ROCZNIKI PSYCHOLOGICZNE
2016, XIX, 1, 191-202
ENGLISH VERSION

DOI: http://dx.doi.org/10.18290/rpsych.2016.19.1-7en

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REINFORCEMENT SENSITIVITY AND JEALOUSY IN ROMANTIC RELATIONSHIPS

Jealousy is an adaptive emotional reaction that signals threat to the current romantic relationship and motivates the person to protect that relationship. Given that jealousy is a mechanism of sensitivity to signals of relational threat, it was predicted that neurobiological systems of fight-flight--freeze (FFFS) and behavioral inhibition (BIS) would be positively correlated with emotional jealousy. It was also predicted that these associations would be stronger in individuals highly committed to their relationships. We examined the mediatory role of approach-avoidance social goals in relations between BIS, FFFS, behavioral activation system (BAS), and the experience of jealousy. The present study was conducted on a group of 217 participants aged between 17 and 36 years, involved in romantic relationships. The results showed that the sensitivity of BIS and the freeze system (FFFS) was correlated positively with the intensity of jealousy. Commitment appeared to moderate the relations between FFFS and the intensity of jealousy. Avoidance social goals mediated the relation between BIS and the intensity of jealousy.

Keywords: reinforcement sensitivity; jealousy; commitment; approach-avoidance social goals.

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INTRODUCTION

Romantic jealousy is a complex cognitive, affective, and behavioral reaction to signals of potential or realistic threat to the stability and quality of a close romantic relationship (Buss, 2002). The role of jealousy is to build a motivation to undertake actions serving to maintain, defend, or repair the relationship (Buss & Haselton, 2005). Treating jealousy as a system of reacting to signals of threat to the relationship leads to linking the sensitivity of the jealousy "barometer" to general reinforcement sensitivity (Corr, 2004). Gray and McNaughton (2000) distinguished three neurobiological systems that regulate the organism's behavior in response to different types of stimuli: behavioral approach system (BAS), behavioral inhibition system (BIS), and fight-flight-freeze system (FFFS). BAS is responsible for receiving and reacting to conditioned and unconditioned appetitive stimuli (reward seeking, relief) and is manifested by positive affect and appetitive motivation. FFFS is activated by conditioned and unconditioned aversive stimuli, and its activity is manifested by avoidance motivation. BIS is activated in a situation of goal conflict between BAS and FFFS, and it manifests itself in the experience of fear and a tendency to inhibit current activity in order to limit the risk involved in taking unpremeditated action (Carver, Sutton, & Scheier, 2000). The sensitivity of these systems shows a significant interindividual variability; therefore, BAS, BIS, and FFFS are operationalized as personality traits referring to stable patterns of behavior (Carver & White, 1994). Factors inducing jealousy are aversive or conflict-linked signals; consequently, the sensitivity of BIS and FFFS should result in an intensification of the affective experience of jealousy. This prediction is additionally supported by the results of studies in which correlations were found between the intensity of jealousy and the personality correlates of BAS, BIS, and FFFS sensitivity – neuroticism, insecure attachment, and suspiciousness (Buunk, 1997; Jackson, 2009).

The associations between personality and the intensity of jealousy are moderated by romantic commitment, defined as a belief that one can fulfill one's intrapersonal and interpersonal needs by relying on the romantic relationship (Rusbult, Martz, & Agnew, 1998). Rydell, McConnell, & Bringle (2004) demonstrated that if romantic partners see their alternatives for the current relationship (the possibilities of starting a new relationship with somebody else instead of the current partner) as weak or believe that their relationship is threatened by low compatibility with their partner, then the more committed they are to the relationship, the stronger jealousy they experience. In the light of these results,

it was predicted that commitment would moderate the associations between the sensitivity of FFFS and BIS and the intensity of jealousy.

Gable (2006) showed that reinforcement sensitivity determines specific orientations in functioning in close relationships: the orientation towards goals connected with deepening the relationship (based on a higher sensitivity of the behavioral approach system) or towards avoiding negative interactions (based on a higher sensitivity of the behavioral inhibition system). Approach goal orientation manifests itself in an increased frequency of engagement in interactions with the romantic partner that make it possible to experience more positive affect, whereas avoidance goal orientation increases the sensitivity to signals of threats to the relationship, leading to a higher intensity of negative affect (Impett et al., 2010). Based on these results, it was predicted that the sensitivity of FFFS and BIS would be correlated with a higher intensity of jealousy because of a stronger orientation towards avoiding negative interactions with the romantic partner (see Elliot, Gable, & Maps, 2006).

Aims and hypotheses

The present study aimed to analyze the associations between the sensitivity of BAS, BIS, and FFFS and the intensity of jealousy. We predicted that the sensitivity of BIS would be positively correlated with the intensity of jealousy (Hypothesis 1a) and that there would be similar positive correlations between FFFS sensitivity and the intensity of jealousy (Hypothesis 1b). The moderating role of commitment to the romantic relationship in the associations between reinforcement sensitivity and the intensity of jealousy was also examined. We also hypothesized that in people more strongly committed to their relationships the associations of BIS and FFFS sensitivity with jealousy would be stronger than in those with lower commitment to the romantic relationship (Hypotheses 2a and 2b). The role of avoidance goal orientation as a mediator between the sensitivity of BIS and FFFS and the intensity of jealousy was also tested as well. We hypothesized that avoidance goal orientation would mediate between FFFS and BIS sensitivity and the intensity of jealousy (Hypotheses 3a and 3b).

METHOD

Participants

The participants were 217 people (59% female) aged between 17 and 36 (M = 23.51, SD = 3.15). At the moment of the study, all participants were engaged in romantic relationships. The mean length of their relationships was 37.60 months, SD = 31.14 months (min = 1, max = 168).

Materials

Jackson-5 Scales (Jackson, 2009; our translation). The scale consists of 30 items measuring the sensitivity of the behavioral approach system (BAS; example item: "I like to do things which are new and different"), the behavioral inhibition system (BIS; "I want to avoid looking bad"), as well as the fight system ("If I caught somebody stealing my belongings, I would attack"), the flight system ("If the fire alarm rings, I immediately rush out of the building"), and the freeze system ("If something very bad was just about to happen to me, I would just stop"). Each subscale included six items assessed on a Likert-type scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The translation of the scale was verified by a comparison of scores in two language versions of the scale by persons proficient in English. A group of 36 female graduate students of English Studies completed the original scale and the Polish version at a two-week interval. The scores in the two versions of the scale were positively and significantly intercorrelated, $.53 \leq r \leq .83$, $p < .01$.

Commitment Scale (Rusbult et al., 1998; our translation). The scale consisted of 7 items (e.g., "I want our relationship to last for a very long time"), assessed on a scale ranging from 0 (*strongly disagree*) to 8 (*strongly agree*).

Measure of approach and avoidance goals in romantic relationships. The instrument was prepared based on a scale measuring goals in friendship relationships (*friendship goals*; Elliot, Gable, & Maps, 2006) and in romantic relationships (Impett, Strachman, Finkel, & Gable, 2008). We translated eight items taken from these methods. Four of these items related to orientation towards approach goals (e.g., "I am trying to deepen my relationship with my romantic partner"), and the other four related to orientation towards avoidance goals (e.g., "I am trying to avoid disagreements and conflicts with my romantic partner"). In the present study, the participants gave their answers using a scale from 1 (*not at all like me*) to 7 (*very much like me*).

Jealousy Experience Scale. The instrument consisted of 24 items describing various behaviors of the romantic partner, romantic rivals, and people from the partner's environment that result in the experience of jealousy (the items were formulated on the basis of a list of jealousy-evoking situations, published in Sheets, Fredendall, & Claypool, 1997; Study 2). The participants specified to what extent they would feel jealous if their partner behaved in the way described (from 1 – *I wouldn't be jealous at all*, to 7 – *I would definitely be jealous*). Example items of this questionnaire are "Your partner tells you that another woman is attractive and good looking" or "Your partner dances with other women at a party you are attending together." In a pilot study on a sample of 100 young adults in close relationships, the reliability of the Scale was acceptable, $\alpha = .94$.

RESULTS

Reinforcement sensitivity and romantic jealousy

Means, standard deviations, reliability coefficients, and intercorrelations of the variables are presented in Table 1.

Table 1
Means, Standard Deviations, and Intercorrelations of the Variables

	1	2	3	4	5	6	7	8	9
1. Behavioral approach system									
2. Behavioral inhibition system	.18**								
3. Fight system	-.02	-.03							
4. Flight system	-.27***	.15*	-.02						
5. Freeze system	-.27***	.15*	-.18**	.56***					
6. Commitment	.01	.08	-.14*	.08	.03				
7. Approach goals	.04	.14*	-.10	.08	-.01	.62***			
8. Avoidance goals	-.09	.24***	-.05	.05	.09	.45***	.59***		
9. Intensity of jealousy	-.04	.20***	-.01	.20**	.28***	.13×	.19**	.37***	
M	3.64	3.80	2.94	2.84	2.73	6.80	6.21	5.40	4.41
SD	0.67	0.63	0.82	0.77	0.89	1.31	0.95	1.21	1.25
α	.72	.69	.77	.71	.77	.85	.88	.71	.95

Note. *** $p < .001$; ** $p < .01$; * $p < .05$; × $p < .053$.

The sensitivity of BIS, flight and freeze systems (FFFS), as well as approach and avoidance goals were positively and significantly correlated with the intensity of jealousy, $.04 \leq r^2 \leq .14$. The overall score of the sensitivity of FFFS correlated negatively with BAS, $r(215) = -.29$, $p < .001$, and positively with the intensity of jealousy, $r(215) = .24$, $p < .001$.

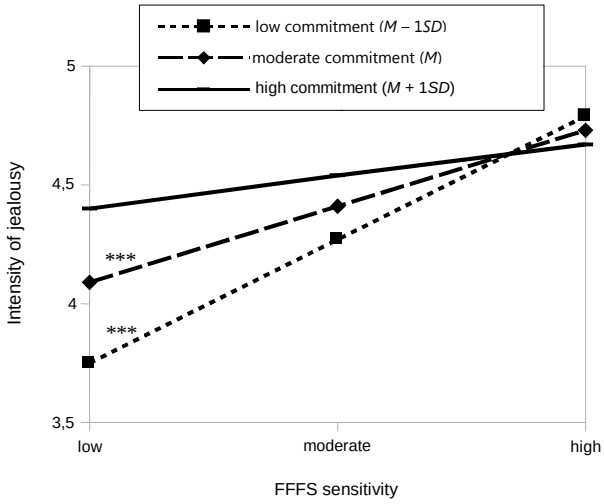
Moderating role of commitment

Hypothesis 2 was tested by means of hierarchical regression analysis. In the first step the intensity of jealousy was regressed on BIS, FFFS, and commitment, and in the second step the interaction terms, computed as products of centered predictors, were entered.

The interaction of BIS and Commitment was insignificant, $\beta = -.02$, $b = -.03$, $SE = 0.10$, $p < .79$, 95% CI = [-.22, .17], and the entering this effect in the regression model did not significantly improve the level of explained variance, $\Delta R^2 < .001$, $F_{change}(1, 213) = 0.07$, $p < .79$. The interaction of FFFS and Commitment was significant, $\beta = -.14$, $b = -.29$, $SE = 0.14$, $p < .04$, 95% CI = [-.57, -.01] (change statistics for the second step: $\Delta R^2 = .02$, $F_{change}(1, 213) = 4.09$; $p < .04$; $f^2 = .02$). The results of interaction of FFFS and Commitment are presented in panel (a) of Figure 1.

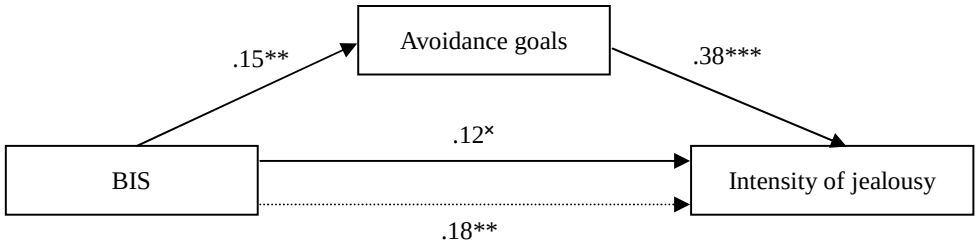
Simple slopes analysis showed that at a low level of commitment ($M - 1SD$) FFFS sensitivity was positively and significantly correlated with the intensity of jealousy, $\beta = .42$, $b = .98$, $SE = 0.25$, $t = 3.93$, $p < .001$. At a moderate level of commitment the correlation was also positive and significant, $\beta = .26$, $b = .60$, $SE = 0.15$, $t = 3.91$, $p < .001$. Finally, at a high level of commitment, the correlation between FFFS and the intensity of jealousy was not significant, $\beta = .10$, $b = .25$, $SE = 0.22$, $t = 1.14$, $p < .26$.

Additional moderation analyses were conducted to examine the role of FFFS subscales. There was no significant interaction effect of the sensitivity of the flight system, $\beta = -.04$, $b = -.06$, $SE = 0.09$, $p < .54$, 95% CI = [-.24, .12] (change statistics for the second step: $\Delta R^2 = .002$; $F_{change}(1, 213) = 0.38$, $p < .54$) or the freeze system, $\beta = -.001$, $b = -.001$, $SE = 0.08$, $p < .99$, 95% CI = [-.15, .15] (change statistics for second step: $\Delta R^2 < .001$, $F_{change}(1, 213) < 0.01$, $p < .99$).



(a) Interaction effect of FFFS sensitivity and commitment on the intensity of jealousy

Note. *** $p < .001$. Statistics for full regression model: $F(3, 213) = 7.52$; $p < .001$; *adj.* $R^2 = .10$.



(b) Results of the analysis of the mediation model: BIS → avoidance goals → intensity of jealousy

Note. *** $p < .001$; ** $p < .01$; * $p < .05$; × $p < .07$. Effect not controlled for mediator is shown as a dotted line. In the full regression model, approach goals were controlled for (entered in the first step of analysis). Standardized beta coefficients are placed next to the arrows.

Figure 1. Results of (a) interaction and (b) mediation analysis.

However, we foung a significant interaction effect of the sensitivity of the fight system and commitment, β = -.18, b = -.22, SE = 0.08, p < .01, 95% CI = [-.38, -.05] (change statistics for the second step: ΔR^2 = .03, $F_{\text{change}}(1, 213)$ = 6.81, p < .01, f^2 = .03[1]). At a low level of commitment (M – 1SD), the sensitivity of the fight system was positively correlated with the intensity of jealousy, β = .19, b = .30, SE = 0.15, t = 1.95, p < .052, at a moderate level of commitment (M) the correlation was not significant, β = .01, b = .02, SE = 0.10, t = 0.15, p < .88, and at a high level of commitment (M + 1SD) the correlation changed its direction to negative but was only marginally significant, β = -.17, b = -.25, SE = 0.14, t = -1.73, p < .085.

Mediatory role of approach and avoidance goals

The analysis of the mediation model: BIS → avoidance goals → intensity of jealousy[2] was performed using the bootstrapping method (10,000 samples) implemented in the PROCESS macro (Hayes, 2013), controlled for approach goals. The results are presented in panel (b) of Figure 1.

The mediation effect: BIS → avoidance goals → intensity of jealousy was significant, β = .06, b = .24, 95% CI = [.01, .26], and the regression model had a good fit to data, F(3, 213) = 12.96, p < .001, *adj*. R^2 = .16. The direct effect of BIS on the intensity of jealousy before entering avoidance goals in the regression model was significant, β = .18, SE = 0.07, t = 2.66, p < .008, and after entering the mediator variable it appeared to be only marginally significant, β = .12, SE = 0.06, t = 1.85, p < .07. It is therefore legitimate to say that the mediation was only partial.

DISCUSSION

The present study demonstrated that the sensitivity of BIS and FFFS (mainly the flight and freeze systems) correlates positively with the intensity of jealousy, which confirms Hypotheses 1a and 1b. These results are consistent with the characteristics of the functions of BIS and FFFS. BIS correlates with punishment sensitivity in close relationships and with higher emotional dependency on others (Hundt, Mitchell, Kimbrel, & Nelson-Gray, 2010), and individuals who are sen-

[1] The full regression model was also significant, F(3, 213) = 3.56; p < .015; adj. R^2 = .05.

[2] The lack of significant correlations between FFFS, FFFS subscales, and avoidance goals did not confirm Hypothesis 3b.

sitive to signals of rejection and emotionally dependent experience jealousy more strongly (Buunk, 1997). BIS is also responsible for the inhibition of current actions to obtain time for scanning the memory to find an effective solution to the conflict situation that the individual is involved in (Corr, 2004; Smillie, Pickering, & Johnson, 2006). The association between the sensitivity of BIS and the intensity of jealousy may indicate that jealousy is an expression of motivation to engage in controlled processing of information about a threat to the relationship in order, for instance, to choose appropriate forms of relationship defense (Buss, 2002). FFFS is responsible for responding to aversive stimuli (Gray & McNaughton, 2000), which also include the class of signals that have a potential to evoke jealousy (Bachman & Guerrero, 2006). The sensitivity of the flight and freeze systems, in contrast to the fight system, is strongly correlated with neuroticism and anxiety (Jackson, 2009), which are predictors of the intensity of jealousy (Buunk, 1997). The obtained results are also consistent with other studies that demonstrated positive correlations between BIS and distress in a situation of threat to the romantic relationship (Meyer, Olivier, & Roth, 2005).

The level of commitment to the relationship did not moderate the association between BIS and jealousy experience, which did not confirm Hypothesis 2a. The sensitivity of BIS was a significant predictor of the intensity of jealousy at all levels of commitment: low, moderate, and high. This result is consistent with the view of jealousy as a system of monitoring and reacting to signals of threat to the relationship's stability (Buss & Haselton, 2005) and with reports about the higher effectiveness of nonaggressive reactions in a situation of experiencing jealousy (Buss, 2002). BIS as a system of monitoring motivational conflicts and inhibiting reactions driven by BAS and FFFS (manifesting themselves in confrontational behaviors; Meyer et al., 2005) may constitute the core of the monitoring function of jealousy, at the same time facilitating the adaptive use of the information about the current state of the romantic relationship that is conveyed by the emotion of jealousy and initiating appropriate remedial behavior.

A significant interaction effect of FFFS and commitment was demonstrated; however, its character was different than predicted in Hypothesis 2b. The sensitivity of FFFS was positively correlated with the intensity of jealousy at low and moderate levels of commitment to the romantic relationship, while at a high level of commitment the intensity of jealousy was high irrespective of FFFS sensitivity. This result suggests that high commitment may increase the tendency to react with jealousy regardless of the level of personality correlates of this tendency – which, in present study, were the sensitivity values of the flight and freeze systems. Commitment to the romantic relationship, defined as the extent to which

the individual's current relationship fulfills intra- and interpersonal needs, evokes a strong urge to maintain the relationship (Rusbult et al., 1998) and reduces the tendency to undertake actions that may threaten the relationship – for instance, it decreases the propensity for infidelity (Buss, 2002). Therefore, it is justified to claim that heightened commitment results in higher sensitivity to signals of threats to the relationship and in more intensive jealousy, which loosens the associations between the intensity of jealousy and general sensitivity to aversive stimuli. The results of the analysis of the interaction between the fight system and commitment also showed that commitment could inhibit nonadaptive reactions resulting from a dispositional tendency to actively counteract aversive stimuli (high sensitivity of the fight system). Among individuals with lower commitment to the romantic relationship, the intensity of jealousy was correlated with the fight system. This association may lead to the situation where jealousy experience is dominated by the motivation to aggressive behavior (towards the romantic partner of rival), which is not an adaptive reaction to jealousy (Buss, 2002). It can therefore be concluded that the level of commitment modifies the activity of those reinforcement sensitivity systems whose activity can induce a tendency to nonadaptive reactions but does not change the positive associations between the systems responsible for awareness (BIS) and nonaggressive reactions to aversive stimuli (the flight-freeze system) and the intensity of jealousy. It is worth noting that both interaction effects were weak, $.02 \leq f^2 \leq .03$. These effects should be examined in new studies conducted on larger samples, which could help maximize the study's power to detect the interactions with such an effect size.

Orientation to avoidance goals appeared to mediate between the sensitivity of BIS and jealousy, which confirms Hypothesis 3a. The sensitivity of BIS is correlated with an increased tendency to focus on avoiding negative aspects of the relationship, and this tendency is linked to a strengthened propensity to experience jealousy. This result concords with the proposed interpretation of jealousy as a "relationship barometer" that reacts to threats to the relationship, aiming to avoid or prevent them. The predicted associations between the sensitivity of FFFS and avoidance goals were not found, which means the study failed to confirm Hypothesis 3b. This finding may suggest that avoidance goals in a close relationship is a result of conscious and reflective monitoring of the relationship rather than just a result of general sensitivity to aversive signals. The proposed interpretation is supported by the results of correlational analysis, which showed intercorrelations between both approach and avoidance goals in a romantic relationship and their associations with romantic commitment. Orientation to avoid-

ance goals may be aimed not so much at effortlessly avoiding aversive stimuli as at sensitizing the person to the signals of relationship deterioration, while the avoidance of such signals may be linked with the implementation of corrective behavior towards the romantic partner. In the light of these results, it seems that avoidance goals may perform a function close to the empathic reaction of sympathy (focused on the partner and the relationship) rather than to personal distress (focused on one's own discomfort; see Davis, 1999).

The present study demonstrated that the intensity of jealousy is correlated with the sensitivity of the flight-freeze system and the behavioral inhibition system. These results make it legitimate to claim that the experience of jealousy in close relationships is a consequence of heightened sensitivity of the systems of reacting to aversive stimuli, whose activity is manifested by increasing vigilance and a tendency to nonaggressive relationship-protective behaviors. Romantic com-mitment was shown to be a moderator of the association between the sensitivity of the fight-flight-freeze system and the intensity of jealousy. At a high level of commitment, the intensity of jealousy was heightened regardless of the level of sensitivity to aversive stimuli (FFFS). It was also shown that the association between the sensitivity of BIS and jealousy is mediated by orientation towards avoidance goals in romantic relationships.

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The preparation of the English version of *Roczniki Psychologiczne* (*Annals of Psychology*) and its publication in electronic databases was financed under contract no. 723/P-DUN/2016 from the resources of the Minister of Science and Higher Education for the popularization of science.