping with relationship loss are associated with minor PPBs (e.g., following, excessive contact) and severe PPBs (e.g., aggression) when including prior theoretically relevant variables, such as prior relationship violence (part of *coercive control theory*) and break-up related distress and rumination (*relational goal pursuit theory*). Potential differences in predictors of in-person and cyber PPBs are explored, as are moderating effects of gender.

Method N=821 undergraduates (59.4% women) who experienced a break-up within the past two years completed measures related to in-person and severe PPBs, coping strategies, prior relationship violence, and relational goal pursuit constructs.

Results Coping by acceptance was associated with reductions in minor PPBs among men (but not women), whereas coping by denial was associated with increases in minor and severe PPBs across genders, through direct and indirect paths. Supporting prior research, relational goal pursuit was related only to minor PPBs, whereas prior relationship violence was associated with all PPBs, particularly among men. There were few differences in predictors of in-person and cyber PPBs.

Conclusion Denial over relationship loss may serve as a risk factor for PPB engagement, whereas coping by acceptance may serve a more limited protective role. Additional risk factors remain important to study in future research.

Keywords PPBs · Stalking · IPV · Rumination · Coping

Experiencing the break-up of a romantic relationship is often reported to be one of life's most upsetting events (Anders et al., 2011; Kendler et al., 2003). While contact between former partners may be normative, when these behaviors become persistent, repeated, and unwanted, they are often referred to as “unwanted pursuit behaviors” or “obsessive relational intrusion” and may even reach legal definitions of stalking (Dardis & Gidycz, 2017, 2019; Dutton & Winstead, 2006; Dye & Davis, 2003; Langhinrichsen-Rohling et al., 2000; Tassy & Winstead, 2014; Spitzberg & Cupach, 2010; Thompson et al., 2012). However, as legal definitions

of stalking typically require that victims report fear, distress, or harm, these factors may not be reliably ascertained from the pursuer's perspective alone (Fox et al., 2011). Thus, for the purposes of the present study, the term *post-relationship pursuit behaviors (PPBs)* will be used to refer to any repeated unwanted or unsolicited pursuit of a former partner after the relationship has ended.

Among undergraduates, rates of PPBs have varied between 24% to up to 81% (Dardis & Gidycz, 2017, 2019; Dutton & Winstead, 2006; Tassy & Winstead, 2014), and, across college and national samples, current or former partners represent between 13.3% (Fedina et al., 2020) to 43.4% (Smith et al., 2022) of perpetrators of stalking. In efforts to explain the potentially varied motivations of stalking and pursuit behavior, Davis and colleagues (2012) recommended integrating extant theories (e.g., relational goal pursuit theory and coercive control theory, discussed

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further below). Subsequent research has identified that these theories might differentially predict minor pursuit (e.g., following, excessive contact) compared to severe pursuit (e.g., threats, aggressive behavior; e.g., Dardis & Gidycz, 2019). However, while some theories imply that distress over relationship loss might predict PPB engagement (e.g., Cupach et al., 2000), prior studies have not assessed whether coping strategies in response to relationship loss (i.e., acceptance or denial) may be potential predictors of PPBs. Thus, the primary aim of the present study is to examine whether acceptance or denial-based efforts to cope with relationship loss might be associated with engagement in minor or severe PPBs. In efforts to build on existing theory integration efforts, coping strategies are explored concurrently with theory-based predictors found to be significantly associated with PPBs in prior research (Dardis & Gidycz, 2019). As prior research examining putative differences in predictors of pursuit performed in-person (e.g., following, showing up places) and through cyber forms (e.g., texting; using social media) has been mixed (Chan et al., 2021; Dardis & Gidycz, 2019; Ménard & Pincus, 2012), minor and severe PPBs are further disaggregated into in-person and cyber PPBs to examine potential similarities and differences in their predictors. Finally, given some research documenting gender differences in predictors of PPBs and stalking (see Langhinrichsen-Rohling, 2012, for a review), a secondary aim of the present paper is to explore whether gender moderates these associations. Results of the present paper can be used to inform healthy relationship termination among young adults and, hopefully, prevent engagement in PPBs following the end of a relationship.

Relational Goal Pursuit Theory

In efforts to understand the potentially varied motivations for engaging in PPBs, Cupach and colleagues (2000) proposed relational goal pursuit theory, in which reconciliatory goals may drive pursuit. According to this theory, beliefs that the relationship is the sole means of achieving higher-order goals of happiness or esteem (*goal-linking*) contribute to persistent *rumination* about the former partner and break-up distress (*emotional flooding*; Cupach et al., 2000), which, together, increase the risk of obsessive pursuit. While there is limited research empirically testing the tenets of relational goal pursuit theory, the most consistent support has been found for an association between rumination and pursuit behaviors (Cupach et al., 2011; Johnson & Thompson, 2016; Spitzberg et al., 2014), with some studies demonstrating associations between break-up related distress and increased PPB engagement (Brownhalls et al., 2021; Dye & Davis, 2003; Johnson & Thompson,

2016). However, as noted above, in studies disaggregating minor and severe PPBs, relational goal pursuit constructs were associated with more mild, but not more severe, PPBs (Cupach et al., 2011; Dardis & Gidycz, 2019). For example, Dardis and Gidycz (2019) found that a latent factor representing the relational goal pursuit constructs of rumination, emotional flooding, and goal-linking was associated with higher engagement in minor in-person and cyber PPBs, but not with severe in-person or cyber PPBs. Thus, perpetration of severe PPBs may be motivated by other factors, such as efforts to control a former partner.

Prior Relationship Violence

Coercive control theory (Dutton & Goodman, 2005; Stark, 2007) posits that relationship violence (such as intimate partner violence) is utilized to maintain control over a partner. Stalking has been considered an “extension” of coercive control within relationships, and has been related to psychological, physical, and sexual relationship violence (Logan & Cole, 2011, p.917). Applying coercive control theory to pursuit behavior, Davis and colleagues (2012) note that pursuit may be used in efforts to reassert control over a former partner through surveillance or may also be used to vengefully punish a former partner for their departure. Based upon coercive control theory, prior relationship violence should be positively associated with PPB perpetration, such that PPBs are a continuation of partner violence after relationship termination. Supporting this theory, prior relationship violence has been associated with both increased frequency of PPBs (Logan et al., 2007; Logan & Walker, 2009) and severity of PPBs or stalking (Dardis & Gidycz, 2019; Logan & Cole, 2011; Ferreira & Matos, 2013).

Coping by Denial and Acceptance

Although both relational goal pursuit and coercive control theories have been posited, prior studies have not directly invoked coping theory. Coping strategies represent the cognitive and behavioral efforts individuals make in response to stressful events (Lazarus & Folkman, 1984). While *problem-focused* efforts to directly solve or change the circumstances are deemed more adaptive in circumstances in which one has control over the problem, *emotion-focused* strategies are often deemed more adaptive in less controllable circumstances, such as relational contexts dependent on the interpersonal behavior of another (Carver et al., 1989; Tamres et al., 2002). Among the emotion-focused strategies, *avoidant* coping, such as *denial*, are associated with psychopathology and increased distress and are often deemed maladaptive,

whereas *approach*-oriented strategies, such as *acceptance*, either demonstrate protective effects or are unrelated to distress (Aldao et al., 2010; Littleton et al., 2007).

Though the coping literature has not been frequently applied in the context of relationship loss, acceptance of the relationship's end is viewed as critical to the resolution of relationship grief and loss (Hollenbaugh et al., 2020). Meaning-making and coming to resolution, strategies that necessitate some acceptance of loss, are deemed beneficial for adjustment (Rollie & Duck, 2006; Sorensen et al., 1993). Theoretically, with greater *acceptance* of the relationship's end, one would be less inclined to engage in continued pursuit of a former partner. By contrast, "excessively" reflecting on the prior relationship is associated with distress (Fagundes, 2012), and may be anticipated in contexts in which one is in *denial* over the loss of the relationship, or when efforts to deny the end of the relationship have been overwhelmed. Denial could thereby be expected to contribute to greater engagement in PPBs in efforts to maintain connection with the former partner.

Coping and Potential Associations with Relational Goal Pursuit Theory

Although relational goal pursuit theory does not directly invoke coping theory, within a coping framework, prior research indicates that efforts at denial are frequently overwhelmed and cannot be maintained, leading to heightened distress, and the development of ruminative thought (see Stroebe et al., 2007 for a review). Rumination can thereby serve "to avoid the presumably even more painful work of admitting and adjusting to the loss" (Stroebe et al., 2007, p.470). Thus, in addition to direct effects of coping by denial on PPBs, coping by denial could be indirectly associated with minor PPBs through increases in rumination and break-up distress when relational goals are not met. By contrast, acceptance of the end of the relationship would represent a more adaptive coping strategy, potentially directly associated with reductions in PPBs.

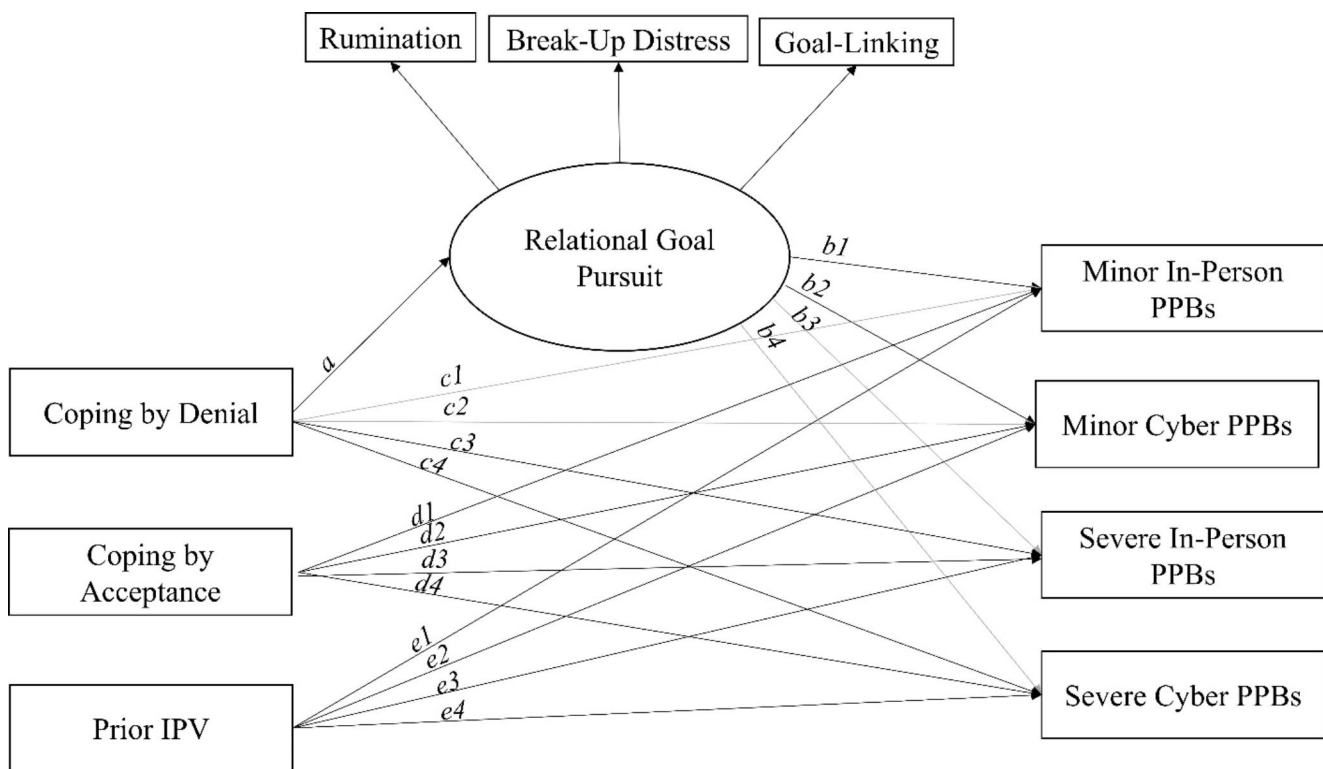
Gender and PPB Theories

Along with sexual violence, relationship abuse, and human trafficking, stalking has been conceptualized as a form of gender-based violence, as men frequently represent the majority of perpetrators, and women the majority of targets, of PPBs and stalking (see Langhinrichsen-Rohling, 2012, for a review). Even when greater gender similarity in rates of PPB perpetration are documented (e.g., among undergraduate samples, Spitzberg et al., 2010), PPBs and stalking

are often viewed differently when perpetrated by men and women (Davis et al., 2012; Langhinrichsen-Rohling, 2012). For example, due to structural advantages, gender norms, and the size differential between women and men, men's pursuit and aggression toward former partners are viewed as more frightening, problematic, unacceptable, dangerous, and threatening by others than women's pursuit (Nguyen et al., 2012; Sheridan & Lyndon, 2012; Thompson et al., 2012). Coercive control theory aligns with gender-based theories of violence by positing that men, who hold greater social power, will be more likely to use violence in efforts to maintain control of their partners; consistent with this theory, prior relationship violence has been more strongly associated with PPB engagement for men than for women (Dardis & Gidycz, 2019; Senkans et al., 2021). By contrast, associations between relational goal pursuit constructs and PPBs have not been moderated by gender in prior research.

Current Study

In sum, although theories used to explain PPBs have invoked notions of difficulty coping with relationship loss (i.e., relational goal pursuit theory), there is limited research directly assessing how coping—through denial or acceptance of the end of the relationship—might predict engagement in PPBs. To the extent that coping strategies represent risk and/or protective factors for PPBs, these strategies might be targeted in psychotherapeutic or prevention efforts. Based on relational goal pursuit theory and coping theory, Hypothesis #1 is that coping by denial will be indirectly associated with minor PPBs through increased use of rumination, break-up distress, and goal-linking. The indirect effects are represented in Fig. 1, as the combination of paths a and b_{1-2} (paths $a*b_1$ and $a*b_2$). As relational goal pursuit constructs were not significantly associated with severe PPBs in one prior study (Dardis & Gidycz, 2019), Hypothesis #2 is that there will be direct, but not indirect, effects of coping by denial on severe PPBs (paths c_3 and c_4 will be significant, but not paths $a*b_3$ and $a*b_4$). Based on the theoretically adaptive nature of coping via acceptance, and the notion that acceptance of the end of a relationship will lead to less overall engagement with the former partner, Hypothesis #3 is that higher engagement in coping with the break-up through acceptance will be directly associated with reductions in both minor and severe PPBs (paths d_1-d_4 in Fig. 1). Based on prior research, Hypothesis #4 is that prior relationship violence will be significantly associated with both minor and severe PPBs (paths e_1-e_4), and that this effect will be moderated by gender, with effects stronger for men than for women (Dardis & Gidycz, 2019; Senkans et al., 2021). Given the lack of gender differences in coping strategies or



Indirect Effects of Coping by Denial on UPBs through RGP: $a*b1$, $a*b2$, $a*b3$, $a*b4$

Fig. 1 Hypothesized Model. Note: PPB=unsolicited/unwanted pursuit behavior. RGP=Relational Goal Pursuit. IPV=Intimate Partner Violence. gray paths are not hypothesized to be significant. Possible

relational goal pursuit constructs in prior studies, we do not hypothesize that gender will moderate these associations, though this will be explored through moderation analyses. Theoretically, no primary reasons for significant differences in predictors of in-person vs. cyber PPBs are anticipated, however, given the mixed prior research on the subject (e.g., Chan et al., 2021; Dardis & Gidycz, 2019; Ménard & Pincus, 2012) minor and severe PPBs will be separated into in-person and cyber forms in order to examine the possibility of unique predictors and to provide additional context for future meta-analyses.

Methods

Participants and Procedure

Undergraduate participants who reported a break-up with a partner within the past two years (to emphasize recent relationships) were recruited from the psychology research participant pool. In all, 897 participants who had reported a break-up with a partner within the past two years completed

covariates (i.e., time since break-up; extent that partner initiated break-up) not depicted to simplify image

the survey. However, to reduce inclusion of inattentive participants (Meade & Craig, 2012), participants who self-reported giving the study “almost none” or “very little” of their attention were excluded, resulting in $N=832$. Unfortunately, as only 11 participants reported a non-binary gender identity, this group was too small to statistically compare to the other gender groups; thus, the final sample includes $N=821$, with demographic characteristics presented in Table 1. The sample included 333 men (40.6%) and 488 women (59.4%) and was predominantly White/Caucasian (54.5%) or Black/African American (28.7%) and non-Hispanic/Latinx (89.7%). Most participants self-reported being heterosexual (89.7%) and reported that their ex-partner was of the other gender (94.6%). On average, it had been just over one year since the break-up, and the relationship had lasted an average of around 14.5 months before it ended.

Study procedures were approved by the institution’s IRB. After providing informed consent, participants completed online surveys using Qualtrics. For all measures, participants were told to respond in reference to an ex-partner from within the past two years. If participants reported more

Table 1 Sample Demographic Characteristics

Characteristic	%/n or M (SD)
Gender	
Men	40.6% (333)
Women	59.4% (488)
Age (M, SD)	19.00 (1.58)
Race	
White	54.5% (448)
Black	28.7% (236)
Asian-American/Pacific Islander	9.6% (79)
Native American	0.9% (7)
Other	5.7% (47)
Chose not to respond	0.6% (5)
Ethnicity	
Non-Hispanic/Latina(o)	89.7% (737)
Hispanic/Latina(o)	7.7% (63)
Chose not to respond	2.7% (22)
Family Income	
<\$49,999	24.6% (202)
\$50,000-\$99,999	26.0% (214)
>\$100,000	27.3% (224)
Do Not Know/Chose not to respond	22.1% (182)
Sexual Orientation	
Heterosexual	89.7% (737)
Bisexual	6.1% (50)
Gay/Lesbian/Homosexual	1.9% (16)
Pansexual	0.9% (7)
Other	1.2% (10)
Chose not to respond	0.2% (2)
Prior Relationship Characteristics	
Length of Relationship (months)	14.46 (13.70)
Time Since Break-Up (months)	12.45 (9.11)
Who Initiated Break-Up	
Me	29.3% (241)
Mutual, but more me than my partner	23.7% (195)
Completely Mutual	11.4% (94)
Mutual, but more my partner than me	17.8% (146)
My partner	17.6% (145)
Chose not to respond	0.1% (1)
Former Partner Same or Other Gender	
Other Gender	94.6% (778)
Same-Gender	5.1% (42)
Chose not to respond	0.2% (2)

than one ex-partner, they were instructed to respond in reference to their “most significant” relationship.

Measures

Demographics

Participants were asked a series of questions about their personal characteristics (e.g., age, race, ethnicity, etc.). Participants were also asked how long they had dated their former partner (in months), how many months had passed since

the relationship ended, and who initiated the break-up, with options of 0 (*only me*), 1 (*mutual, but more me than my partner*), 2 (*completely mutual*), 3 (*mutual, but more my partner than me*), and 4 (*only my partner*).

PPBs

In-person PPBs. In-person PPBs were assessed using the modified Unwanted Pursuit Behavior Inventory (UPBI; Langhinrichsen-Rohling & Palarea, 2006), a 23-item measure assessing the presence and frequency of use of various in-person pursuit behaviors. Modifications to the original 26-item measure were undertaken (consistent with Dardis & Gidycz, 2017) due to overlap with cyber PPB constructs assessed in greater detail below. Participants were asked how often they conducted “unsolicited contact behaviors” toward their ex-partners after their break-up. Responses were reported on a 5-point scale, 0 (*never*), 1 (*once*), 2 (*twice*), 3 (*3–9 times*), or 4 (*10 or more times*), they were recoded to 0 (*never*), 1 (*once*), or 2 (*two or more times*) to reduce skew as suggested by Dardis & Gidycz (2017). Items were summed to create a total frequency of in-person PPB engagement across all items. The minor subscale includes 10 items assessing unsolicited contact, sending gifts, waiting outside or showing up at the target’s home, work or school, and asking others for information about the target ($\alpha=0.82$ for men and 0.77 for women; sample items: “Send/leave unwanted letters/gifts”; “Show up in places where you thought he/she might be”), whereas the severe subscale includes 13 items assessing threat, harm, injury, kidnapping and property damage ($\alpha=0.96$ for men, 0.85 for women, sample items: “Cause damage to his/her property (e.g., home or car)”; “Threaten him/her with a weapon”).

Cyber PPBs. Cyber PPBs were assessed using the Controlling Partners Inventory-Self (CPI-S; Burke et al., 2011), an 18-item measure of whether participants have performed a variety of “unsolicited contact behaviors” toward former partners since the break-up. The same scale was used for the CPI as was used for the PPBs above, recoded to 0 (*never*), 1 (*once*) or 2 (*two or more times*), and summed, as it has been used in prior studies. Consistent with results of factor analysis (Dardis & Gidycz, 2017), the minor subscale includes 5 items assessing excessive communication behaviors, checking email or cell histories, or using passwords to check the former partner’s accounts ($\alpha=0.80$ for men, 0.72 for women; sample item: “Send excessive number of texts to him/her”), whereas the severe subscale includes 10 items assessing the use of threatening messages, threats to post/send explicit photos, and use of technology to surveil (e.g., GPS, webcam) the former partner ($\alpha=0.92$ for men, 0.74 for women, sample items: “Use spyware to monitor his/her activities”).

Coping

Strategies to cope with the end of the relationship were assessed using two subscales of the Brief COPE questionnaire (Carver, 1997). Participants were asked to respond to “ways you’ve been coping with the stress of the romantic relationship ending.” Responses range from 0 (“*I usually don’t do this at all*”) to 3 (“*I usually do this a lot*”). The two subscales each included two items, which were summed (range: 0–6), with higher scores indicating greater use of each form of coping. Denial subscale items included: “I’ve been saying to myself, ‘this isn’t real’” and “I’ve been refusing to believe that it has happened” ($\alpha=0.75$ for men, 0.74 for women). Acceptance subscale items included: “I’ve been accepting the reality of the fact that it has happened” and “I’ve been learning to live with it” ($\alpha=0.79$ for men, 0.72 for women).

Relational Goal Pursuit

Three measures were used to assess rumination, emotional flooding (i.e., break-up distress), and goal-linking (Cupach et al., 2011; Spitzberg et al., 2014). *Rumination* was assessed via a 24-item measure asking them about their thoughts about their former partner after the relationship ended (sample item: “I thought about this person constantly”). Items were assessed on a 7-point scale from 1 (*not at all*) to 7 (*very much*). A sum score was created, with higher scores indicating greater rumination about the former partner. Results of factor analysis suggested two factors (Spitzberg et al., 2014), however, the two subscales were correlated 0.93 in the present sample and were thus combined into a single factor, consistent with Cupach et al., 2011. In the present sample, $\alpha=0.98$ for both men and women and the scale ranged from 24 to 168. *Goal linking* was assessed using an 8-item measure on the same Likert scale as the rumination scale (sample item: “I determined that only this person could help me achieve my life’s goals”). A sum score was created (range: 8–56), with higher scores indicative of greater goal-linking to the target ($\alpha=0.91$ for men, 0.92 for women). *Emotional flooding* (i.e., break-up distress) was assessed using a 12-item measure on a 7-point scale from 1 (*not at all agree*) to 7 (*very much agree*). Whereas factor analysis has suggested two factors (Spitzberg et al., 2014), the factors were correlated 0.78, and therefore combined into a single factor of break-up distress in the present study. A sum score was created (range: 12–84), with higher scores indicative of distress after the break-up (sample items: “I felt intense emotion after we broke up” and “I felt frustrated over the breakup”); $\alpha=0.93$ for men, 0.94 for women).

Intimate Partner Violence

The Conflict Tactics Scales-Short Form (Straus & Douglas, 2004) was used to assess participants’ self-reported engagement in relationship violence. Participants were asked how many times they engaged in three types of behaviors during their relationship with their former partner, including physical abuse (2 items; sample item: “I punched or kicked or beat-up my partner”), sexual abuse (2 items; sample item: “I used force (like hitting, holding down, or using a weapon) to make my partner have sex”) and severe psychological abuse (1 item; “I destroyed something belonging to my partner or threatened to hit my partner”). Response options are on a 6-point scale (ranging from 0 (*Never*) to 6 (*More than 20 times*), and, per original author instructions, are coded to the midpoints for the response categories (Straus & Douglas, 2004). In the present study, $\alpha=0.79$ for men, 0.78 for women, and scores ranged from 0 to 39.

Data Analysis

Descriptive statistics and correlations among variables of interest were computed. Using the *lavaan* package for R (v 0.6-6, (Rosseel, 2012) a structural equation model, using full information maximum likelihood, simultaneously assessed the hypotheses across all four PPB forms (in-person minor, in-person severe, cyber minor, and cyber severe), while incorporating a latent variable for relational goal pursuit. Per guidelines by (Kline, 2015), models were deemed well-fitting when $RMSEA < 0.08$ (with confidence interval upper limits < 0.10), $CFI > 0.95$, and $SRMR < 0.08$. Bootstrapped bias-corrected 95% confidence intervals were used to determine the significance of indirect effects; confidence intervals not containing zero were significant. Moderation by gender was tested using a multiple groups approach, in which the model is freely estimated first across both men and women. After this, the indirect effects were constrained to be equal, one at a time; the resultant model fit is compared to the fit of the model in which the indirect effect is freely estimated using a chi-square test of difference (Rosseel, 2012). Following the testing of indirect effects, potential moderation of each regression path was also tested in the same fashion. As some have theorized that those who perceived that they were less involved in initiating the decision to end the relationship would be more likely to engage in PPBs (Langhinrichsen-Rohling et al., 2000; De Smet et al., 2015), the extent to which the participant initiated the break-up was explored as a possible covariate within the present model. The amount of time elapsed since the break-up was also included as a possible covariate, given that this has been negatively associated with PPB perpetration in some studies (Brownhalls et al., 2021; Cupach et al., 2011).

Results

Descriptive statistics and correlations among variables of interest are presented in Table 2. Minor in-person PPBs were most common across genders and were reported by 82.2% ($n=675$) of participants; both women and men reported engaging in, on average, approximately 4 unsolicited minor in-person contacts toward their former partner, with no significant differences by gender. Fewer participants (25.3%, $n=208$) reported minor cyber PPBs, and women reported significantly higher frequency of engagement in minor cyber PPBs than did men ($d=0.19$, $p=.007$). Severe PPBs were reported less frequently (in-person: 8.2% ($n=67$), cyber: 13.6% ($n=112$)); women and men did not differ in their mean engagement in severe in-person or cyber PPBs. Women reported higher break-up distress ($d=0.28$, $p<.001$) and higher coping by acceptance ($d=0.14$, $p=.047$) than did men, but there were no other significant gender differences in any of the other constructs of interest, including coping by denial, rumination, goal-linking, locus of the break-up, time since break-up, or prior relationship violence (which was reported by 20.6% of participants).

All study hypotheses were tested within one path model. Initially, both time since the break-up and break-up locus were included as possible covariates of relational goal pursuit and all PPBs, however, only the break-up locus was associated with any of the paths. As parsimony is favored in path models (McDonald & Marsh, 1990), time since the break-up was removed. The final model was a good fit to the data when the groups (i.e., by gender) were freely estimated, $\chi^2(34)=67.60$, $p<.001$, CFI=0.987, RMSEA=0.050 (95% CI=0.032-0.067), SRMR=0.021. An omnibus Wald test comparing the fit of a model constraining paths to be equal was significant, $\chi^2(38)=115.04$, $p<.001$, indicating that not all paths were equal by gender. Next, paths were constrained to be equal, one at a time, using a Wald test to determine which paths differed significantly by gender. Unstandardized estimates are presented in Table 3, with standardized estimates shown in Fig. 2. Overall, among men, the model explained 14.1% of the variance in minor in-person PPBs, 21.0% of the variance in minor cyber PPBs, 7.8% of the variance in severe in-person PPBs, and 27.4% of the variance in severe cyber PPBs. Among women, the model explained 14.0% of the variance in minor in-person PPBs, 12.9% of the variance in minor cyber PPBs, 16.0% of the variance in severe in-person PPBs, and 30.0% of the variance in severe cyber PPBs. Break-up locus was not significantly associated with PPBs.

Table 2 Descriptive Statistics and Correlations Among Variables of Interest

Range	Men		Women		<i>d</i>	1	2	3	4	5	6	7	8	9	10	11	12
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>													
1. Minor In-Person PPBs	0–20	3.88 (4.10)	4.13 (3.71)	0.06	-	0.06	0.41*	0.39*	0.35*	0.11*	-0.12*	0.23*	0.21*	0.20*	0.19*	0.03	-0.03
2. Minor Cyber PPBs	0–10	0.58 (1.60)	0.92 (1.82)	0.20*	0.42*	-	-	0.51*	0.68*	0.27*	-0.14*	0.23*	0.18*	0.13*	0.33*	0.06	-0.06
3. Severe In-Person PPBs	0–26	0.42 (2.52)	0.33 (1.54)	0.04	0.33*	0.31*	-	-	0.67*	0.15*	-0.11*	0.03	0.05	0.01	0.24*	-0.03	-0.09
4. Severe Cyber PPBs	0–19	0.39 (1.94)	0.35 (1.30)	0.02	0.32*	0.33*	0.74*	-	-	0.28*	-0.09	0.10	0.09	0.04	0.42*	0.05	-0.12*
5. Coping by Denial	0–6	0.58 (1.17)	0.60 (1.18)	0.02	0.19*	0.17*	0.20*	0.19*	0.19*	-	-0.05	0.32*	0.37*	0.20*	0.22*	-0.03	-0.09
6. Coping by Acceptance	0–6	3.94 (2.00)	4.21 (1.79)	0.14*	0.06	0.03	0.02	0.02	-0.05	-0.03	-	0.19*	0.20*	0.08	-0.01	0.08	0.12*
7. Rumination	24–168	65.70 (39.57)	69.22 (39.64)	0.09	0.36*	0.32*	0.09	0.09	0.17*	0.29*	0.14*	-	0.73*	0.59*	0.03	0.26*	-0.06
8. Break-Up Distress	12–84	36.82 (18.66)	42.13 (19.70)	0.28*	0.20*	0.25*	0.08	0.08	0.12*	0.32*	0.20*	0.68*	-	0.49*	0.02	0.34*	0.02
9. Goal-Linking	8–56	28.75 (11.84)	27.75 (12.72)	0.08	0.20*	0.17*	-0.02	-0.02	0.06	0.20*	0.07	0.50*	0.41*	-	0.04	0.24*	-0.05
10. Prior IPV	0–39	1.11 (4.50)	1.28 (4.39)	0.04	0.13*	0.10*	0.37*	0.37*	0.37*	0.19*	-0.02	0.17*	0.11*	0.10*	-	-0.05	-0.16*
11. Break-Up Locus	1–5	2.78 (1.43)	2.65 (1.53)	0.09	0.13*	0.08	-0.04	-0.04	0.01	0.11*	0.03	0.38*	0.33*	0.30*	-0.09*	-	-0.04
12. Months Since Break-Up	0–84	12.32 (8.84)	12.47 (9.76)	0.02	-0.02	-0.06	-0.05	-0.05	-0.08	-0.03	0.02	-0.11*	-0.05	-0.19*	-0.01	-0.07	-

Note. PPB = unsolicited/unwanted pursuit behaviors. IPV = Intimate Partner Violence. * $p<.05$

Correlations among men are above the diagonal; correlations among women are below

Hypothesis #1: Coping with the Break-Up by Denial Will be Indirectly Associated with Minor PPBs Through Relational Goal Pursuit Constructs

Consistent with the hypothesis, coping by denial was indirectly associated with minor in-person and cyber PPBs through increases in relational goal pursuit among both men and women (i.e., the bootstrapped 95% CIs that did not contain zero). Gender did not moderate either of these effects. In addition to the indirect effect, there remained a direct effect of coping by denial on minor cyber PPBs among men ($\beta = 0.12, p = .047$).

Hypothesis #2: There Will be Direct, but Not Indirect, Effects of Coping by Denial on Severe PPBs.

Supporting Hypothesis #2, there were no significant indirect effects of coping by denial on either severe in-person or cyber PPBs among men or women (all CIs contained zero). However, the direct effects of coping by denial on severe PPBs varied by gender. Coping by denial was significantly associated with increases in severe in-person PPBs among women ($\beta = 0.16, p = .001$), but not men ($\beta = 0.09, p = .156$); conversely, coping by denial was significantly associated with increases in severe cyber PPBs among men ($\beta = 0.18, p = .001$) but only marginally associated among women ($\beta = 0.09, p = .052$). The magnitude of these gender differences were not, however, large enough to lead to significant moderation by gender (p 's > 0.05).

Hypothesis #3: Coping with the Break-Up by Acceptance Will be Directly Associated with Reductions in PPBs.

Support for Hypothesis #3 was mixed, as gender moderated these associations. Coping by acceptance was significantly associated with reductions in minor PPBs for men (p 's ≤ 0.001), but not women (p 's > 0.05). However, coping by acceptance was only marginally associated with severe PPBs among men (p 's < 0.10) and was not associated with severe PPBs among women (p 's > 0.05).

Hypothesis #4: Prior Relationship Violence Will be Significantly Associated with both Minor and Severe PPBs, but Will be Moderated by Gender, with Effects Stronger for Men Than for Women

Hypothesis #4 was partially supported. Consistent with Hypothesis #4, among men, prior relationship violence was associated with significant increases in all forms of PPBs, including minor in-person and cyber PPBs ($\beta = 0.19$ and 0.30, p 's < 0.001) and severe in-person and cyber PPBs

(β 's = 0.22 and 0.38, respectively, p 's < 0.001). However, among women, prior relationship violence was associated with significant increases in only severe PPBs (in person: $\beta = 0.35$; cyber: $\beta = 0.34, p$'s < 0.001), but not minor PPBs (p 's > 0.05). Whereas gender did not significantly moderate the effect of prior relationship violence on severe PPBs, gender did significantly moderate the effect of prior relationship violence on minor cyber PPBs, with a marginal moderation effect for minor in-person PPBs.

Discussion

The goal of the present study was to assess whether efforts to cope with relationship loss would be associated with engagement in post-relationship pursuit behaviors. Overall, results suggest that coping by acceptance may reduce risk for engagement in minor PPBs (e.g., following or excessive contact) among men (but not women), whereas coping by denial over the end of the relationship presents a potential risk factor for engagement in PPBs among both women and men, through direct and indirect paths. The present study also supported some prior research and theory regarding the role of relational goal pursuit and prior relationship violence in predicting varied severity of PPBs. Each of these primary results are discussed in the context of prior research below.

First, as hypothesized, coping by acceptance did appear to exert a protective effect against PPB engagement, but this effect was moderated by gender. Among men, but not women, coping by acceptance was associated with significantly lower engagement in minor PPBs (with marginal effects on severe PPBs, i.e., use of threats and aggression). In general, women reported higher coping by acceptance than did men, so there may have been limited variability in this construct to predict differential outcomes among women. However, it is unclear why acceptance-based coping did not mitigate severe PPBs among men. One theory is that acceptance of the relationship's demise may have varied between-persons effects. For example, while acceptance might enable healthy resolution for some, for others, full acceptance of the relationship's demise could foster anger, jealousy, or desires for retaliation; in turn, these reactions could possibly lead to the use of threatening or physically violent reactions (i.e., severe PPBs). This hypothesis, as well as potential temporal changes in coping strategies following relationship termination, could be further explored in future research.

Next, as hypothesized, coping by denial increased the risk for engagement in minor in-person and cyber PPBs indirectly via relational goal pursuit processes of rumination, distress, and goal-linking. This is consistent with prior theory and research suggesting that denial is often

Table 3 Results of Structural Equation Model Predicting Minor and Severe In-Person and Cyber PPBs

Indirect and Total Effects	Men <i>B (SE), 95% CI of B</i>	Women <i>β, B (SE), 95% CI of B</i>	Moderation by Gender $\chi^2(1), p$
Indirect Effect of Denial on PPBs through Relational Goal Pursuit (RGP)			
On Minor In-Person PPBs (path $a*b_1$)	0.14 (0.03), [0.07, 0.20]	0.11 (0.02) [0.06, 0.15]	$\chi^2 = 0.61, p = .433$
On Minor Cyber PPBs (path $a*b_2$)	0.08 (0.03), [0.03, 0.14]	0.11 (0.03), [0.07, 0.16]	$\chi^2 = 0.62, p = .431$
On Severe In-Person PPBs (path $a*b_3$)	0.01 (0.03), [-0.05, 0.06]	-0.01 (0.02), [-0.05, 0.02]	$\chi^2 = 0.33, p = .564$
On Severe Cyber PPBs (path $a*b_4$)	< 0.01 (0.03), [-0.05, 0.06]	0.03 (0.02), [-0.01, 0.07]	$\chi^2 = 0.60, p = .439$
Total Effect of Denial on PPBs			
On Minor In-Person PPBs (path $a*b_{1+c_1}$)	0.07 (0.06), [-0.04, 0.18]	0.16 (0.05), [0.07, 0.25]	$\chi^2 = 1.72, p = .189$
On Minor Cyber PPBs (path $a*b_{2+c_2}$)	0.20 (0.05), [0.10, 0.30]	0.16 (0.05), [0.07, 0.26]	$\chi^2 = 0.26, p = .613$
On Severe In-Person PPBs (path $a*b_{3+c_3}$)	0.10 (0.05), [-0.01, 0.20]	0.14 (0.04), [0.06, 0.23]	$\chi^2 = 0.46, p = .498$
On Severe Cyber PPBs (path $a*b_{4+c_4}$)	0.19 (0.05), [0.09, 0.29]	0.12 (0.04), [0.03, 0.20]	$\chi^2 = 1.04, p = .308$
Direct Paths			
	Men <i>B (SE), z, p</i>	Women <i>B (SE), z, p</i>	Moderation by Gender $\chi^2(1), p$
DV: RGP			
Coping by Denial (path <i>a</i>)	0.47 (0.07), z = 7.15, p < .001	0.37 (0.05), z = 6.80, p < .001	$\chi^2 = 1.35, p = .245$
Break-Up Locus	0.41 (0.06), z = 6.41, p < .001	0.50 (0.06), z = 8.98, p < .001	$\chi^2 = 1.03, p = .311$
DV: Minor In-Person PPBs			
RGP (path <i>b₁</i>)	0.30 (0.06), z = 4.96, p < .001	0.29 (0.05), z = 5.61, p < .001	$\chi^2 = 0.01, p = .919$
Coping by Denial (path <i>c₁</i>)	-0.07 (0.06), z = -1.18, p = .240	0.06 (0.05), z = 1.15, p = .248	$\chi^2 = 2.68, p = .101$
Coping by Acceptance	-0.20 (0.05), z = -3.62, p < .001	-0.01 (0.05), z = -0.01, p = .990	$\chi^2 = 7.71, p = .005$
Prior IPV	0.19 (0.05), z = 3.50, p < .001	0.05 (0.05), z = 1.13, p = .259	$\chi^2 = 3.72, p = .053$
Break-Up Locus	-0.06 (0.06), z = -1.11, p = .266	-0.02 (0.05), z = -0.48, p = .634	$\chi^2 = 0.26, p = .606$
DV: Minor Cyber PPBs			
RGP (path <i>b₂</i>)	0.18 (0.06), z = 3.20, p = .001	0.31 (0.05), z = 6.01, p < .001	$\chi^2 = 2.86, p = .090$
Coping by Denial (path <i>c₂</i>)	0.12 (0.06), z = 1.99, p = .047	0.05 (0.05), z = 1.04, p = .299	$\chi^2 = 0.75, p = .387$
Coping by Acceptance	-0.18 (0.05), z = -3.47, p = .001	-0.04 (0.05), z = -0.88, p = .379	$\chi^2 = 4.12, p = .042$
Prior IPV	0.30 (0.05), z = 5.90, p < .001	0.01 (0.05), z = 0.20, p = .840	$\chi^2 = 18.08, p < .001$
Break-Up Locus	0.02 (0.05), z = 0.44, p = .664	-0.09 (0.05), z = -1.76, p = .079	$\chi^2 = 2.31, p = .129$
DV: Severe In-Person PPBs			
RGP (path <i>b₃</i>)	0.02 (0.06), z = 0.28, p = .776	-0.04, -0.03 (0.05), z = -0.63, p = .532	$\chi^2 = 0.38, p = .539$
Coping by Denial (path <i>c₃</i>)	0.09 (0.06), z = 1.42, p = .156	0.15 (0.05), z = 3.33, p = .001	$\chi^2 = 0.74, p = .390$
Coping by Acceptance	-0.11 (0.06), z = -1.95, p = .051	0.03 (0.04), z = 0.69, p = .492	$\chi^2 = 3.82, p = .051$
Prior IPV	0.22 (0.05), z = 4.02, p < .001	0.35 (0.04), z = 7.93, p = .001	$\chi^2 = 3.46, p = .062$
Break-Up Locus	-0.01 (0.06), z = -0.17, p = .865	0.01 (0.05), z = -0.14, p = .889	$\chi^2 = 0.01, p = .968$
DV: Severe Cyber PPBs			
RGP (path <i>b₄</i>)	0.01 (0.06), z = 0.16, p = .870	0.08 (0.05), z = 1.59, p = .112	$\chi^2 = 0.88, p = .349$
Coping by Denial (path <i>c₄</i>)	0.18 (0.06), z = 3.21, p = .001	0.09 (0.05), z = 1.95, p = .052	$\chi^2 = 1.58, p = .209$

Table 3 (continued)

Indirect and Total Effects	Men <i>B</i> (<i>SE</i>), 95% CI of <i>B</i>	Women <i>β</i> , <i>B</i> (<i>SE</i>), 95% CI of <i>B</i>	Moderation by Gender $\chi^2(1)$, <i>p</i>
Coping by Acceptance	-0.09 (0.05), <i>z</i> = -1.74, <i>p</i> = .082	-0.06 (0.04), <i>z</i> = -1.27, <i>p</i> = .203	$\chi^2 = 0.24$, <i>p</i> = .624
Prior IPV	0.38 (0.05) , <i>z</i> = 7.60, <i>p</i> < .001	0.34 (0.04) , <i>z</i> = 7.62, <i>p</i> < .001	$\chi^2 = 0.44$, <i>p</i> = .506
Break-Up Locus	0.07 (0.05), <i>z</i> = 1.27, <i>p</i> = .204	-0.01 (0.05), <i>z</i> = -0.08, <i>p</i> = .939	$\chi^2 = 0.98$, <i>p</i> = .323
Correlations			
Coping by Denial ↔ Coping by Acceptance	-0.05 (0.06), <i>z</i> = -0.85, <i>p</i> = .393	-0.04 (0.05), <i>z</i> = -0.83, <i>p</i> = .405	$\chi^2 = 0.01$, <i>p</i> = .903
Coping by Denial ↔ Prior IPV	0.22 (0.06) , <i>z</i> = 3.97, <i>p</i> < .001	0.20 (0.05) , <i>z</i> = 4.37, <i>p</i> < .001	$\chi^2 = 0.08$, <i>p</i> = .780
Coping by Denial ↔ Break-Up Locus	-0.02 (0.05), <i>z</i> = -0.36, <i>p</i> = .723	0.13 (0.05) , <i>z</i> = 2.89, <i>p</i> = .004	$\chi^2 = 4.56$, <i>p</i> = .033
Coping by Acceptance ↔ Prior IPV	0.01 (0.06), <i>z</i> = 0.02, <i>p</i> = .981	-0.02 (0.05), <i>z</i> = -0.38, <i>p</i> = .704	$\chi^2 = 0.07$, <i>p</i> = .793
Coping by Acceptance ↔ Break-Up Locus	0.08 (0.06), <i>z</i> = 1.39, <i>p</i> = .165	0.03 (0.05), <i>z</i> = 0.70, <i>p</i> = .485	$\chi^2 = 0.39$, <i>p</i> = .534
RGP ↔ Coping by Acceptance	0.24 (0.06) , <i>z</i> = 3.95, <i>p</i> < .001	0.22 (0.05) , <i>z</i> = 4.34, <i>p</i> < .001	$\chi^2 = 0.04$, <i>p</i> = .832
RGP ↔ IPV	-0.04 (0.06), <i>z</i> = -0.74, <i>p</i> = .458	0.19 (0.05) , <i>z</i> = 3.72, <i>p</i> < .001	$\chi^2 = 8.74$, <i>p</i> = .003
Factor Loadings			
Relational Goal Pursuit			
Rumination	0.75 (0.04) , <i>z</i> = 17.60, <i>p</i> < .001	0.75 (0.04) , <i>z</i> = 20.43, <i>p</i> < .001	$\chi^2 = 0.01$, <i>p</i> = .953
Emotional Flooding	0.71 (0.04) , <i>z</i> = 16.62, <i>p</i> < .001	0.64 (0.04) , <i>z</i> = 17.77, <i>p</i> < .001	$\chi^2 = 1.39$, <i>p</i> = .239
Goal Linking	0.54 (0.05) , <i>z</i> = 12.01, <i>p</i> < .001	0.47 (0.04) , <i>z</i> = 12.35, <i>p</i> < .001	$\chi^2 = 1.45$, <i>p</i> = .228

Note. PPB = unsolicited/unwanted pursuit behaviors. RGP = Relational Goal Pursuit. IPV = Intimate Partner Violence

Bolded results are statistically significant at *p* < .05

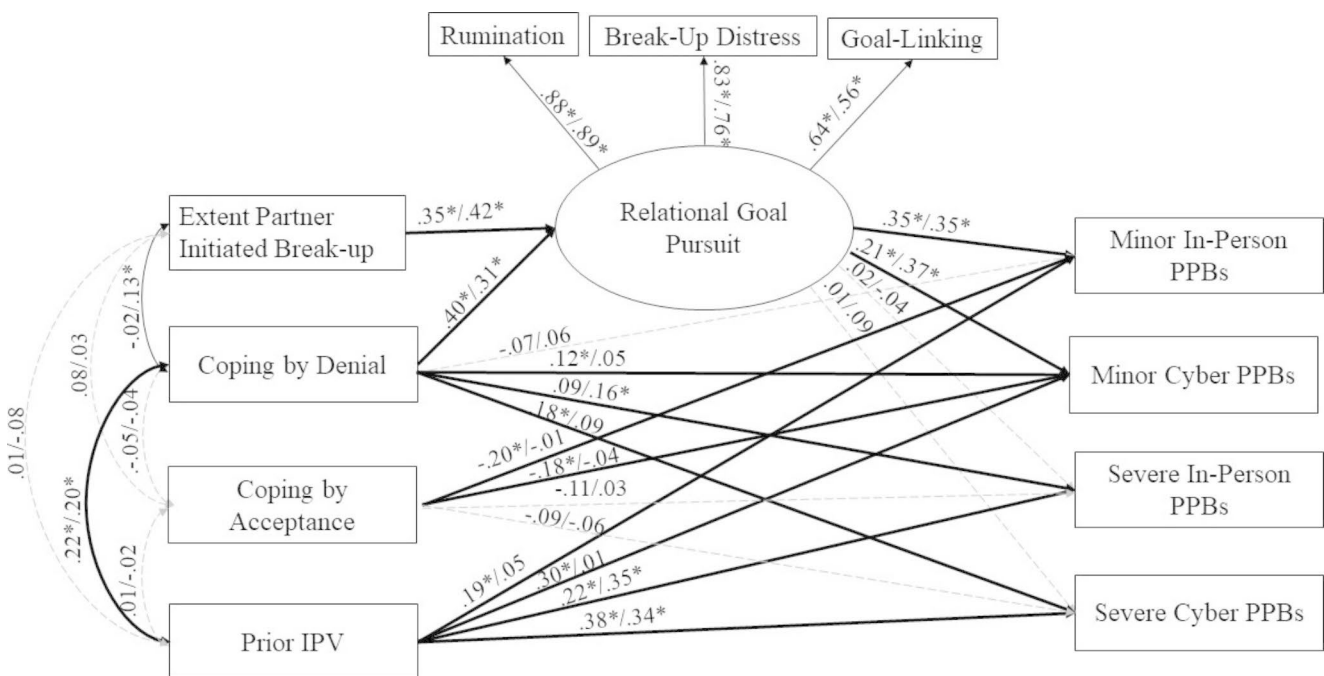


Fig. 2 Standardized Results of Mediation Model. Note: Men’s results are presented before the slash and women’s after. PPB = unsolicited/unwanted pursuit behavior. IPV = Intimate Partner Violence. Gray dashed paths were non-significant

overwhelmed by reality and associated with increases in ruminative thought (Stroebe et al., 2007). Coping by denial may therefore be maladaptive, ultimately resulting in obsessional thought and increased distress, and, ultimately, use of minor PPBs (e.g., giving gifts, excessive contact). However, consistent with prior research (Dardis & Gidycz, 2019) the relevance of relational goal pursuit theory appears limited

to minor PPBs. Factors beyond reconciliatory concerns may underlie more severe, threatening, and aggressive forms of pursuit.

Coping by denial was also directly associated with severe PPBs, however, the pattern of results varied by gender: among women, denial was associated with severe in-person PPBs (and marginally with severe cyber-PPBs), while

among men, denial was associated with only severe cyber (but not in-person) PPBs. While it is unclear why coping by denial was not associated with men's severe in-person PPBs, notably, men's severe in-person PPBs were not well-explained by the included variables ($R^2=0.078$). Other constructs may better explain in-person threatening and aggressive post-relationship behaviors, such as: proximity to the target, possessiveness (Dardis & Gidycz, 2019), emotion regulation deficits (Reilly & Hines, 2017), cognitive-perceptual differences, such as rationalization of PPBs or positive attitudes toward PPBs (Brownhalls et al., 2019), or motives to harm the target (Johnson & Thompson, 2016).

Consistent with models of coercive control viewing pursuit and stalking as extensions of partner abuse (Logan & Cole, 2011), prior relationship violence was associated with PPBs; however, the pattern varied by gender. Among women, prior relationship violence led to increased use of *only* severe PPBs, whereas, among men, prior relationship violence diffusely predicted *both minor and severe* PPBs. That even minor pursuit behaviors used by men may be mired within contexts of prior dynamics of psychological, physical, and/or sexual violence may help to explain why pursuit from male perpetrators is seen as more distressing, severe, and frightening than pursuit from female perpetrators (Nguyen et al., 2012; Sheridan & Lyndon, 2012; Thompson et al., 2012). Importantly, while these results are supportive of a coercive control theory, it is unknown to what extent dynamics of coercion and control motivated the behavior; it is also unknown whether PPBs arise from situations of common couple violence. Future research could assess use of coercive control in the prior relationship more directly, as well as whether PPBs are more likely to arise out of coercively controlling dynamics as opposed to mutual (or common couple) abusive dynamics. Further research could also explore whether alternative motives for relationship violence, such as communication difficulties, expression of negative affect, or jealousy (e.g., Langhinrichsen-Rohling, McCullars et al., 2012), might bear relevance for PPBs.

Limitations

There are some limitations to the present study of note. First, while atemporal mediation models can help to support initial theory-building, atemporal mediation does not provide evidence of causality and instead correlation (Winer et al., 2016); longitudinal tests of mediation models are required to establish temporal associations among constructs. For example, engagement in PPBs, and victims' responses to the behavior, could affect a pursuer's subsequent coping or rumination. As emotions and coping after break-ups are likely fluctuating and non-linear, diary studies could better explore

whether momentary changes in ruminative thought or distress directly predict PPBs at the event level. While the present study inquired about behaviors that were "unsolicited" (as pursuers may not accurately assess whether behaviors are upsetting or threatening to victims) future studies could assess directly whether pursuers knew or expected that the behaviors were unwanted in efforts to avoid overinclusion. In addition, while the sample did include some diversity with respect to race/ethnicity, cell sizes were insufficient to permit subgroup analysis. Further, exploration of these constructs among varied sexual orientations and across transgender and non-binary identities would be of value, as prior research indicates that these populations are at higher risk of relationship violence and stalking victimization overall (Edwards et al., 2022). While positive associations between prior relationship violence and PPBs support coercive control theory indirectly, coercive control theory can only be formally assessed by directly measuring the use of coercive control within prior relationships. As noted above, modest variance in the dependent variables was explained; thus, strong implications should not be drawn from this preliminary study until replication has been performed and other possible variables included within longitudinal designs. Other factors that may be protective against PPB engagement, such as those found in other studies assessing perpetration of violence, could be examined (e.g., empathy, social support and belonging, spirituality; Espelage et al., 2020; Kaukinen, 2014).

Research Implications

Additional research is needed to replicate this model and further explore ways that coping with relationship loss may confer risk for violence. Qualitative studies may help to clarify self-reported motivations for pursuit and whether, as theorized, motives for reconciliation and ruminative thought patterns are more associated with minor pursuit whereas motives for control or retaliation are more commonly associated with severe pursuit. As noted above, diary studies could be useful in exploring event-level patterns in thoughts (e.g., rumination), emotions (e.g., distress, anger) and coping efforts over time, and how they might proximally predict pursuit. Such studies could include additional explanatory variables (e.g., attachment, substance use, anger, victims' responses to pursuit and reinforcement for pursuer behavior, etc.). In addition, future research should examine dynamic interactions between the pursuer and target, including whether certain target responses might either reinforce or lessen pursuers' behaviors.

Clinical Implications

If replicated, the present study suggests that efforts to help college young adults cope with relationship loss by reducing denial, or increasing acceptance, could contribute to reductions in PPBs. According to relational goal pursuit theory, PPBs are more likely when individuals ruminate and have linked their higher-order goals to their former partner; engagement in PPBs may reduce this tension (i.e., be negatively reinforcing), thereby increasing its future use. Thus, approaches aimed at reducing rumination and avoidance-based coping methods (e.g., denial), might be effective. Such approaches might aim to: (1) reduce ruminative thought by increasing awareness of the present moment, (2) help clients to become aware of and accept the range of evolving emotions (e.g., anger, sadness) that may arise after a breakup rather than deny or escape them through PPBs, (3) help former partners find alternative values-consistent goals that might meet their needs, to reduce goal-linking, distress, and rumination, or (4) reframe irrational or unhelpful thoughts (e.g., “This is the only person who can make me happy”). While a range of approaches may be appropriate, one such approach, Acceptance and Commitment Therapy (ACT; Hayes et al., 2009), has shown some efficacy in reducing rates of future domestic assault charges among perpetrators (Zarling et al., 2015, 2019), as have other mindfulness-based approaches (Nesset et al., 2020) that may address some of the targets noted above. The applicability of these approaches to reducing post-relationship PPBs could therefore be explored in future research.

Finally, prior relationship violence remains a strong correlate of PPBs, particularly severe PPBs. When prior relationship violence is known, post-breakup counseling may be merited (as suggested by Senkans et al., 2021), enabling would-be perpetrators to work through and better manage emotions by nonviolent means. Further, if PPBs can serve as an extension of relationship violence, it is possible that disrupting processes of abuse during relationships could contribute to reductions in PPBs. Potential programming to explore could relate to promotion of healthy relationship strategies, such as healthy communication, reducing possessiveness and jealousy, or finding alternatives to physical violence when distressed, which could potentially help young adults to disrupt or prevent problematic relationship patterns during and after the end of relationships.

Declarations

Conflict of Interest The author declares that they have no conflicts of interest.

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