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EMPIRICAL RESEARCH

Adolescents' Daily Romantic Experiences and Negative Mood: A Dyadic, Intensive Longitudinal Study

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Abstract Romantic relationships, although increasingly normative during adolescence, also present unique developmental challenges that can portend psychological difficulties. Underlying these difficulties may be the degree to which daily romantic transactions potentiate fluctuations in negative mood. The present study examined associations between adolescents' daily romantic relationship experiences and their same-day negative affective states (i.e., fluctuations in high-arousal, aversive mood). Using a dyadic ecological momentary assessment (EMA) design, this study followed an ethnically and socioeconomically diverse sample of 98 adolescent romantic couples twice weekly for 12 weeks ($n = 196$ individuals; $M_{age} = 16.74$ years, $SD = 0.90$; 45% Latina/o, 45% White; 55% receiving free or reduced meals). The results indicated that various daily romantic experiences (e.g., conflict, feelings about the relationship) predicted greater same-day negative affect. Beyond the effects of these romantic experiences, adolescent couples were also synchronized in their fluctuating negative affective states, evidencing the presence of emotional contagion. Overall, the findings indicate the salience of romantic relationships in the everyday lives of adolescents.

Keywords Romantic relationships · Adolescents · Negative affect · Negative mood · Ecological momentary assessment

Introduction

Romantic relationships are a normative feature of adolescent development. Puberty sparks a heightened interest in dating and by the age of 18, over half of adolescents have had at least one romantic relationship (Carver et al. 2003). In time, these relationships can even become more prominent and influential than relationships with friends (Roth and Parker 2001; Collins et al. 2009). When paced with the emerging psychosocial resources of the adolescent, romantic involvement can provide adolescents with opportunities to practice important relational competencies that will serve them in future, more committed relationships (Collins et al. 2009; Connolly et al. 2014). However, because of the novelty and complexity of romantic relationships, they often present adolescents with significant challenges, particularly in regards to mental health (Davila et al. 2009; Ha et al. 2014; Joyner and Udry 2000). Identifying how specific romantic relationship experiences contribute to adolescents' well-being can inform parents, teachers, and practitioners on how to best scaffold adolescents in learning to navigate these challenges.

Presently, few studies have sought a more fine-grained understanding of adolescents' specific relationship experiences that contribute to their daily mood states. Central to

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this pursuit is the examination of how adolescents' *daily* romantic experiences relate to fluctuations in their negative affect, or high-arousal aversive mood states. Using an innovative longitudinal ecological momentary assessment (EMA) design, this study examined how adolescents' daily relationship transactions, namely relationship conflict, their feelings toward the relationship (love, commitment, jealousy, doubtfulness), and time spent together with a romantic partner, were associated with their same-day negative affective states. Also examined was the co-regulation (i.e., covariance or synchrony) of daily negative affect between adolescent romantic partners *above and beyond* these relationship processes.

The Developmental Demands of Adolescent Romance

Although romantic involvement is normative and can contribute positively to development, navigating these relationship dynamics is not always easy for adolescents (Davila 2008; Connolly and McIsaac 2011). Indeed, increasing empirical evidence supports a link between adolescents' romantic involvement and the emergence of psychological difficulties, particularly greater depressive symptomology (Joyner and Udry 2000; Davila et al. 2009; Ha et al. 2014; Furman et al. 2008; Szwedo et al. 2015). Theory on adolescent romantic relationships suggests that because adolescents are relatively inexperienced with romantic relationship dynamics, which can be highly variable and emotionally intense, that romantic involvement can present significant coping challenges (Larson et al. 1999). Furthermore, relationship dynamics require high-level communication and problem solving skills, which may still be developing for adolescents (Shulman and Connolly 2013). For example, advanced emotional cognition is still emerging at this time, including core competencies such as the ability to differentiate blended emotions, conflicting emotions, and the situational sources of co-occurring emotions (Larson et al. 1999; see also Nannis and Cowan 1987; Harter and Buddin 1987). As a result, most adolescents are likely to be inconsistent in their application of these skills in their day-to-day lives (Larson et al. 1999), making novel and challenging romantic experiences a risky context for the emergence of psychological difficulties.

Further, under a bioecological framework, a fundamental mechanism of the associations between romantic involvement and psychological adjustment is adolescents' repeated, daily transactions with a romantic partner (i.e., proximal processes; Bronfenbrenner and Morris 2006). Adolescents enjoy regular contact with their romantic partners, so their repeated, *day-to-day* engagement with these variable relationship dynamics might account for aspects of their psychological adjustment. To date, no studies have investigated the association between romantic involvement and psychological adjustment at a fine-grained level, identifying the *daily* romantic transactions that predict negative affective states.

Daily Romantic Transactions and Negative Affect

Several types of romantic experiences are salient features of adolescents' daily romantic lives, including conflict, positive and negative feelings toward the relationship, and spending time together. Adolescents have ample experience handling relationship conflicts, given that conflicts are a common feature of most friendships (Laursen and Hafen 2010). Adolescents generally handle these conflicts and stressors quite well, using negotiation and mitigation strategies (Laursen et al. 2001) to ensure that conflicts are resolved amicably (Burk and Laursen 2005; Laursen and Hafen 2010). Although there are similarities among friendships and romantic relationships, such as their functions for affiliation, recreation, and companionship (Furman and Shoemaker 2008), conflicts in a romantic context may be uniquely challenging given the powerful emotional aspects that differentiate romantic from peer relationships. Indeed, romantic relationships are the first in which adolescents establish intimate and passionate emotional connections with a partner (Carver et al. 2003). Breakups are also more likely in romantic relationships (Ha et al. 2012). Given these higher stakes, conflicts in a romantic context might be more demanding for adolescents relative to conflict with friends (Ha et al. 2013). Indeed, conflicts happen more frequently with romantic partners than with friends (Furman and Shoemaker 2008) and unlike conflicts with friends, are more likely to be handled with maladaptive strategies such as avoidance and coercion (Shulman et al. 2006). Because these conflicts can present a coping challenge (Ha et al. 2013; Szwedo et al. 2015), adolescents' daily romantic conflicts might reasonably be expected to covary with fluctuations in their negative affect.

In addition to conflicts, adolescents experience strong and passionate feelings about their relationships (Furman et al. 2008). Some of these feelings are negative in nature, and in addition to being strongly felt, are novel for many adolescents. For example, feelings of jealousy and doubtfulness are, for many, experienced for the first time in the context of a romantic relationship (Furman and Shoemaker 2008). Adolescents are already more prone to emotional volatility than adults (Spear 2009), and with still-maturing cognitive capabilities, the novelty of these strong feelings may heighten risks for psychological difficulties (Frost et al. 2015; Szwedo et al. 2015; Mirsu-Paun and Oliver 2017). For example, Ha and colleagues (2014) found that adolescent couples' observed negative emotionality in the context of a conflict discussion was prospectively linked to greater depressive symptomology for both male and female

partners. Relatedly, romantic breakups, and presumably the intense negative emotions involved, are among the strongest predictors of adolescent depression and suicide attempts (Fleming et al. 2010; Monroe et al. 1999; Brent et al. 1993). Even feelings of romantic jealousy can be powerful in their influence, predicting adolescents' greater likelihood of perpetrating intimate partner violence (Johnson et al. 2015). Given these links, it was hypothesized that negatively-valenced romantic feelings, such as jealousy and doubt, may relate to adolescents' daily negative affect.

However, the positive romantic feelings that adolescence experience (e.g., love, commitment) are more common than negative feelings, and can promote a sense of belonging and perceived support (Furman and Shoemaker 2008; Connolly et al. 2014). Experiencing these positive romantic feelings from day-to-day might actually buffer against daily negative affect. In other relational contexts (e.g., family, peers), such feelings are a catalyst for positive development, promoting personal growth and greater self-worth (Birkeland et al. 2014). That said, the adaptive value of such emotions in the context of romantic relationships is less straightforward given the novelty and complexity of these relationships. For example, observed positive emotionality can, in some circumstances, represent maladaptive coping strategies, such as attempts to gloss over relationship problems (Ha et al. 2014), which may lead to more long-term relationship problems. Ultimately, very little is known about how positive feelings toward the relationship, such as love and commitment, may contribute to overall well-being, and in particular, daily negative affect.

Finally, one of the primary motivators of adolescents' entry into romantic relationships is spending time together with a partner and the companionship that it brings. As adolescent partners get older and become more intimate, they spend increasing amounts of time together (Connolly et al. 2014). The lack of time spent together is one of the primary reasons for breakups (Connolly and McIsaac 2009). Thus, even despite the inherent challenges of adolescent romance, adolescents still report high levels of satisfaction with their current relationships and desire high amounts of time spent together with their partners (Connolly and McIsaac 2011). Indeed, romantic partners can be an important source of social support for adolescents (Collibee and Furman 2015). Therefore, high levels of romantic affiliation can, in the absence of tensions or conflicts, be very satisfying and may even protect against adolescents' daily negative affect.

Emotional Co-Regulation in Adolescent Relationships

In addition to the previously mentioned romantic experiences, adolescent couples may experience "emotional co-regulation" in their daily negative affect. Also referred to as emotional crossover or transmission (Larson and Almeida 1999; Butner et al. 2007), co-regulation is conceptually defined as the tendency for an individual to experience the emotional states of others nearby (Butler and Randall 2013). This happens in a couple ways. Some evidence suggests that emotion is transmitted through shared environments and/or interactions. For example, conflictual interactions often create a shared negative emotional state among partners (Gottman 1993; Moed et al. 2015). Other evidence supports a process known as "emotion contagion," which is a more subtle, even unconscious acquisition of another person's emotional state (Hatfield et al. 1994). Emotion contagion is typically indicated in studies by the presence of co-varying affective states above and beyond their shared interactions that same day (e.g., Butner et al. 2007; Saxbe and Repetti 2010).

It should be noted that emotional co-regulation is not in and of itself "good" or "bad", but is considered a normative feature of development, deriving from the early attachment process wherein infants learn to regulate emotions by co-regulating with their caregiver (Butler and Randall 2013). Thus, in the context of romantic interactions, its impact on individuals and couples depends on a number of situational factors, such as the type of emotion, the target of the emotion, and duration of the co-regulation (Saxbe and Repetti 2010). There is also evidence that partners can co-vary in their positive affective states (Anderson et al. 2003). This possible variation acknowledged, research generally shows that covariation in negative affect is stronger than covariation in positive affect (Larson and Almeida 1999), and that covariation in negative affect is typically associated with diminished psychological well-being and strained relationship outcomes (Saxbe and Repetti 2010).

Emotional co-regulation is especially salient in intimate relationships because of the proximity and attention given in these contexts (Hatfield et al. 1994). Several studies have documented this process among cohabiting and married couples; for example, a stressor experienced by one spouse predicts the psychological distress of the other (Bolger et al. 1989). Schoebi (2008) showed that upon reuniting at the end of a typical work day, one spouses' anger and sadness positively predicted change in the other's anger and sadness. In another study, cohabiting couples showed affective co-regulation in both their positive and negative affect throughout the course of a given day, indicated by their covarying affective states above and beyond their shared negative experiences (Butner et al. 2007).

It is unclear whether the same processes of co-regulation documented among cohabiting and married couples are experienced by adolescent romantic couples, who usually do not live together and whose relationships are more transient in nature. Affective co-regulation is stronger for couples who spend more time together (Saxbe and Repetti

2010), and so adolescent couples may not experience a similar emotional synchrony. However, adolescents are known to give considerable time and attention to their relationships, at times even prioritizing them above other interpersonal relations, such as those with family and friends (Roth and Parker 2001). This heightened attention to romantic relationships could make emotional co-regulation likely. Although emotional co-regulation has not been examined among adolescents, a recent study showed that adolescent dating couples exhibited synchrony in their cortisol response (a physiological indicator of the stress response) to a stress task in a laboratory setting (Ha et al. 2016). Therefore, it was hypothesized that adolescent couples would covary in their daily negative affective states. The present study takes a first step in examining the presence of emotional co-regulation in adolescents' daily negative affective states with those of their romantic partner.

Current Study

This study examined how various daily relationship transactions were associated with adolescents' daily negative affective states. First, it examined how daily negative affect fluctuates according to adolescents' experiences of relationship conflict, feelings toward the relationship (love, commitment, jealousy, doubtfulness), and time spent together. It was hypothesized that daily conflicts and negative relationship feelings (e.g., jealousy, doubtfulness) would predict greater levels of same-day negative affect, given the novelty and intensity of these experiences for adolescents. In contrast, more pleasurable transactions, such as experiencing positive romantic feelings (e.g., love, commitment) and spending more time together were hypothesized to predict lower levels of same-day negative affect.

In addition, evidence was examined for the co-regulation of daily negative affect between adolescent romantic partners *above and beyond* these relationship processes, a phenomenon shown to exist among adult couples in more committed relationships and referred to as "emotional contagion." It was predicted that adolescents would also experience covariation in their daily negative affect, unique from their shared negative experiences (i.e., relationship conflict, negative romantic feelings), evidencing an emotion contagion mechanism (Hatfield et al. 1994).

Critical to addressing these questions was the use of an innovative, longitudinal ecological momentary assessment (EMA) design in which adolescents completed short, twice-weekly surveys about their daily relationship experiences. This design allowed for the examination of fine-grained, *daily* variability in adolescents' social and emotional relationship processes (Bolger et al. 1989) and provided greater ecological validity to the assessments by circumventing problems of retrospective recall (Laurenceau and Bolger 2005). Further, the design enabled the study of *within-person* processes, inherently controlling for temporally stable variables (e.g., personality characteristics) that may otherwise act as confounds to the associations of interest (Bolger et al. 1989).

In these analyses, the role of the broader socio-cultural context was acknowledged, particularly in regards to gender, race, and social class. For example, many norms for dating and sexuality fall along gendered lines (e.g., Kapungu et al. 2010; Perilloux et al. 2008), potentially leading to unique romantic and sexual experiences for boys and girls. Furthermore, social disadvantages can place added demands on romantic relationships, potentiating lower quality dynamics and greater instability (Conger et al. 2010). In the U.S. context, adolescents of ethnic/racial minority status (particularly Latina/o and African Americans) have more limited access to resources, on average, than White adolescents (Mather and Dupuis 2012; Semega et al. 2017). As such, minority adolescents may have unique experiences in relationships, particularly those who represent less-privileged segments of society. Although these factors are not focal points of the present research, they are accounted for in the study's examination of adolescents' daily romantic relationship experiences.

Method

Participants

The data for this study were drawn from an intensive longitudinal investigation of adolescents' romantic relationships (see Ha et al. 2016). Inclusion criteria for recruitment were that adolescents had to be exclusively dating, participate as a couple, and be between 14–18 years of age. Couples were recruited through social media advertisements ($n = 82$), two consenting schools ($n = 27$), and in-person at a local shopping mall ($n = 2$). The participants who were recruited from the schools were more likely to be ethnic minority students than those recruited through social media, $t\ (201) = 5.57$, $p < .001$. There were no differences by recruitment location on parent education level, $t\ (199) = 1.55$, $p = .22$, number of previous romantic partners, $t\ (200) = -0.39$, $p = .70$, current relationship duration, $t\ (200) = 1.22$, $p = .26$, or participants' age, $t\ (201) = -0.41$, $p = .68$.

At the outset, 111 couples participated in the study. Because the study examined sex differences in the associations between romantic experiences and negative affect, the analyses had to distinguish dyads on the basis of sex (Kenny et al. 2006). Eight couples were same-sex

couples and because these represented too small a sample to be examined separately, they were removed from the analyses. Another 5 couples were removed because they completed less than 20% of the EMAs. Therefore, the present sample comprised 98 heterosexual adolescent couples (196 individuals). The participating adolescents averaged 16.74 years ($SD = 0.90$; range = 14 to 18) and represented Latina/o (43%), White (45%), African-American (4%), Asian-American (2%), Native American (3%), and other (3%) ethnic backgrounds. The adolescents represented diverse socioeconomic backgrounds; 38.7% of fathers and 33.7% of mothers had a high school diploma or less, and 55% of adolescents received free or reduced meals at school. Relationship duration varied among the couples, with 33% reporting being together less than 6 months, 35% between 6 months and one year, and 32% for more than a year. During the course of the study, all but one couple were living separately and 11 couples (11.2%) broke up.

Procedure

Approval for the study was obtained from the Arizona State University Institutional Review Board. Data were collected between July of 2014 and April of 2015. Parental consent and adolescent assent were obtained for all participants. The study began with the adolescents individually completing an online baseline survey that assessed their interpersonal relationships (e.g., family, peer, romantic partner) and various adjustment indices. Then, the couples attended a laboratory session together to participate in observational and EEG tasks (these data were not used in the present study). At the end of the laboratory session, the adolescents were instructed on a texting protocol through which they would be receiving twice-weekly ecological momentary assessments (EMAs). Specifically, they were instructed that they would each be texted a link to a brief, online survey twice weekly for the ensuing 12 weeks (total of 24 surveys). They were briefed on the importance of confidentiality and were instructed that EMAs were to be completed as individuals and that answers were to be private. The first Sunday following the lab session, the adolescents began receiving EMAs via text. These EMAs were sent every Sunday and Wednesday evening between 7:00 and 7:30 pm for 12 weeks. At 9:00 pm, a reminder text with the link to the assessment was sent to adolescents who had not yet completed the EMA. These EMAs assessed adolescents' interpersonal interactions, particularly in regards to their romantic relationships and negative affective states, as experienced *that day*. The EMAs took approximately 5 to 10 min to complete. To help maintain high levels of compliance, research assistants monitored the progress of the EMAs and gave a phone call reminder to adolescents who had missed two consecutive assessments. Week to week, completion of EMAs ranged from 60% to 83%; on average, the adolescents completed 17 of 24 (71%) of their assessments. The adolescents were paid $1.77 for every EMA for a potential total of approximately $42, with a $5 bonus at the halfway point if they had completed at least half of their EMAs. They also received $20 for completing the initial baseline survey.

Ecological Momentary Assessment Measures

Negative affect

The adolescents indicated their negative affect by completing four items from the Positive and Negative Affect Schedule (PANAS; Watson et al. 1988). The items indicated the degree to which adolescents felt nervous, irritable, upset, and distressed. These items were rated on a 7-point Likert-type scale (*1 = Not at all*, *7 = Very much)*, and were averaged for an overall negative affect score, higher scores representing higher negative affect for that day. This measure displayed an internal consistency of $\alpha = 75$.

Daily conflict

At each assessment, the adolescents indicated their degree of *conflict* with their partner that day with a single item, "Today, how much conflict or tension was there between you and your partner?" Their responses were scored on a 7-point scale (*1 = None*, *7 = A lot)*.

Daily positive and negative romantic feelings

Each assessment day, the adolescents self-reported the degree to which they experienced various romantic-related feelings. The stem, "Within my relationship with my partner, I feel…" was followed by four statements each rated on a 7-point Likert-type scale (1 = *Not at all*, 7 = *Very much).* *Positive Romantic Feelings* were assessed with a mean score of two emotions, feeling loved and feeling committed ($r = 70$). *Negative Romantic Feelings* were assessed with a mean score of two emotions, feeling jealous and feeling doubtful ($r = 48$).

Daily time spent with partner

The adolescents indicated the amount of *time spent* with their partner on a seven-point interval scale, (*1 = 1 h or less*, *7 = 7 h or more*).

Baseline Control Variables

At the baseline assessment, the adolescents reported on several covariates.

Past romantic partners

The adolescents reported the number of past romantic partners they have had.

Relationship length

The adolescents reported on the length of their current relationship in months.

Age

The adolescents reported their current age in years.

Minority status

A dummy code was created for adolescents' minority status (*1 = white*, *0 = ethnic minority*).

Parents' education level

Socioeconomic status was indicated by a proxy measure of parents' average education level (*1 = less than high school, 2 = high school/GED, 3 = some college, 4 = 2-year college degree, 5 = 4-year college degree, 6 = master's degree, 7 = doctoral degree, 8 = professional degree* (*JD, MD*)).

Recruitment location

A dummy variable was created for the recruitment location (*0 = schools*, *1 = social media*) of each adolescent.

Analytic Strategy

Analyses were conducted in *SAS* 9.4 using PROC MIXED. As the data were nested (observations within individuals and individuals within couples), a multilevel modeling framework was used to allow for the estimation of within- and between-person effects simultaneously. If couples broke up during the study ($n = 11$), their data were retained until the date of the break-up, after which they contributed no additional EMAs to the analyses. Given that the time lag of the EMAs was three or four days, it was not reasonable to expect prospective relations among daily relationship processes and negative affect (Larson and Almeida 1999). Therefore, a concurrent, two-intercept multilevel model was estimated to examine associations between self-reported daily relationship transactions and negative affect, as well as covariation in couples' same-day negative affect.

To specify the two-intercept model, male and female dummy variables were used to estimate parallel models for males and females, such that the Level 1 (within-person) model is expressed as:

$$\begin{aligned}\text{Males}: NA_{Mij} &= \beta_{00Mi} + \beta_{1Mi}X11_{ij} + \beta_{2Mi}X12_{ij} \\ &+ \beta_{3Mi}X13_{ij} + \beta_{4Mi}X14_{ij} + \beta_{5Mi}X15_{ij} + e_{Mij}\end{aligned}$$

$$\begin{aligned}\text{Females}: NA_{Fij} &= \beta_{00Fi} + \beta_{1Fi}X21_{ij} + \beta_{2Fi}X22_{ij} \\ &+ \beta_{3Fi}X23_{ij} + \beta_{4Fi}X24_{ij} + \beta_{5Fi}X25_{ij} + e_{Fij}\end{aligned}$$

Interpreted, a negative affect rating on a particular day (*j*) of an adolescent (*i*) is modeled as a function of within-person variables and a residual, e_{ij}. The parameters β_{00Mi} and β_{00Fi} represent the intercept for males and females, respectively (i.e., a participant's average daily negative affect). The parameters β_{1Mi} through β_{4Mi} (β_{1Fi} through β_{4Fi} for females) are regression coefficients of the population slopes predicting an adolescent's negative affect on a particular day from the same-day predictor variables:

X11/X21: degree of conflict with partner on day *j* for adolescent *i*.

X12/X22: negative romantic feelings on day *j* for adolescent *i*.

X13/X23: positive romantic feelings on day *j* for adolescent *i*.

X14/X24: time spent together on day *j* for adolescent *i*.

The parameter β_{5Mi} (β_{5Fi} for females) is the regression coefficient of a within-person covariate for the survey number *j* for adolescent *i*. This was used to control for growth trends in negative affect.

The level 2 (between-person) equations were specified as follows:

$$\begin{aligned}\beta_{00Mi} &= \gamma_{00M} + \gamma_{01M}X16_i + \gamma_{02M}X17_i + \gamma_{03M}X18_i \\ &+ \gamma_{04M}X19_i + \gamma_{05M}X110_i + \gamma_{06M}X111_i + u_{0Mi},\end{aligned}$$

$$\begin{aligned}\beta_{00Fi} &= \gamma_{00F} + \gamma_{01F}X26_i + \gamma_{02F}X27_i + \gamma_{03F}X28_i \\ &+ \gamma_{04F}X29_i + \gamma_{05F}X210_i + \gamma_{06F}X211_i + u_{0Fi},\end{aligned}$$

The parameters γ_{01M} through γ_{06M} (γ_{01F} through γ_{06F} for females) are level-2 regression coefficients of the population slopes predicting the intercept of adolescent *i* from the between-person control variables. These variables were included in initial model, but were trimmed from the final model if they were not significant at $p < 10$ to avoid overcontrolling the model (Little 2013):

X16/X26: the number of previous romantic partners of an adolescent *i*.

X17/X27: the duration of the current romantic relationship of an adolescent *i*.

X18/X28: the age of an adolescent *i*.

X19/X29: the minority status of an adolescent *i*.

X110/X210: the parents' average education of an adolescent *i*.

X111/X211: the recruitment location of an adolescent *i*.

Then, to examine evidence for negative affective co-regulation (i.e., covariation above and beyond these predictors), the residual for daily negative affect, e_{ij}, was examined. This residual represents the unexplained variance in an adolescent's daily negative affect after accounting for all predictors and controls. It is assumed to be normally distributed with a standardized mean of zero and a variance of σ^2. Because there are two estimated equations per couple (i.e., a male equation and a female equation), estimates for the within couple (across-partner) variances and covariances of the residual are produced:

$$\begin{bmatrix} \sigma^2_{e_{Mti}} & \\ \sigma_{e_{Mti}e_{Fti}} & \sigma^2_{e_{Fti}} \end{bmatrix}$$

Negative affective co-regulation is indicated by the cross-partner residual covariance, $\sigma_{eMti,eFti}$, as it represents the degree to which negative affect on a given day covaries between partners above and beyond the predictors.

Results

Data Screening

Twenty-three percent of cases across all EMAs were missing values for negative affect. Missing values on all other EMA variables were missing for 24–29% of cases. Little's MCAR test was marginally significant, χ^2 (21) = 32.19, $p = 06$. To be conservative, the null hypothesis that the missing values were missing completely at random (MCAR) was rejected. To identify variables within the data set that predicted missingness, dummy codes were created for missingness (0 = value present, 1 = value missing) and used in logistic regression and chi square analyses as a dependent variable. Missingness on the EMA variables was more likely for ethnic-minority adolescents, for males, and for those from lower socioeconomic backgrounds. As such, these demographic variables were used as auxiliary variables to assist in the estimation of the missing data via multiple imputation. Using PROC MI in SAS, 10 statistically independent data sets were imputed. Then, the two-intercept multilevel models were estimated across all data sets and pooled to produce final parameter estimates (Enders 2010).

Descriptive Statistics

Descriptive statistics and bivariate correlations for the key variables are presented in Table 1. For the EMA variables, the cross-time averages were used for descriptive analyses. Overall, the adolescents displayed low average daily levels of negative affect. They also reported low average daily levels of negative romantic feelings and relationship conflict, moderate levels of time spent together, and high levels of positive romantic feelings. Mean differences were examined by sex and showed that females reported greater levels of average daily negative affect than males $t(176) = 2.69$, $p = .008$, with a moderate standardized mean difference (i.e., effect size), $d = 40$. Correlations were also examined among the study variables. For males and females alike, adolescents' average daily negative affect was significantly associated with greater average daily levels of conflict and higher average daily levels of negative romantic feelings. Average daily levels of positive romantic feelings were unassociated with lower levels of negative affect for males and females, and average time spent together was associated with lower levels of negative affect for females.

Daily Relationship Experiences and Negative Affect

The first research question regarding relations between adolescents' daily romantic relationship experiences and their same-day negative affect scores was examined using a multilevel, two-intercept model with negative affect as the dependent variable. All available EMAs were used for analyses ($n = 196$ adolescents; 4704 observations). Predictor variables were person-mean centered, meaning that the scores of an adolescent *i* at occasion *j* were subtracted of his/her cross-time average to represent a within-person effect (Curran and Bauer 2011). For example, a positive within-person association between perceived conflict and negative affect would indicate that on days in which adolescents reported more conflict than their own cross-time averages, they also reported higher levels of negative affect than their cross-time averages. Because some of the variables were skewed, including the outcome variable negative affect (skew = 1.31), the two-intercept model was re-estimated using appropriate variable transformations to ensure that the skewness of the variable distributions did not bias the initial results. All results remained unchanged in their direction and significance, but because of the difficulty interpreting results for transformed variables, results are reported for the model without variable transformations.

Table 2 displays the results of the final model. The covariate for minority status (coded with white as the referent group) was significant and positive in the prediction

Table 1 Descriptive statistics of key variables ($N = 98$ couples)

	1	2	3	4	5	6	7	8	9
1. Negative affect	**.19**	.34***	.53***	−.16	.01	−.08	−.11	.07	.01
2. Degree of conflict	.32**	**.40***	.42***	−.16	.18	.05	.08	−.20	.18
3. Neg. romantic feelings	.41***	.65***	**.58***	−.24*	.10	−.05	−.03	−.12	−.09
4. Pos. romantic feelings	−.17	−.40***	−.38***	**.43***	.41***	.01	−.08	.16	−.13
5. Time spent together	−.20*	.01	−.06	.41***	**.58***	−.10	−.04	−.13	−.18
6. Relationship duration	.04	−.05	−05	.07	−.02	**.88***	.02	−.08	.17
7. Previous partners	.16	.14	.05	.03	.11	−.17	**.02**	−.13	.04
8. Parent education	.08	.12	−.16	−.11	−.20	.02	−.09	**.54***	−.08
9. Age	.01	.06	−.07	−.01	−.01	.05	.05	.04	**.42***
Mean	2.05 (2.43)[a]	1.91 (2.08)	1.86 (2.02)	6.17 (6.21)	3.77 (3.98)	13.74 (14.16)	3.81 (3.40)	3.21 (2.93)	16.48 (16.28)
Standard deviation	0.88 (0.78)	0.82 (0.81)	1.12 (1.20)	1.12 (1.09)	1.67 (1.73)	8.22 (8.52)	2.53 (3.08)	1.60 (1.54)	0.91 (0.99)
Minimum	1.00 (1.00)	1.00 (1.00)	1.00 (1.00)	1.60 (1.98)	1.00 (1.21)	0.50 (0.50)	0 (0)	1.00 (1.00)	14 (14)
Maximum	5.46 (5.07)	4.70 (4.50)	6.95 (6.17)	7.00 (7.00)	7.00 (7.00)	36.00 (36.00)	12 (15)	8.00 (6.00)	18 (18)

Note. Males' correlations are above the diagonal, females' below. Correlations along the main diagonal (in bold) are of partners' reports. Means, standard deviations, and min/max values are given for males (and females). Significant mean differences between males and females are indicated by superscript *a*

*$p < .05$; **$p < .01$; ***$p < .001$

Table 2 Final model predicting one's own negative affect from relationship experiences ($N = 98$)

Parameter	Coefficient (SE)	*t*-ratio
Fixed effects		
Male intercept	1.77 (.11)	16.88***
Female intercept	2.31 (.11)	20.19***
Within—person effects		
Conflict—male	.21 (.02)	9.56***
Conflict—female	.21 (.02)	9.98***
Negative rom. emotionality—male	.16 (.02)	4.26**
Negative rom. emotionality—female	.18 (.02)	5.11***
Positive rom. emotionality—male	−.02 (.02)	−0.65
Positive rom. emotionality—female	−.04 (.02)	−1.21
Time together—male	−.06 (.01)	−3.24**
Time together—female	−.04 (.01)	−3.14**
Between-Person controls		
Minority status—males	.42 (.14)	2.72**
Minority status—females	.29 (.15)	1.90*
Covariance of NA residuals	.06 (.02)	2.47**

NA Negative Affect

*$p < .05$; **$p < .01$; ***$p < .001$

of negative affect, suggesting that white adolescents exhibited greater daily levels of negative affect, on average, than ethnic minority adolescents. In particular, being white corresponded to a 0.42 unit increase in males' and a 0.29 unit increase in females' *average* daily negative affect. A multilevel effect size, the proportional reduction in variance (PRV; Raudenbush and Byrk 2002) was calculated for significant effects. The PRV is a local effect size measure obtained by calculating the percent reduction in the residual variance by the addition of a particular variable or set of variables into the final model. In this way, it is comparable to the change in R^2 statistic that is frequently used in a hierarchical multiple regression (Peugh 2010). In the case of the level-2 equation, the PRV estimates the percent decrease in males' and females' *average*, or between person, residual for negative affect by the addition of minority status into the model for males (PRV = 8%) and females (PRV = 7%). In other words, adding minority status as a predictor of negative affect reduced the between-person residual variance in negative affect by 8% for males and 7% for females. The other between-person covariates, including number of previous romantic partners, current relationship duration, age, parent education level, and recruitment location were not significant in the prediction of average daily negative affect scores at $p < 10$, and thus were trimmed from the final model. A single within-person covariate was also examined for time (indicated by survey number) to account for growth trends in negative affect. This control was not significant for males or females, indicating no evidence for within-person growth in negative affect across time.

Estimates were also produced for the within-person daily relationship processes predicting daily negative affect. For each predictor that was significant, its proportion reduction of variance (PRV) of the *within*-person residual for negative affect was obtained. For males and females, daily conflict predicted greater negative affect, meaning that on days in

which an adolescent reported greater relationship conflict than his/her cross-time average, s/he also reported greater levels of negative affect that same day. This effect was significant for males and females, such that a one unit increase in relationship conflict corresponded to a 0.21 unit increase in males' (PRV = 8%) and 0.21 unit increase in females' (PRV = 6%) same day negative affect.

Daily negative romantic feelings also predicted greater negative affect. On days in which adolescents experienced greater levels of daily negative romantic feelings than their cross-time average, they reported higher levels of negative affect. Specifically, a one-unit increase in daily negative romantic emotions corresponded with a 0.16 unit increase in males' and 0.18 unit increase in females' same day negative affect. The addition of negative romantic feelings into the model reduced the within-person residual by 2% for males and 3% for females. Daily positive romantic emotions were unrelated to daily negative affect for males and females.

Finally, the amount of time an adolescent spent with his/her partner on a given day also significantly and *inversely* predicted negative affect for males and females, meaning that on days in which adolescents spent more time with their romantic partner than their cross-time average, they reported lower levels of negative affect than their own average. Specifically, a one unit increase in time spent together corresponded to a .06 unit decrease in males' (PRV = 1%) and .04 unit decrease in females' (PRV = 1%) same-day negative affect.

Daily Transmission of Negative Affect among Couples

Finally, the model was examined for evidence of negative affective co-regulation in adolescent couples above and beyond shared negative experiences (i.e., relationship conflict and negative romantic feelings). The same, two-intercept model was used to estimate covariation in negative affect. Specifically, this covariation is represented by the residual covariance among couples' daily negative affect scores after the predictors are accounted for in the model. Results are displayed in Table 2 and showed this covariance to be significant and positive, suggesting that, unique from their shared negative experiences, greater negative affect in one partner on a given day corresponded with greater negative affect in the other partner on that same day. Notably, because this covariation was above and beyond shared negative experiences (i.e., conflict, negative romantic feelings), it evidenced an emotion contagion mechanism.

Discussion

Romantic relationship involvement, although normative during adolescence, has been linked to diminished psychological well-being (Davila et al. 2004; Joyner and Udry 2000). The challenging nature of romantic relationships during this period is believed to stem partly from their novelty and from adolescents' still-maturing socio-emotional capacities (Davila 2008; Larson et al. 1999). To date, however, few studies have examined the *daily* processes of adolescent romantic relationships, and in particular whether these processes explain variability in their mood states. Such an investigation is warranted; because of the regularity with which romantic partners interact, their day-to-day transactions constitute the "proximal processes" of a potentially vulnerable context that can impact longer-term trajectories of psychological well-being (Bronfenbrenner and Morris 2006; Elder 1998). The current study addressed this need by investigating whether adolescent dating couples' daily romantic transactions predicted fluctuations in their same-day negative affect. Findings indicated that conflict and having negative feelings toward the relationship uniquely predicted higher same-day negative affect, whereas spending time together with a partner predicted lower levels of negative affect. Results also evidenced the presence of a complex, yet subtle emotion contagion processes wherein partners were synchronized in their daily negative affective states, above and beyond their shared, negative transactions that day.

Romantic relationships are inherently challenging for many adolescents (Larson et al. 1999). Because certain advanced cognitive-emotional competencies are still emerging during this period, adolescents may be inconsistent in their application of these skills from day-to-day (Larson et al. 1999). Thus, the interpersonal and emotional complexity of a romantic relationship may present a considerable coping challenge (Connolly and McIsaac 2011). Indeed, studies show the link between romantic involvement and depression (Joyner and Udry 2000) is pronounced when coping resources are compromised (Davila 2008), such as greater co-rumination with friends (Starr and Davila 2008), more preoccupied relational styles (Davila et al. 2004), and low emotional support from parents (Steinberg and Davila 2008).

Conflicts are a relatively normative feature of romantic relationships and even have the potential for relationship enhancement when handled with appropriate strategies (McIsaac et al. 2008; Shulman et al. 2006). However, for many adolescents, such competencies do not come easily; conflicts are more often challenging than not (Laurent et al. 2009). For example, observational work has demonstrated that adolescents can struggle so much in the midst of romantic conflict that they often resort to coping strategies (e.g., upregulation, deflecting) that exacerbate relationship problems (Ha et al. 2014). Similar principles also likely apply to romantic related feelings, particularly negative feelings. Romantic-related emotions constitute a significant

portion of dating adolescents' daily emotional lives and are very strongly felt (Furman and Shoemaker 2008; Larson et al. 1999). Intense, negative feelings such as jealousy and doubtfulness, may also present coping challenges and leave adolescents vulnerable to fluctuations in their negative mood states. The present findings provide further evidence for the challenges of these relationship processes, particularly romantic conflicts and negative romantic feelings, which predicted greater negative affect on same-day assessments.

Interestingly, positive romantic feelings, such as feeling loved or committed, were not predictive of adolescents' daily negative affective states. One reason for this might be that positive emotions are typically not as powerfully felt as negative emotions, and as a result, negative emotions are more likely than positive emotions to "spillover" into other emotional domains (Larson and Almeida 1999). Therefore, feelings of romantic love and commitment may be less powerful in their influence over mood states. Another possibility for this null finding might have to do with the nature of negative affect itself. Negative affect represents high-arousal aversive emotionality, and its absence reflects a state of calm (Watson et al. 1988). The exciting feelings of being in love are positive, *high* arousal emotions (Larson et al. 1999) and may influence categorically different mood states, such as positive affect, which were not examined.

As a result, this null finding should be interpreted cautiously as it does not rule out the existence of potential benefits of these positive romantic emotions. Indeed, experiences of feeling loved and committed are one of the primary drivers for adolescents becoming romantically involved (Connolly et al. 1999). Such feelings might be an important source of emotional support, which is a known buffer against the effects of stress (e.g., Auerbach et al. 2011). Indeed, some evidence emerged for the positive implications for romantic involvement, as spending time together was related to lower daily levels of negative affect. Such findings give reason to believe that, despite the challenges inherent to romantic relationships, there might well be benefits. Future research is needed to examine how these and other relevant relationship emotions and experiences are related to other domains of adolescents' emotional experience and how they may be developmentally supportive.

A final notable pattern was the similarity in findings between females and males. Although the females in the study did report higher average daily levels of negative affect than the males, the negative affective states of both females and males varied according to the *same* daily experiences of romantic conflict, negative feelings, and time spent together. Such a pattern is important to note because some previous studies have reported girls to be more negatively affected by romantic relationship involvement than boys (e.g., Joyner and Udry 2000), resulting in a multitude of hypotheses about sex-based mechanisms of these effects. The identification of said mechanisms can be valuable, for example, in illuminating the differential socialization experiences of boys and girls (Maccoby 1990), particularly around topics of dating and sexuality. However, that this study, with its specific design and measures, found no such differences, should remind readers to approach the topic of these sex differences with care and precision. Overstating such differences has the potential to draw more attention and resources to addressing the challenges of one group over the other, even though both males and females struggled fairly equally to cope with their relationship challenges, as presently evidenced. Identifying the configuration of sex differences (and the meaningful absence thereof) across a number of romantic relationship domains and outcomes is a valuable direction for future research.

Emotion Contagion

The second goal of this study was to examine the presence of emotional co-regulation in adolescent couples, and particularly evidence for emotion contagion. Findings provided support for emotion contagion, as adolescent partners covaried in their negative affect ratings above and beyond the effects of negative romantic feelings and conflict. This same transmission of negative emotion is documented among adult couples, who live together and spend significant amounts of time together (e.g., Butner et al. 2007). That these findings evidenced emotional contagion during adolescence may seem striking given that adolescents do not live together or spend as much time interacting as adult couples. However, adolescents' relationships are highly meaningful, and so adolescents may keenly attend to the emotional dynamics of their relationships, making emotional attunement, or co-regulation, more likely. Furthermore, because adolescents are generally less practiced and therefore less skilled in coping with the emotionally challenging experiences inherent to romantic interactions, they may have increased vulnerability to acquiring the negative emotional states of a romantic partner.

Of course, it is probable that not all adolescents are vulnerable to negative affective co-regulation, as this is the case among adult couples. An important aim for future studies is to document those traits and contexts that make some adolescents more vulnerable to acquiring the negative emotional states of a partner. Among adults, negative emotional transmission is more likely to occur for individuals with diminished psychological and relationship assets, broadly defined (see Larson and Almeida 1999, for a review). For example, attachment or interpersonal insecurities (Butner et al. 2007; Schoebi 2008), depression and/or anxiety (Larson and Richards 1994; Repetti and Wood

1997), greater stress (Larson and Gillman 1999), and a lack of perspective taking (Schoebi 2008), all increase the likelihood that an individual will acquire or transmit negative emotions to their partners and family members. Such characteristics are a promising starting-point for research on negative affective transmission among adolescents.

Implications

This study adds to a growing literature evidencing the challenges of romantic involvement for adolescents. Several studies report associations between romantic involvement and mental health challenges (Davila 2008). This study advances the literature by showing that these challenges persist at a daily level and are detectable with more precise, within-person research designs. This is significant because adolescents have regular interactions with their romantic partners, and as such, these interactions contribute in an important way to the proximal processes that are the fundamental drivers of development and change. Under the lens of bio-ecological perspectives that emphasize the centrality of proximal processes for individual development (Bronfenbrenner and Morris 2006), the present findings imply that adolescents' daily romantic experiences might potentiate longer-term trajectories of adolescents' psychological adjustment. Investigating these longitudinal links is an important direction for future research. Furthermore, and from a prevention perspective, programs designed to promote mental health among adolescents may find added success by addressing these daily relationship challenges. Indeed, adolescents are often hesitant to disclose romantic related information with their parents (Rote and Smetana 2015), and so many parents and helping professionals may feel lacking in information about how to help adolescents navigate the inherent challenges of romantic involvement. The present findings can guide prevention and anticipatory guidance efforts to more pointedly instruct parents about the challenges that adolescents' daily romantic experiences can present (i.e., conflict, negative romantic feelings, contagion of negative affect).

Limitations

Although the intensive, repeated measures facilitated the estimation of *within-person* fluctuations in affective states, associations between daily relationship experiences and negative affect were estimated from same-day assessments. Same day associations were examined instead of lagged associations because the assessment intervals were three to four days apart, and relationship experiences were not expected to predict affective states three to four days later (e.g., Wednesday experiences predicting Sunday affect). The analyses, therefore, cannot confirm the directionality of these relations. Although it is consistent with theory and prior literature to interpret relationship experiences as influencing affective states, these results cannot rule out relations that proceed in the opposite direction. For example, negative affect on a given day can lead to more negative relationship processes. With these daily measures, it is also possible that adolescents' fluctuations in negative affect could color perceptions of relationship experiences that day, making them more likely to report negative romantic emotions and perceived conflict. Future work should use assessments lagged at appropriate intervals to tease apart these directional influences.

Another limitation is that the study only examined one underlying dimension of mood: negative affect. Although this was an important contribution as negative affect can effectively indicate more serious mental health challenges, such as depression and anxiety (Crawford and Henry 2004; Watson et al. 1988), it is limited to high-arousal, aversive emotionality (e.g., anger, distress). Not examined in the study were relations among romantic relationship experiences and *positive* affect, a high arousal, energetic sense of engagement and pleasure (Watson et al. 1988). Because adolescents are especially sensitive to social rewards, their romantic experiences have the potential to *enhance* positive emotionality. Therefore, although the study lends important insights regarding the potential challenges of romantic involvement, it is insensitive to some of the potential positive qualities that were not detectable with the measurement of negative affect alone. Readers are cautioned against inferring from these findings that romantic relationship experiences in adolescence are predominantly negative in their implications. Future studies are needed to examine how romantic relationship experiences predict and heighten adolescents' positive affectivity.

Finally, the sample studied was heterosexual for the purposes of the chosen design and analysis. These findings may or may not adequately apply to adolescents of different sexual orientations, whose romantic experiences and challenges are unique in important ways from heterosexual adolescents' given the various social stigmas and pressures against same-sex relationships, for example (Diamond et al. 1999; Udry and Chantala 2002; Russell et al. 2001).

Conclusion

The present study advances the literature on romantic relationships and psychological adjustment during adolescence by examining the specific, daily relationship processes that account for fluctuations in adolescents' negative mood. The results showed that relationship conflict and negative feelings about one's relationship were associated with greater fluctuations in negative affect; time spent with

a partner predicted slight decreases in negative affect. Evidence also indicated a subtle emotion contagion process in which adolescent partners displayed synchronized fluctuations in their daily negative affect. Prior work links adolescents' romantic relationship involvement to compromised mental health outcomes. The present results, therefore, help sensitize parents and educators to the specific challenges that romantic involvement can present during adolescence. Because most adolescents will have experience with romantic relationships, the present findings justify prevention efforts that aim to educate and support adolescents' healthy romantic involvement.

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Authors' Contributions A.R. conceived of the study, performed the statistical analyses and interpretation of the data, and led the writing of the manuscript. T.H. oversaw implementation and administration of the larger study from which the data are drawn and contributed to the conceptualization and writing of the study. K.U. assisted in the conceptualization of the study and interpretation of findings, and reviewed drafts. M.I. assisted in statistical analyses and reviewed drafts. All authors read and approved the final manuscript.

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Data Sharing Declaration This manuscript's data will not be deposited.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no competing interests.

Ethical Approval All procedures involving human participants were performed in accordance with the ethical standards of the institution and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethnical standards.

Informed Consent All adolescents in the study assented to participation; consent was obtained from each participants' primary caregiver.

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