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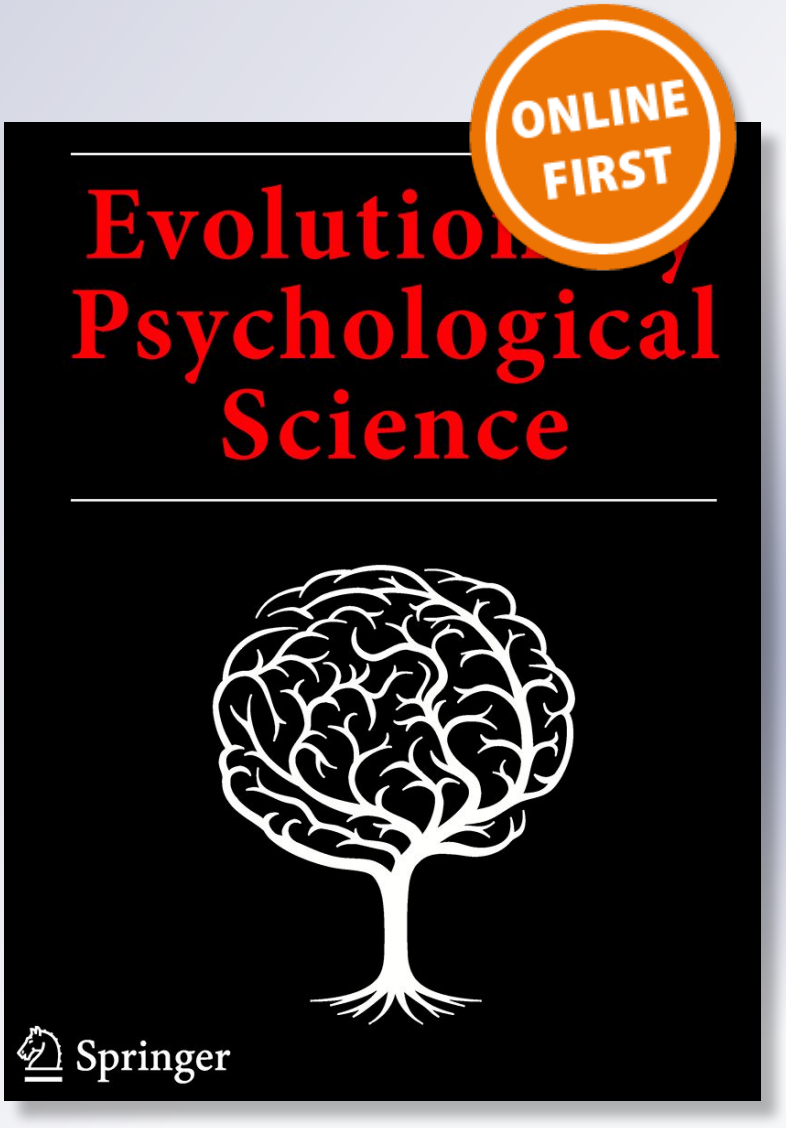
Evolutionary Psychological Science

e-ISSN 2198-9885

Evolutionary Psychological Science
DOI 10.1007/s40806-019-00197-x



Springer

Evolutionary Psychological Science
https://doi.org/10.1007/s40806-019-00197-x

RESEARCH ARTICLE

An Attachment Theoretical Perspective on Tend-and-Befriend Stress Reactions

Kenneth N. Levy[1] · Jessica K. Hlay[2] · Benjamin N. Johnson[3] · Courtney P. Witmer[4]

Abstract

This study investigates the "tend-and-befriend" hypothesis proposed in 2000 by Taylor and colleagues, which posits that women utilize an alternative stress response to fight-or-flight, ensuring the survival of themselves and their offspring (tend) through the formation of groups (befriend). In contrast, we propose that, while sexes may differ in the use of tend-and-befriend behaviors, attachment style is a more robust predictor of these behaviors. The relationships among sex, adult attachment anxiety and avoidance, and stress responses were examined in 237 young adults. Participants completed the Experiences in Close Relationships—Revised and the Tend-and-Befriend Questionnaire. Results suggest that women preferred tend/befriend and flight responses over men, while men engaged in more fight responses than women. However, importantly, women and men both endorsed being most likely to engage in tend/befriend behaviors during stress than other responses. Attachment style was an independent and robust predictor of all stress responses, with anxious attachment predicting fight and flight behaviors and increased tend/befriend behavior, and avoidant attachment predicting decreased tend/befriend behavior. One interaction was also identified: Women who were more avoidantly attached were as likely as men to engage in fight behaviors, while less avoidant women reported the lowest fight response. Our findings suggest that while sex differences in self-reported tend-and-befriend behaviors may exist, exploration within sexes (an important oversight of previous research) may indicate different patterns of results. We found evidence of strong effects of attachment style on all forms of stress response, even after accounting for sex, indicating the importance of attachment behavior in stress responsivity.

Keywords Attachment · Evolutionary behavior · Fight-or-flight · Sex differences · Stress response

Aspects of this study were conducted as part of an undergraduate honors thesis completed by the fourth author under the supervision of the first author.

✉ Kenneth N. Levy
klevy@psu.edu

Jessica K. Hlay
jhlay@bu.edu

Benjamin N. Johnson
bnjohnson.psych@gmail.com

Courtney P. Witmer
cpf118@psu.edu

[1] Department of Psychology, The Pennsylvania State University, 362 Bruce V. Moore Building, University Park, PA 16802, USA

[2] Department of Anthropology, Boston University, 232 Bay State Road, Boston, MA 02215, USA

[3] Department of Psychology, The Pennsylvania State University, 359 Bruce V. Moore Building, University Park, PA 16802, USA

[4] The Pennsylvania State University, 329 Innovation Park Blvd, State College, PA 16803, USA

Published online: 03 July 2019

Introduction

In 2000, Shelley Taylor et al. (2000) published a provocative paper introducing an alternative stress response domain to the traditionally considered "fight-or-flight" responses to stressful situations (Cannon 1929), which they termed "tend-and-befriend". In contrast to the assumption that fight-or-flight responsivity is ubiquitous across individuals, Taylor's theory contends that for women, as the traditional caretaker, the fight-or-flight response would not always have proved evolutionarily advantageous because it might have endangered their young offspring. For example, by fighting or fleeing, mothers would have had to abandon their children in times of danger, which could have led to higher offspring mortality. Instead, Taylor and colleagues theorized that women developed an alternative tend-and-befriend stress response that would maximize both their and their offspring's chances of survival. As in the fight-or-flight model, Taylor's tend-and-befriend paradigm is composed of two complementary parts. Tending refers to the evolutionary imperative of procreation, representing the inclination for a woman to protect and care for offspring. Befriending, meanwhile, involves forming and maintaining strong social bonds with other women in order to form coalitions for protection.

Consistent with Taylor's (2006) contention that tend-and-befriend behavior is specific to women, a number of subsequent studies investigating sex differences in cortisol and testosterone levels in response to stress, as well as behavioral patterns of stress response, found support for the hypothesis that men and women show different physiological responses to stress (Kivlighan et al. 2005; Smeets et al. 2009; Taylor et al. 2010). For example, after experiencing stress within one's relationship, there was a spike in women's plasma oxytocin levels, whereas men had an increase in vasopressin (Taylor et al. 2010), further supporting Taylor's suggestion that women may pursue social groups after stress, as oxytocin is related to bonding behaviors (Insel and Hulihan 1995; Kendrick 2000). However, evidence suggests vasopressin may also be related to pair-bond behaviors and has been shown to mediate parental behaviors and affiliative relationships in male prairie voles (Winslow et al. 1993), both facets of tend-and-befriend behaviors, calling into question the hypothesis that tend-and-befriend behavior is a uniquely female stress response.

The results of studies examining behavioral tend-and-befriend responses to stress are mixed. Female athletes are more likely than men to prepare for a competitive, athletic event by interacting with their teammates (Kivlighan et al. 2005), while men are more likely than women to utilize physical aggression in response to stress (Verona and Curtin 2006). In another study, when invited to sort a set of possible stress responses according to their self-reported tendency to engage in each, women consistently identified a befriend response, whereas men identified a fight response, although both men and women described flight responses to stress (Turton and Campbell 2007). In the workplace, Morrison (2009) found that men focused on friendships when it benefitted their careers, but women described workplace friendships as support systems in times of stress. In another study, after experiencing stress, men were more likely to act selfishly in a hypothetical risky situation, while women were more likely to behave in a more cooperative and prosocial manner (Nickels et al. 2017). Similarly, Probst et al. (2017) found that men had a decrease in motivation to take care of newborns after a stressful situation, but women had more motivation to care for the infant. These studies provide some support for Taylor and colleagues' theorized sex-based division between fight-or-flight and tend-and-befriend stress domains.

However, several studies have found evidence for tend-and-befriend responses to stress among men, given certain contexts, muddying the results of the literature reviewed above. Singer et al. (2017) found that men were more likely to act prosocially after experiencing stress when making everyday moral decisions than those that did not experience stress. Additionally, in this study, participants' cortisol levels were positively associated with prosocial decision-making, suggesting that an increase in cortisol may be related to increased altruistic behaviors in men. However, in another study, while there was no relationship between stress and decision-making in everyday moral dilemmas, increases in cortisol were actually negatively associated with altruistic decision-making in emotional dilemmas in both men and women (Starcke et al. 2011). Similarly, Cardoso et al. (2013) found that higher levels of oxytocin in both men and women may promote finding social support in times of stress. Stress response typology may therefore depend on the kind and context of stressor. For instance, social stress may encourage increases in prosocial behavior and trust in men (von Dawans et al. 2012). Finally, other demographic variables may also contribute to the varied results of past research, as a recent study found that those with a graduate education and higher income utilized tend-and-befriend behaviors more often than participants with lower socioeconomic status, regardless of sex (Evetts 2017). Clearly, the evidence is mixed regarding types of stress response, sex differences among these, and the differential effects of various stressful contexts.

Related researchers have noted that evolutionary circumstances, such as coalitional competition (e.g., Geary et al. 2003) or parental investment (e.g., Trivers 1972), could have encouraged men to use tend-and-befriend behaviors as well as women, arguing that tend-and-befriend behaviors might be more context-dependent, rather than sex-dependent (e.g., Geary and Flinn 2002). When a group experiences large scale conflict, it may have been evolutionarily advantageous for men to befriend each other in order to form larger groups for the purposes of combat or physical conflict (i.e., coalitional

competition), thus increasing their chances of fighting off their enemy. Additionally, several studies have found that men's testosterone decreases after being in a long-term relationship or after having children (Burnham et al. 2003; Gray et al. 2006). Researchers theorize the purpose of heightened testosterone prior to these life events is to increase mate seeking and male-male competition, while lowered testosterone leads to higher parental investment and affiliative pair bonding behaviors (Gray et al. 2006). These findings suggest that subsequent research should examine social situations in which men might use tend-and-befriend behaviors (Geary and Flinn 2002), as there are contexts in which it would have been evolutionarily beneficial for men to use tend-and-befriend behaviors as well. Since men also provide parental care in several cultures, and secure attachment has been linked to high paternal investment (Belsky et al.1991; Belsky 1997), Taylor et al.'s (2000) argument that women would be most likely to "tend" may not be universal. Men may also have adapted to tend to children in times of stress, especially when securely attached, and to befriend to form coalitions.

Given these literatures, we contend that both men and women may have the capacity to exhibit fight-or-flight and tend-and-befriend behaviors, and such use may depend on other extrinsic or intrinsic factors. Although past research has found sex differences in the endorsement of tend-and-befriend tendencies, there is nonetheless variability within sexes. In fact, the majority of research suggesting women exhibit more tend-and-befriend behavior and men more fight-or-flight behavior has produced evidence based on analyses comparing response styles between sexes; in contrast, the literature utilizing within-sex analyses seems to suggest situations in which men may utilize more tend-and-befriend behavior than fight-or-flight (e.g., von Dawans et al. 2012). For these reasons, we suggest that sex differences in stress response may not be as clear-cut as previously suggested and may depend both on the type of outcome being assessed, the comparison being made (e.g., between-groups vs. within-groups), contextual factors, and characteristics of the individual beyond sex. Within-group variability not only suggests that men and women both have the capacity for tend-and-befriend behaviors, but that both personality and situational variables might predict use of these behaviors, regardless of sex.

Attachment Theory as an Alternative Model

Originally developed from an evolutionary framework, attachment theory attempts to explain close relationship behavior across the lifespan (Bowlby 1969, 1973, 1977, 1982). Bowlby theorized that the affectional, emotional bond between infant and caregiver serves the evolutionary function of maintaining the infant's proximity to its caregiver in the face of occasional separations. Infants who stay close to their caregivers are more likely to be safe from predators and to be better fed and cared for than infants who do not stay close to their caregivers, thus enhancing the likelihood of survival and eventual reproduction. At the same time, this bond promotes comfort during stressful periods, a reduction in negative affect, and a felt sense of security. Attachment theory has consistently been looked to as an empirically supported framework for understanding stress responses and general interpersonal regulatory capacity (e.g., Ehrenthal et al. 2018; see Levy et al. 2015 for a review).

Attachment theory provides specific predictions as to what type of stress response behavior individuals may engage in, dependent on their "internal working models" of self and other (Bartholomew 1990; Bowlby 1969). Although different patterns of attachment behavior were originally identified in young children (Ainsworth et al. 1978), following Bowlby's contention that the attachment system was operative "from the cradle to the grave," a number of investigators (Hazan and Shaver 1987; Main et al. 1985; West and Sheldon 1988), theorized that adult relationships could also be described according to attachment patterns.

Later, Bartholomew (1990) integrated adult parental and romantic attachment findings by describing Bowlby's models of self and other as two dimensions, ranging from positive to negative. Later empirical work by Brennan et al. (1998) found two oblique dimensions of attachment anxiety and attachment avoidance parsimoniously underlay the breadth of attachment measures at the time. Securely attached adults — those low in both attachment anxiety and avoidance — are interdependent with close others and see relationships as conducive to positive change. Anxiously attached adults fear abandonment, clinging to romantic partners or other supports, and they are easily disappointed and often worried, especially in relationship contexts. Avoidantly attached individuals tend to shun intimacy, preferring isolation and sometimes lacking empathy, caring, or other attributes designed to enhance interpersonal interaction (Mikulincer and Shaver 2007). Since the anxious and avoidant dimensions are relatively independent (correlated around .32; del Giudice 2011), individuals can be described via nuanced combinations of (or interactions between) these two dimensions that correspond to the proposed categories. Individuals need not be solely anxiously or avoidantly attached but could be high in both dimensions (i.e., "fearfully" attached).

Past research has shown that attachment style moderates sex differences. For example, jealousy induced by a partner's sexual infidelity versus emotional infidelity has been proposed to be a sex difference. Research has found that women are more distressed by a partner's emotional infidelity, whereas men are more distressed by a partner's sexual infidelity (Buss et al. 1992). However, Levy and Kelly (2010) found that attachment style predicted differences in jealousy, over and above differences predicted by sex, such that securely attached individuals, including secure men, are more distressed by emotional

infidelity, whereas dismissing individuals, including dismissing women, are more distressed by sexual infidelity. These and other findings (e.g., Burchell and Ward 2011; Treger and Sprecher 2011) suggest that both sex and attachment style are important predictors of relational behavior and response to threat. In the present study, we propose that attachment may also help to explain and/or moderate the putative sex difference in reported stress response behaviors.

Attachment and Stress Response

Although Taylor and colleagues mention attachment-seeking as a possible mechanism by which tend-and-befriend behaviors may have evolved, few studies have investigated this aspect of the paradigm. David and Lyons-Ruth (2005) investigated the behavioral stress responses of boy and girl infants when faced with frightening stimuli in terms of proximity maintenance behaviors towards their mothers. They noted that girls were more likely to approach and befriend, whereas boys were more likely to show a fight-or-flight response. Although this study supports the supposition of sex differences in stress response, the authors did not report whether or not there were attachment pattern differences that might moderate sex differences in behavioral stress responses.

Further research on adult stress and attachment has shown that attachment style has an effect on response to stress and may contribute to different patterns of interpersonal behavior in the context of stress. Diamond (2001, 2015) has highlighted the link between attachment and physiological stress responsivity in the parasympathetic nervous system and the hypothalamic-pituitary-adrenocortical (HPA) axis and has argued that attachment relationships help to regulate physiological and behavioral responses in the context of stress. Diamond and Fagundes (2010) reviewed over a decade of evidence suggesting both attachment anxiety and avoidance predict heightened cortisol reactivity (i.e., HPA activity) and other physiological reactivity (e.g., Carpenter and Kirkpatrick 1996; Feeney and Kirkpatrick 1996; Sroufe and Waters 1977). This is also in line with Starcke et al. (2011) who found that increased cortisol responsivity was negatively linked to altruistic decision-making in both men and women. Thus, lower cortisol reactivity may be associated with both secure attachment and tend-and-befriend behaviors.

Attachment patterns also predict a range of other indices of physiological stress, such as galvanic skin response and cardiovascular reactivity (an acute stress response with implications for significant major health conditions such as coronary heart disease; Linden et al. 2003). Dozier and Kobak (1992) found that undergraduates who use "deactivating" attachment strategies (i.e., an avoidant strategy that downplays attachment-related stress and overreports positivity of parental relationships) have greater skin conductance during the Adult Attachment Interview than students who do not use deactivating strategies. Similarly, Diamond et al. (2006) recorded changes in skin conductance among 148 adults subjected to stress tasks and attachment-relevant conversations, finding attachment avoidance, but not anxiety, predicted elevations in skin conductance response. Related, avoidant, but not anxious, attachment predicted blood pressure changes and recovery among 50 adults in the context of an attachment-focused "separation recall" stressor (Ehrenthal et al. 2011). Finally, avoidant attachment predicted salivary alpha amylase (an indicator of sympathetic adrenomedullary activity; Granger et al. 2007) and cortisol response to a social stress task among 113 women with heightened borderline personality disorder features (Ehrenthal et al. 2018). This study also showed that the robust link between childhood stress and eventual attenuation of cortisol responsivity (operationalized as the association between self-reported childhood trauma and either alpha amylase or cortisol response) only occurred in the context of individuals with attachment anxiety, suggesting low attachment anxiety buffers against the detrimental effects of childhood stress on the HPA axis. In sum, physiological stress response, which in many ways comprises the core of the fight-or-flight paradigm, is clearly linked to attachment anxiety and avoidance, suggesting the importance of attachment theory in understanding these stress responses.

A large body of evidence has also implicated attachment style in a variety of interpersonal behaviors, such as styles of communication and openness in relationships, especially during times of conflict (see Mikulincer and Shaver 2007, for a review). Interpersonal stress behavior is directly relevant to the tend-and-befriend model. Those who are securely attached may be expected to be more likely to use the tend-and-befriend response system in appropriate situations, due to their greater openness to effective, reciprocal communication. Ditzen et al. (2008) found that secure attachment interacted with social support to reduce anxiety levels after stress, suggesting the potential importance of attachment as a buffer against maladaptive or distressing responses to stressors.

Especially relevant to Taylor's tend-and-befriend model, posited as an alternate for women to the traditionally used fight-or-flight system in men, attachment may moderate psychological or behavioral responses traditionally assumed to be explained by sex differences. Levy and Kelly (2010), for example, found that attachment style moderates the relationship between jealousy and type of infidelity (sexual or emotional). What was originally thought to be solely a sex difference, where men experienced more distress caused by sexual infidelity, and women reacted more to emotional infidelity (Buss et al. 1992), was found to be related more strongly to individuals' attachment style: secure individuals, both men and women, were more distressed by emotional infidelity, while dismissing individuals of either sex, were more distressed by sexual infidelity. This, and other research (e.g., Kirkpatrick and Davis 1994) suggests that attachment style may go above

and beyond previous assumptions of sex differences in explaining various interpersonal behavior patterns.

In sum, the evidence base underlying attachment and its relation to stress, especially in the context of interpersonal behaviors associated with tend-and-befriend behaviors, is robust. Attachment is potentially a vital contributor to differential stress responses and related evidence on moderating effects of attachment on sex differences in the interpersonal context argues for the utility of examining the moderating effects of attachment security on proposed sex differences in tend-and-befriend versus fight-or-flight behavior. If this is the case, then in contrast to Taylor's theory, sex differences in stress response may be muted in the context of secure attachment, which may promote tend-and-befriend behaviors and associated adaptive relationships and peer bonding in the context of stress.

Hypotheses

Building from the literature reviewed above, we make three hypotheses regarding sex and attachment in predicting stress responses. Hypothesis 1: Sex will be associated with stress response, such that women will be more likely than men to report using tend-and-befriend responses while men will be more likely to report using fight-or-flight responses. Hypothesis 2: Attachment security will be associated with reported stress behavior, such that attachment anxiety and avoidance will predict lower levels of engagement in tend-and-befriend responses and higher levels of fight-or-flight responses to stress. Hypothesis 3: Finally, attachment and sex will interact in predicting stress response, such that as attachment security increases (i.e., lower rates of both anxiety and avoidance), sex differences in stress response style will be less pronounced but will become more distinct at lower levels of attachment security (i.e., higher rates of anxiety and avoidance).

Methods

Participants

Participants were 237 undergraduate psychology students at The Pennsylvania State University. Participants were granted 1 h of credit towards their class research requirement as compensation for participating in the study. Of the participants, 128 (54.2%) were women, 108 (45.8%) were men, and 1 (0.4%) unknown. The participants ranged in age from 18 to 31 years (Mage = 19.0, SD = 1.63). The sample was primarily self-identified as Caucasian (86.8%). The remaining 13.2% were 5.0% Asian, 2.5% Hispanic, 2.0% Indian, 1.7% African-American or African Caribbean, 0.8% Native American, 0.8% Arab, and 0.4% Pacific Islander.

Measures

Experiences in Close Relationships-Revised (ECR-R)

The ECR-R (Fraley et al. 2000) is a 36-item self-report measure that assesses attachment anxiety and avoidance. Participants are asked to think about how they feel in romantic relationships and then rate items on a seven-point Likert-style scale from 1 = strongly disagree to 7 = strongly agree. Empirical studies internationally have shown both external and internal validity for the measure, making it an optimal choice for a self-report scale of adult attachment (Kooiman et al. 2013; Sibley et al. 2005; Uppal et al. 2015). The internal consistency of the ECR-R is high for both dimensions (α_{anx} = .95, α_{avd} = .93; Sibley et al. 2005), and the current study found good-to-excellent internal consistency (α_{anx} = .91, α_{avd} = .84)

Tend-and Befriend-Questionnaire (TBQ)

The TBQ (Turton and Campbell 2007) consists of 61 self-report questions designed to assess the likelihood of engaging in tend-and-befriend versus fight-or-flight stress responses. Participants were asked to think about how they generally respond in stressful situations and to then rate how much they agree/disagree with whether or not the statement corresponded to their typical reactions to stress using a seven-point Likert scale. In the original study, the 61 TBQ items were generated during semi-structured interviews with 11 university students regarding their general responses to stress. These items were then organized by 40 students using a Q-sort technique (McKeown and Thomas 1988), producing a distribution of items based on their representativeness of each factor (fight, flight, tend, befriend) for each student. The correlation matrix among these distributions was used as input into a principal component factor analysis (using orthogonal rotation), producing four factors which corresponded to fight, flight, tend, and befriend.

However, the construct-focused psychometric properties of the TBQ have yet to be examined and there is some evidence suggesting the TBQ does not distinctly assess the four putative dimensions mentioned above (Evetts 2017). Therefore, to ensure the accuracy of our assessment of stress response constructs using the TBQ, in the present study, we performed principal components analysis with Direct Oblimin rotation (an oblique rotation allowing for correlated components) on the 61 TBQ items and generated average scale scores for each resulting component (unweighted mean of items loading at > .45 on each component) for use in the main study analyses. According to total variance explained (41%), Eigenvalues > 2, and visual analysis of the scree plot, a five-component solution appeared to best reflect the measure items parsimoniously. However, the fourth and fifth components appeared to reflect secondary constructs

not directly corresponding to any of the four proposed stress responses of Taylor's theory, instead reflecting items related to freezing or shutting down (Component 4) and general group interactions/socializing (Component 5). Components 1 through 3 reflected Flight, Tend/Befriend, and Fight domains, respectively (Appendix Table 3), and we chose to retain these three components for subsequent analyses. Results below, therefore, derive from a three-component model. In order of variance explained, these components were labeled Flight (highest loading item: "I'm intimidated by stressful situations."), Tend/Befriend ("In times of stress, I help other people calm down."), and Fight ("If someone causes me stress, I try to take revenge."). We refer to the second component as Tend/Befriend as it appeared to reflect a combination of both tend (e.g., "If someone I care for is stressed, I try to help them, regardless of the stress this may cause me.") and befriend responses (e.g., "In times of stress, friends and family are important because they can help supply resources.") that were not differentiated by eigen decomposition. Scale scores were generated for each subscale by taking the mean of all items for each scale (Appendix Table 3). All three subscales displayed good internal consistency ($\alpha_{Flight} = .86$; $\alpha_{Tend/Befriend} = .84$; $\alpha_{Fight} = .83$). To assess overall stress responsivity, a total TBQ score was computed as the mean of all 61 items.

Procedure

Participants were assessed via an online survey system (SurveyMonkey). They filled out a demographic questionnaire composed of descriptive questions such as age, sex, and year in school, followed by the ECR and the TBQ. The questionnaires took about 45 minutes to complete and were completed by subjects online on their own time via a link provided when they signed up to participate. Data were converted from SurveyMonkey to Excel format and entered into SPSS (Version 24.0) for data analysis.

Data Analysis Plan

Hypothesis 1: TBQ scale scores were compared by sex using independent samples *t* tests. Hypothesis 2: Pearson product-moment correlations were used to assess the relationship between ECR-R anxiety and avoidance dimensions and TBQ scale scores. Hypothesis 3: Multiple linear regression was utilized to evaluate interaction effects between attachment dimensions and sex in predicting TBQ scale scores. As attachment anxiety and avoidance were moderately correlated ($r = .31$), we controlled for the other dimension in these analyses, consistent with prior research (e.g., Johnson and Bliwise 2017). In order to satisfy the assumption of homogeneity of regression slopes when evaluating interaction models with covariates (Stone and Hollenback 1989), we tested up to three-way interaction models (Sex × Anxiety × Avoidance) and removed non-significant three-way and covariate interaction terms and report on the main effects and two-way interactions of interest in these final models.

Results

Hypothesis 1: Sex Differences in Stress Responses

As an important preliminary step in determining the appropriateness of comparing stress response by sex, we tested whether or not men and women differed in overall level of reported stress responsivity. Women reported significantly more overall stress responsivity than men on the total TBQ scale ($M_{women} = 4.19$, $M_{men} = 4.03$, $t(222) = 2.46$, $p = .02$, $d = .33$). However, this difference became non-significant when examining stress responsivity as an average of the three identified subscales (flight, fight, tend/befriend) ($M_{women} = 4.15$, $M_{men} = 4.03$, $t(222) = 1.60$, $p = .11$, $d = .21$). Women reported greater flight ($M_{women} = 4.45$, $M_{men} = 3.93$, $t(222) = 4.10$, $p < .001$, $d = .55$) and tend/befriend ($M_{women} = 4.83$, $M_{men} = 4.51$, $t(222) = 3.15$, $p = .002$, $d = .42$) responses than men, whereas men reported greater fight responses than women ($M_{women} = 3.17$, $M_{men} = 3.64$, $t(222) = 3.27$, $p = .001$, $d = .44$).

We also evaluated differences in stress response within sex. Women displayed the highest level of tend/befriend responses compared to other stress responses, followed by flight, and reported being least likely to utilize fight ($F(2, 236) = 121.20$, $p < .001$, $\eta^2 = .51$), and men similarly displayed higher levels of tend/befriend than each of the other styles ($F(2, 208) = 28.86$, $p < .001$, $\eta^2 = .22$).

Hypothesis 2: Associations Between Attachment Security and Stress Responses

Both attachment anxiety and avoidance were significantly associated with nearly all forms of stress response (Table 1). Specifically, attachment anxiety was most associated with flight responses (positively), while avoidance was most associated with tend/befriend responses (negatively). Both attachment dimensions were positively associated with flight and fight responses, suggesting that attachment insecurity may lead to more use of this domain of stress responsivity. There were no differences between sexes in either attachment dimension (Table 1). In order to determine the specificity of each attachment dimension in predicting stress response, we computed partial correlations controlling for the alternate attachment dimension. Results suggested attachment anxiety (controlling for avoidance) still significantly positively predicted flight and fight responses and also tend/befriend responses, while attachment avoidance (controlling for anxiety) negatively predicted the tend/befriend response and the association with fight and flight responses became non-significant (Table 1).

Table 1 Descriptive statistics of and correlations among the ECR-R and TBQ scales

	Mean	SD	Anxiety	Anxiety (partial)	Avoidance	Avoidance (partial)	Flight	Fight	Tend/befriend
Attachment (ECR-R)									
Anxiety	3.68	1.04							
Avoidance	2.99	1.02	.31**						
Stress response (TBQ)									
Flight	4.21	0.98	.53**	.50**	.21*	.07*			
Fight	3.39	1.03	.28**	.24**	.18*	.11	.25**		
Tend/befriend	4.68	0.78	.05	.19*	− .39**	− .42**	.09	− .07	
Sex	128 (n_F)	54.2 (%F)	.07	.09	− .07	− .09	.27**	− .23**	.21*

Note. Pearson product-moment correlations reported for all correlations except sex, which are point-biserial correlations. Sex coded 1 = Man, 2 = Woman. Two-tailed tests conducted. "Partial" refers to partial correlations with the specified attachment dimension, controlling for the alternate dimension. ECR-R = Experiences in Close Relationships Scale; TBQ = Tend-and-befriend Questionnaire; F = female

*Correlation is significant at $p < .01$

**Correlation is significant at $p < .001$

Hypothesis 3: Independent Associations of Interactions Between Attachment and Sex in Predicting Stress Responses

When controlling for attachment anxiety and avoidance, sex-predicted stress responses, with women being more likely than men to utilize flight and tend/befriend responses and men being more likely than women to utilize a fight response (Table 2). The inclusion of sex as a predictor did not change the pattern of effects contributed by anxiety and avoidance on either flight or tend/befriend stress responses displayed by the partial correlations in Table 1 and there were no significant interactions between sex and attachment in predicting these responses. However, the interaction between sex and attachment avoidance was significant in predicting fight response (Table 2). Simple slope analyses revealed that there was no association between attachment avoidance and fight response among men ($r = -.001$; $b = 0.12$, $t = -1.20$, $p = .23$), but there was a significant positive association between avoidance and fight response among women ($r = .32$; $b = 0.23$, $t = 2.92$, $p = .004$) (Fig. 1).

Discussion

This study investigated alternative explanations for the tend-and-befriend stress response paradigm (Taylor et al. 2000), which suggests that because a fight-or-flight response would not always have been evolutionarily advantageous to women and their young offspring, tend-and-befriend behavior evolved as an alternative female stress response. Specifically, we explored whether attachment insecurity would explain stress responses above and beyond sex and we examined potential interactions between attachment and sex. The results indicate that both sex and attachment style appear to play important roles in the display of different stress responses, although only in the case of fighting do sex and attachment interact in predicting stress behavior.

Table 2 Moderated linear regression analyses of attachment insecurity and sex interactions in predicting stress responses ($N = 224$)

Predictor	F	p	R^2	b	t	p
Flight	38.30	< .001	.34			
(Constant)				1.54	5.54	<.001
Sex			.08	0.47	4.36	<.001
Anxiety			.25	0.46	8.56	< .001
Avoidance			.01	0.08	1.49	.14
Fight	11.51	< .001	.17			
(Constant)				4.55	6.65	< .001
Sex			.06	− 1.53	− 3.82	< .001
Anxiety			.08	0.27	4.28	< .001
Avoidance			.02	− 0.47	− 2.19	.03
Sex × Avoidance			**.03**	**0.35**	**2.73**	**.007**
Tend/befriend	18.69	< .001	.20			
(Constant)				4.80	19.74	< .001
Sex			.03	0.25	2.61	.01
Anxiety			.03	0.12	2.60	.01
Avoidance			.17	− 0.32	− 6.62	< .001

Note. Only significant interactions between sex and attachment styles are reported. In models with significant interactions, remaining effects are reported in the context of the significant interaction. However, models without significant interactions are reported as main-effects models only. Significant interactions are reported in bold font

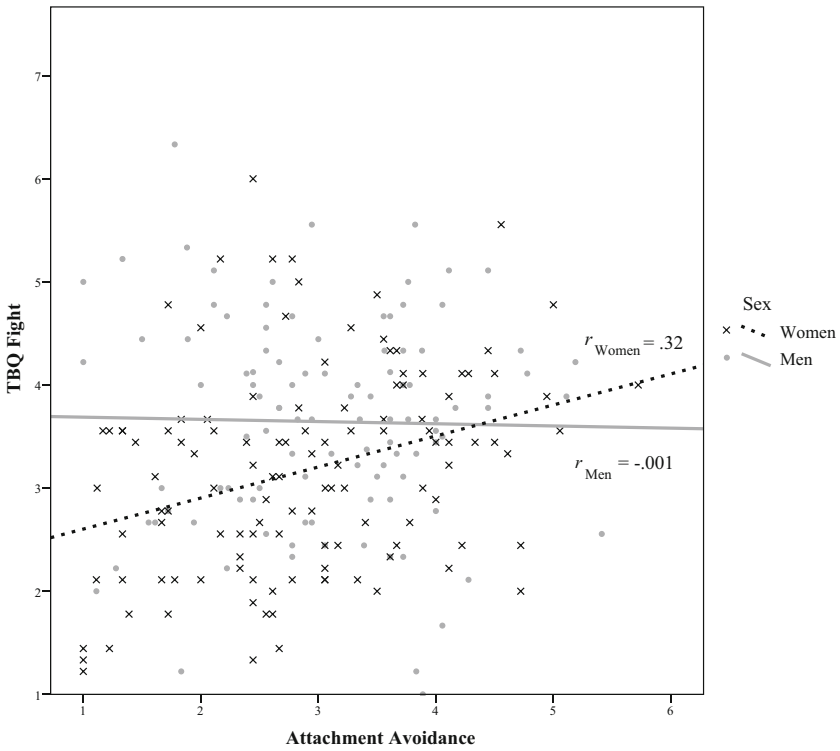


Fig. 1 Interaction between sex and attachment avoidance in predicting TBQ fight response. Increasing levels of attachment avoidance among women predicted increasing fight response ($r = .32$), whereas there was no relation between attachment avoidance and fight response among men ($r = -.001$). Note that men were higher in fight response on average, $t(222) = 3.27$, $p = .001$, $d = .44$. TBQ = Tend-and-Befriend Questionnaire

Women endorsed higher rates of flight and tend/befriend responses, and men endorsed more fight responses. These results are only partially consistent with our hypothesis and the supporting literature suggesting that tend/befriend responses form a domain of stress behavior uniquely adapted by women to enhance survival of themselves and their offspring, and which is distinct from traditional men's fight/flight responses (Abad-Tortosa et al. 2017; Morrison 2009; Nickels et al. 2017; Taylor et al. 2000). Although women did appear to utilize tend/befriend behavior most (and more than men) in stressful situations, consistent both with Taylor and colleagues' theory and experimental research (Nickels et al. 2017; Probst et al. 2017), our unexpected finding that women used more flight response than men deserves some discussion. One study has found that women are more likely than men to report more emotional reactivity after experiencing stress; however, both men's and women's physiological responses were similar (Kelly et al. 2008). Since our study utilized self-report rather than physiological measures, it is possible that women endorsed higher rates than men in terms of items with negative emotional content in response to stress, many of which fell into the flight scale (e.g., "Stress makes me feel insecure"; Appendix Table 3). It is also possible that men were reticent to report more emotion-focused stress responses than women (Grossman and Wood 1993), contributing to an apparent sex difference in flight responses driven in part by sex differences in reporting tendencies. Furthermore, this difference may in part be driven by women's higher level of overall stress responsivity.

Both men and women reported utilizing tend/befriend responses primarily, versus either fight or flight responses. In fact, we argue that evaluation of stress response within sexes, rather than between as has been done in most past research, is a stronger test of Taylor's sex-based stress response theory as it takes into account the possibility that women may simply be more reactive to stress overall. Given that women reported significantly more overall stress responsivity than men in our study, comparing sexes on types of stress responses based purely on absolute differences is a limited approach and within-sex comparisons are vital. Thus, our finding that individuals of both sexes reported using tend/befriend behaviors most frequently is in contrast to Taylor et al.'s original theory. This may be due to the relatively well-adjusted nature of our sample. For instance, Evetts (2017) found that participants with a graduate education and a higher income aligned more closely to tend/befriend behaviors, while those with lower education and lower income aligned more closely with fight/flight behaviors. The education and income level of our undergraduate sample, although not graduate educated, may indicate a greater likelihood towards tend/befriend responses across both sexes. Although other research has utilized

undergraduate samples, to our knowledge none has examined within-sex differences among self-described stress responses. Although our finding that men may also be likely to utilize tend/befriend stress responses is consistent with findings of Singer et al. (2017), who found that men are more likely to make more prosocial decisions after experiencing stress, the literature is inconsistent with experimental studies focusing on tend/befriend behavior in only men (e.g. Steinbeis et al. 2015).

Furthermore, our sample consists of individuals in emerging adulthood, a period when relationship and bond formation become primary goals for many individuals (Arnett 2000). It is possible that tend/befriend responses are generally more utilized than fight-or-flight responses in emerging adults, regardless of sex, due to the salience of social networks and relationship formation in this developmental epoch. Although further research is necessary to determine the potential causes of within-sex differences in stress responses across various age cohorts and socioeconomic levels, we assert that both examining differences in stress responses within sexes is a crucial test of Taylor and colleagues' theory and that our results only support this theory at the between-sex level, but not the within-sex level.

Beyond sex, attachment attitudes also appear to play a large role in the selection of stress behaviors. Attachment anxiety was uniquely associated with fight and flight responses while attachment insecurity in general predicted tend/befriend responses, with anxiety predicting more tend/befriend behaviors and avoidance less. Notably, the relations between attachment insecurity and stress responses were generally comparable with and sometimes up to twice as large as those between sex and stress responses, indicating that research examining sex-based differences in stress responses would do well to incorporate attachment styles as joint predictors in order to more fully understand individual's differential displays of inter- and intra-personal stress behavior.

Until this point, most research has focused on investigating the association between sex and tend-and-befriend behaviors, including many studies focusing on physiological sex differences in reaction to stressors, concluding that because physiological responses to behaviors such as soothing another individual, particularly a child, are different for women and men, there is physiological support for tend-and-befriend being a sex-based response (Abad-Tortosa et al. 2017; Morrison 2009; Nickels et al. 2017; Probst et al. 2017; Turton and Campbell 2007). However, a body of literature has also determined that attachment styles are highly relevant for understanding (and predicting) stress responsivity, both generally (Mikulincer and Shaver 2007) and in terms of specific types of stress responses (Babcock et al. 2000). Given that Bowlby (1969) originally conceptualized attachment behaviors as an adaptive system evolved to protect animals from danger and enhance survival, it is no surprise that attachment patterns would prove a foundational component of variation in adult stress responses. Furthermore, attachment security has been associated with greater parental investment in both men and women (Belsky et al. 1991; Belsky 1997). As Taylor et al.'s (2000) original theory suggested, if tending behaviors specifically evolved to aid child survival in times of stress, then both men and women who are involved in childcare would benefit from using this response; evolutionarily, this would promote reproductive success through the care and survival of offspring. Lastly, attachment promotes survival by reducing stress through the development of "felt security" (Sroufe and Waters 1977), which allows individuals to regulate via "interpersonal" means even when not in the presence of others (Bowlby 1969; Fonagy and Target 1997).

Anxious attachment may confer a general sensitivity to stress, contributing to increases across all types of stress responsivity, both in terms of the fight/flight domain but also in terms of increased bonding behavior. Avoidantly attached individuals may retreat from interpersonal outlets for stress, as indicated by the negative association between tend/befriend behavior and attachment avoidance in our study, while avoidant attachment may be unrelated to fight/flight stress responses. However, evidence suggests that while avoidantly attached individuals may not report high levels of stress reactivity compared to anxiously attached individuals, physiological measures of stress responsivity suggest equivalent levels across both attachment styles of stress activation (e.g., increased skin conductance, increased heart rate) in the context of a stressor, with both groups of insecurely attached individuals displaying more physiological stress reactivity than securely attached individuals (Carpenter and Kirkpatrick 1996; Feeney and Kirkpatrick 1996; Sroufe and Waters 1977). This may explain the lack of association between avoidant attachment and fight/flight stress behaviors in our study, as stress responses were self-reported rather than measured via physiological arousal.

A considerable body of literature has determined the importance of secure attachment as a buffer against the effects of other risk factors on deleterious outcomes. For instance, attachment style has been shown to moderate the effects of temperament, another important predictor of stress response considered to be highly heritable and largely biologically determined (e.g., Beauchaine and Neuhaus 2008), such that secure attachment buffers cortisol response to threatening events among children with frightened temperaments (Gunnar et al. 1996). Similarly, Ditzen et al. (2008) found attachment security in the context of social support buffered against anxiety after stress. Contrary to our third hypothesis, the results of the present study suggest that the strength of the effects of sex on either flight or tend/befriend stress responses is generally unaffected by attachment security (except in the case of attachment avoidance and fight responses). These findings suggest that sex and attachment style largely work independently to explain variations in stress responsivity.

We found one exception to the general finding that attachment and sex did not interact in predicting stress response.

Attachment avoidance appeared to modulate sex differences in fight behavior. Increasing attachment avoidance predicted greater fight responses among women, but there was no relation between avoidance and fighting among men. Cultural stereotypes for men may permit more physical or aggressive forms of stress response, regardless of men's style of attachment, but women may generally be inhibited from such stress behavior (Eagly and Wood 2012), except in the case of avoidant attachment which may promote distance from peer bonding and socially normative behavior (Bartholomew 1990). Additionally, a longitudinal study found avoidantly attached women to be more vulnerable and defensive when stressed than securely attached women (Klohnen and Bera 1998), perhaps leading to increased levels of aggressive behavior in stressful situations. In the context of this literature, our findings suggest avoidantly attached women may experience less social inhibition surrounding aggressive behavior in the context of stress, rivaling men in displays of these behaviors.

Limitations and Future Directions

Although our study offers a more comprehensive avenue for exploring predictors of stress responses beyond much past research, several factors limit the generalizability of these findings. First, our sample consisted of predominantly white, healthy college students, yielding a sample that is not representative of the general population and is limited in terms of variability in ethnicity, socioeconomic status, and other demographic variables. Similarly, our participants' average age was 19, making it difficult to examine stress responsivity among older individuals or parents. The tend aspect of the tend-and-befriend paradigm is closely tied to experiences involving offspring, making it difficult to analyze the long-term validity of participants' responses as their stress reactions may change after having children. Furthermore, social desirability should be controlled for in future studies, as research has shown that participants may alter their results to appear more socially desirable, even in online studies (e.g., Van de Mortel 2008); this may cause an individual to choose a more desirable stress response (e.g., tend/befriend) over a response deemed socially undesirable (e.g., fight). Additionally, we only assessed categorical sex. Previous research using dimensional measures of gender (e.g., the Bem Sex Role Inventory; Bem 1974) has found that femininity levels across both men and women may contribute to positive views of oneself and partners in the context of relationships (Steiner-Pappalardo and Gurung 2002). Thus, gender variables such as femininity or masculinity assessed along a continuum may provide further nuance in understanding predictors of stress response and potential interactions with attachment behavior in predicting these behaviors.

Finally, our results are limited by the use of a self-report measure of stress behavior (i.e., the TBQ) with limited psychometric support. To our knowledge, the TBQ is the only self-report measure to date designed to assess the stress response domains of interest, and we sought to maximize the correspondence between participants' responses and putative stress response domains through principal components analysis; nevertheless, further research on the psychometric properties of the TBQ is warranted. Furthermore, as Turton and Campbell (2007) suggest, it is unclear whether women choose to befriend same-sex or different-sex friends in times of stress; in contrast to Taylor and colleagues' proposition that women rely on other women in stressful situations, women may in fact choose to turn to their significant other in times of stress. The TBQ does not clarify the targets of tend-and-befriend behaviors, and future studies should aim to distinguish between the possible recipients of such behavior. Similarly, it is also possible that the self-reported actions of the participants would not actually match their actions in a real-life stress situation. Future research should incorporate behavioral and physiological responses to analyze ecologically valid stress responses. Finally, assessment of attachment via other methods, such as the Adult Attachment Interview (George et al. 1985), might also produce different results.

Conclusion

Taylor et al.'s (2000) proposal of a tend-and-befriend alternative to the classic fight-or-flight stress response shows promise in aiding an understanding of the full range of human stress responses. However, by not including other important predictors of stress behavior, such as attachment, and the restriction of tend/befriend behaviors to sexual dimorphism, researchers severely limit the claims they can make about sex variation in stress responses. Further, failing to examine within sex differences in stress behavior may produce misleading results in terms of differential displays of stress behavior by sex. The findings of this study reveal that attachment insecurity plays an important role, above and beyond an individual's sex, in their choice of stress response type and that attachment avoidance may lead to more use of fight behavior among women in particular. Future research should include both sex and attachment style as important factors in understanding stress responsivity.

Acknowledgments We thank the participants for their generosity and contribution to the project.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Appendix

Table 3 Results of the principal components analysis of the Tend-and-Befriend Questionnaire

Item #	Item content	Component loading
Flight		
33	...intimidated...	.81
31	...giving up.	.73
22	...feel insecure.	.73
49	...I want to run away...	.68
23	...I panic.	.66
7	...become flustered.	.62
32	...withdraw...	.58
8	...make me cry.	.55
10	...moody and grumpy.	.51
34	...bottle things up...	.47
6	...eat more...	.46
50	...put myself in jeopardy.	.45
Tend/befriend		
45	...help others calm down.	.65
40	...try to help [others] regardless of the stress this may cause me...	.64
47	...friends and family are important because they can help supply resources...	.63
17	If my friends or family experience stress, I'm likely to get involved.	.61
46	...tending to others.	.60
14	...talk to other people involved.	.57
58	...physical affection... helps to reduce my stress.	.55
15	...resolve stressful situations in a calm and rational manner.	.52
1	...talk to friends to let off steam.	.51
25	...looking after others.	.50
61	...turn to my partner for support.	.49
41	… just try to get on with things.	.47
19	… tend to seek female company.	.47

Table 3 (continued)

Item #	Item content	Component loading
57	… more nurturing and caring towards people to whom I'm close.	.45
Fight		
37	...take revenge.	.81
20	...physically fight.	.78
29	...damage things.	.76
39	...verbally aggressive.	.63
60	...I lose my temper.	.55
18	...undermine [others].	.53
13	...raise my voice.	.50
12	...interested in sex.	.49
43	...use alcohol or drugs...	.48

Note. Items are listed in order of loading magnitude in the principal component analysis

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