



Co-rumination via cellphone moderates the association of perceived interpersonal stress and psychosocial well-being in emerging adults



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ABSTRACT

Adolescents' and emerging adults' social interactions increasingly revolve around cellphone use, but little research has investigated the psychological properties of cellphone interactions. The current study explored co-rumination via cellphone; that is, the use of cellphone functions to excessively communicate about problems or negative feelings. Face-to-face co-rumination and co-rumination via cellphone were examined as potential moderators of the association between perceived interpersonal stress and psychosocial well-being (i.e., positive mental health and social burnout) in a sample of 142 college students. Face-to-face co-rumination was not a moderator. However, co-rumination via cellphone was a significant moderator such that higher levels of perceived interpersonal stress were associated with lower levels of well-being only among college students who reported higher levels of co-rumination via cellphone. Co-rumination via cellphone should be further investigated to elucidate its developmental trajectory and mental health correlates.

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Cellphones are now firmly situated at the center of adolescents' and emerging adults' social lives. According to a recent national survey, 72% of undergraduate students owned smartphones in 2013, up from 65% in 2012 and 50% in 2011 (Pearson, 2013). Smartphone owners between the ages of 18 and 24 years reported sending and receiving a total of 3852 text messages and making and receiving a total of 183 calls in an average month in 2013 (Fetto, 2013). College students use text messaging more than any other form of mobile telecommunication and consider it essential to their social interactions (Skierkowski & Wood, 2012).

Although social benefits of cellphone use have been identified (Coyne, Stockdale, Busby, Iverson, & Grant, 2011), heavy cellphone use has been associated with compromises in young adults' psychosocial functioning (Lepp, Barkley, & Karpinski, 2014; Murdock, 2013). These compromises may be associated with the volume of cellphone use as well as the purposes or characteristics of the communication itself. For instance, individuals may use their cellphones as vehicles for co-rumination, which involves extensively and repeatedly discussing, rehashing, and speculating with others about causes of problems or negative feelings (Rose, 2002).

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Psychological and social implications of co-rumination

Among adolescents and emerging adults, co-rumination has been associated with higher levels of friendship closeness (Calmes & Roberts, 2008; Rose, Carlson, & Waller, 2007; Starr & Davila, 2009). However, co-rumination has also been linked with compromises in psychological functioning, including internalizing symptoms such as depression and anxiety (Calmes & Roberts, 2008; Hankin, Stone, & Wright, 2010; Stone, Hankin, Gibb, & Abela, 2011), externalizing symptoms (Tompkins, Hockett, Abraibesh, & Witt, 2011), and production of the stress hormone, cortisol (Byrd-Craven, Geary, Rose, & Ponzi, 2008). Among female undergraduates, higher levels of co-rumination have also been associated with greater alcohol consumption and binge drinking (Ciesla, Dickson, Anderson, & Neal, 2011).

Co-rumination contains elements of rumination, a perseverative focus on negative thoughts or feelings that has been consistently associated with poor problem-solving and risk for depression (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Co-rumination also involves self-disclosure, a process of sharing inner thoughts and feelings that can be associated with building relational intimacy (Wei, Russell, & Zakalik, 2005) and a sense of relief or catharsis for the discloser (Affi, Caughlin, & Affi, 2007). However, the psychological effects of self-disclosure vary based on factors such as whether the disclosure is met with a supportive response (Greene, 2009) and/or a response that helps the discloser to make sense of the problem (Kelly & Macready, 2009). In a recent study, Affi, Affi, Merrill, Denes, and Davis (2013) found that when emerging adults verbally ruminated with a friend who responded in an unsupportive manner, friendship satisfaction decreased and anxiety increased. When verbal rumination elicited a supportive response, friendship satisfaction increased but interestingly, anxiety levels were not significantly reduced. Thus, ruminative attempts at coping appear to be ineffective even within a helpful social context.

Repeatedly disclosing and/or discussing problems or negative emotions can carry social costs when it causes stress to spread to others (Saxbe & Repetti, 2010) or when friends become fatigued of hearing about the stresses of their peers (Stroebe, Zech, Stroebe, & Abakoumkin, 2005). If ruminative social interactions happen repeatedly, as in co-rumination, these psychological and social costs may be amplified (Affi et al., 2013). In fact, studies have found that co-rumination contributes to the generation of interpersonal-dependent stressors, which are controllable forms of social stress that the individual has a hand in producing (Bouchard & Shih, 2013; Hankin et al., 2010). Starr and Davila (2009) found that in a sample of early adolescent girls, co-rumination was associated with a decrease in number of friends one year later. Finally, Davila et al. (2012) found in one sample of college students that higher levels of co-rumination were associated with higher rates of negative interactions via social networking behaviors, including texting. Thus, there is evidence that co-rumination can be associated with compromises in individuals' social functioning.

Co-rumination in a cellphone lifestyle

To date, published co-rumination research has focused on in-person interactions. Co-rumination has been positively correlated with frequency of text messaging among undergraduates (Davila et al., 2012), and given the ubiquity of college students' cellphone use, it is important to investigate if co-ruminative interactions have taken root within cellphone-mediated communication. Cellphone communication differs from face-to-face interaction not only in its multimodality (e.g., calls and texting), but also its accessibility. The stimulus for face-to-face co-ruminative interactions is effectively removed when individuals are physically separated from one another. In contrast, the opportunity to co-ruminate via cellphone is nearly omnipresent for a majority of emerging adults who own cellphones (Pearson, 2013), keep them within arm's reach (Dey et al., 2011), and are subject to liberal social norms regarding appropriate times to utilize them (AFP Relaxnews, 2013). In fact, these conditions may shape emerging adults' use of co-rumination as a method of coping with interpersonal stress.

Interpersonal stress, co-rumination, and psychosocial functioning

Interpersonal stressors are negative experiences involving conflicts or difficulties in social relationships, and they have been associated with both co-rumination and indicators of psychological functioning. For example, Bouchard and Shih (2013) found that among college students, the frequency of interpersonal stressors was positively correlated with co-rumination and with depressive symptoms. Nicolai, Laney, and Mezulis (2013), investigating the content of co-ruminative interactions among high school students, found that co-rumination about interpersonal stressors was associated with depressed mood, but co-rumination about nonsocial stressors was not.

There is evidence that interpersonal stress and co-rumination exert interactive effects on psychological functioning. In a multiwave longitudinal study, Hankin et al. (2010) found evidence for a transactional model in which interpersonal stress, co-rumination, and internalizing symptoms influenced one another dynamically across time in adolescent development. Co-rumination may have different implications within low versus high stress contexts. In a recent daily diary study of college students, White and Shih (2012) found that over and above the variance accounted for by frequency of life stressors, daily co-rumination predicted within-day increases in depressed mood. Additionally, baseline co-rumination moderated the association of life stressors with within-day increases in depressed mood across one week; stress was significantly associated with depressed mood only at levels of baseline co-rumination at or above the mean. These findings suggest that individuals with a tendency toward co-rumination may be particularly ill-equipped to successfully cope at high levels of interpersonal stress.

The context of interpersonal stress may be particularly important to consider in the investigation of cellphone-mediated co-rumination. In a recent cross-sectional study of first year undergraduates, a high frequency of cellphone use, which may

predispose individuals to co-ruminate via cellphone, moderated the association of interpersonal stress with psychosocial functioning (Murdock, 2013). Specifically, perceived interpersonal stress was associated with emotional well-being and burnout only for students who engaged in high levels of text messaging behavior. The current study tested a similar hypothetical model in which indicators of co-rumination were expected to moderate the association of perceived interpersonal stress with psychosocial well-being.

The current study

In this study, college students' co-rumination was assessed with regard to face-to-face interactions as well as cellphone-mediated interactions. It was expected that students would endorse using their cellphones as vehicles for co-rumination. Direct and interactive associations among perceived interpersonal stress, both modes of co-rumination, and two aspects of psychosocial well-being were investigated. Face-to-face co-rumination and co-rumination via cellphone were investigated as potential moderators in the association between perceived interpersonal stress and psychosocial well-being.

Although the construct of interpersonal stress is often operationalized in terms of frequency and tends to be measured with a checklist (e.g., Hankin et al., 2010), there is merit in assessing individuals' perceptions of the stressfulness of negative interpersonal events. Perceived stress can be conceptualized as an individual's appraisal that the demands of an experience challenge or surpass her/his coping resources (Lazarus & Folkman, 1984). Proponents of measuring perceived stress emphasize that the personal implications of stressful experiences arise not simply from qualities of stressful events themselves, but from interactions of the person and context with the events (Cohen & Williamson, 1988). In previous studies perceived stress has been associated with multiple domains of physiological, psychological, and behavioral functioning (e.g., Cohen & Williamson, 1988; Hostinar, Ross, Chen, & Miller, 2014; Pruessner, Hellhammer, & Kirschbaum, 1999). In order to explore this construct with reference to processes surrounding co-rumination, in the current study primary hypotheses were tested with a measure of perceived interpersonal stress. For comparison of these results with previous studies examining interpersonal stressor frequency, supplemental data analyses were conducted using a variable representing the number of interpersonal stressors experienced.

Two aspects of college students' psychosocial well-being were investigated that have not been studied with regard to co-rumination thus far: positive mental health and social burnout. The construct of positive mental health encompasses aspects of psychological well-being (e.g., autonomy, mastery, purpose in life), social well-being (e.g., social acceptance, integration, contribution), and emotional well-being (e.g., positive affect, life satisfaction) (Keyes, 2002). Elements of positive mental health are correlated with but distinct from psychological dysfunction, and individuals significantly vary from one another in their levels of psychological health and well-being (Keyes, 2005). Measures of positive mental health can augment indicators of mental illness in predicting college students' academic and psychological dysfunction (Keyes et al., 2012). Indicators of positive mental health been linked with positive psychosocial outcomes ranging from good physical health (Pressman & Cohen, 2005) to personal success (Lyubomirsky, King, & Diener, 2005).

The psychological state of burnout has been conceptualized as cynicism, reduced personal efficacy, and emotional exhaustion resulting from chronic stress (Maslach, Jackson, & Leiter, 1996). Although most research on burnout has concerned adults' job-related functioning (Maslach & Leiter, 2008), studies have investigated burnout among advanced students in helping professions (Dyrbye et al., 2010; Watson, Deary, Thompson, & Li, 2008), college athletes (DeFreese & Smith, 2013), and undergraduate students in international samples (Li, Song, & Guo, 2009; Schaufeli, Martínez, Pinto, Salanova, & Bakker, 2002). In recent studies, co-worker co-rumination was found to be associated with psychological burnout among employed adults (Boren, 2014) and co-rumination was associated with emotional exhaustion, an aspect of burnout, among graduate students (Boren, 2013). Burnout in the social domain of functioning may be particularly problematic during emerging adulthood, a period during which social competence and social capital appear to have significant implications for psychosocial outcomes later in development (Pettit, Erath, Lansford, Dodge, & Bates, 2011; Roisman, Masten, Douglas, & Tellegen, 2004).

Four hypothetical models were tested to investigate associations among perceived interpersonal stress, the two modes of co-rumination, and two indicators of psychosocial well-being: positive mental health, an indicator of psychological, emotional, and social well-being; and social burnout, an indicator of compromises in social well-being. First, it was hypothesized that higher levels of perceived interpersonal stress would be associated with lower levels of positive mental health and higher levels of social burnout. Second, it was hypothesized that over and above the variance accounted for by interpersonal stress, higher levels of both modes of co-rumination would be associated with lower levels of positive mental health and higher levels of social burnout. Finally, it was expected that face-to-face co-rumination and co-rumination via cellphone would serve similar moderating functions; that is, the association of perceived interpersonal stress with indicators of psychosocial well-being would be augmented in the presence of higher levels of either mode of co-rumination.

Method

Participants

Participants included 142 undergraduate students (112 women; 89% White) recruited during the 2012–2013 academic year from courses across disciplines at an academically rigorous southeastern liberal arts college. Students' ages ranged from

18 to 22 years (mean age = 19.58, $SD = 1.30$). Participants earned \$5 for completing a 20-min online survey in a dedicated laboratory space.

Measures

Psychometric characteristics of primary study variables are provided below. Sample size is noted in the case of missing data.

Participants self-reported their demographic characteristics and access to primary cellphone functions. One hundred percent of participants reported having talk and text capabilities and 90% had Internet access on their cellphone.

Estimated cellphone use

Participants provided subjective estimates of, on an “average day”, the number of minutes they spend talking on their cellphone (range = 0–180 min, $M = 18.59$, $SD = 22.03$, $n = 97$) and the number of text messages sent and received (summed to form a total daily texts variable; range = 0–1000, $M = 108.07$, $SD = 136.63$, $n = 134$). These estimates were significantly correlated, $r = .25$, $p = .02$, $n = 97$. They were transformed into z scores and their mean score was calculated to create a composite score of estimated cellphone use. This composite was used as a control variable in supplemental data analyses.

Perceived interpersonal stress

The 10-item Social Stress Questionnaire (SSQ; Connor-Smith & Compas, 2002) assessed interpersonal stressors experienced during the past six months. The wording of two items was modified slightly to increase their validity for this sample: “Having problems with roommates/housemates” was altered to “people you reside with” and “Being rejected by an organization (fraternity, sorority, etc.)” was revised to “(sports team, honors society, etc.)”. Stressors were rated on a scale from *has not occurred* (1) to *very stressful* (5). The perceived interpersonal stress variable, which was utilized in primary hypothesis testing, was created by summing the stressfulness ratings (range = 11–49, $M = 26.88$, $SD = 8.46$, $\alpha = .80$). A variable reflecting the total number of stressors endorsed on the SSQ (i.e., a checklist) was created for supplemental data analyses (range = 1–10, $M = 6.38$, $SD = 2.34$).

Co-rumination

Parallel 8-item measures were utilized to assess face-to-face co-rumination and co-rumination via cellphone. The 8 core items were extracted from the Co-Rumination Questionnaire (Rose, 2002) and were previously utilized in a study by Calmes and Roberts (2008). In the current study, the following instructions were administered: “Think about the way you usually are in relationships with “close others” such as friends, romantic partners, siblings, or parents. Indicate the degree to which you tend to interact with any of them in the following ways. Respond with regard to face-to-face interactions first. Then respond with regard to interactions via cellphone (including calls, texts, social networking sites, chat programs, or any other function).” Items were nonspecific with respect to whose problem was being discussed in the co-ruminative interaction (e.g., “When my close other and I talk about a problem we’ll talk about every part of the problem over and over.”). Respondents used a scale from *not at all true* (1) to *really true* (5) to report their tendency toward face-to-face co-rumination (range = 12–40, $M = 25.62$, $SD = 7.17$, $\alpha = .88$) and co-rumination via cellphone (range = 8–39, $M = 21.55$, $SD = 7.28$, $\alpha = .89$).

Positive mental health

The Mental Health Continuum-Short Form (MHC-SF; Keyes, 2005) includes 14 items measuring emotional, psychological, and social well-being (e.g., “During the past month, how often did you feel that you liked most parts of your personality?”). Responses ranged from *never* (0) to *every day* (5). Higher total scores indicate higher levels of positive mental health (range = 19–69, $M = 51.73$, $SD = 11.21$, $\alpha = .91$).

Social burnout

A modified form of the Maslach Burnout Inventory (MBI; Maslach et al., 1996) was utilized to assess college students’ social burnout. The MBI is a 16-item scale measuring cynicism, decreased self-efficacy, and emotional exhaustion associated with chronic stress. Responses are made on a 7-point scale ranging from *never* (0) to *every day* (6). Adequate reliability for MBI scores has been reported across a variety of samples (De Hoogh & Hartog, 2009).

In the current study, the MBI was tailored to assess students’ burnout with regard to their social functioning and included items measuring cynicism (e.g., “I have become more cynical about whether my relationships mean anything.”), self-efficacy (“I can effectively solve problems that arise in my social life.”), and exhaustion (e.g., “I feel emotionally drained from the social pressures at college.”). To view all items on this scale, please see Murdock (2013). Internal consistency of this measure was adequate in a previous sample of first year college students ($\alpha = .89$; Murdock, 2013). After reverse-scoring efficacy items, all 16 items were averaged to form a social burnout variable with higher scores indicating higher levels of burnout (range = 2–81, $M = 25.06$, $SD = 14.63$, $\alpha = .86$).

Results

A correlation matrix of primary study variables is presented in Table 1. Face-to-face co-rumination and co-rumination via cellphone were significantly correlated within the dataset as a whole ($N = 142$, $r = .49$, $p < .001$) and among women ($n = 112$, $r = .48$, $p < .001$), but not among men ($n = 30$, $r = .33$, $p = .08$).

Independent samples *t*-tests were utilized to examine gender differences in primary study variables. No significant gender differences in the outcome variables, positive mental health and social burnout, were revealed. However, standardized estimates of daily cellphone use by women ($M = .88$, $SD = .94$, $n = 104$) were significantly higher than estimates by men ($M = -.27$, $SD = .41$, $n = 30$), $t(112) = 3.05$, $p < .001$. Women also reported significantly higher levels of face-to-face co-rumination ($M = 26.66$, $SD = 7.01$, $n = 112$) than men ($M = 21.73$, $SD = 6.48$, $n = 30$), $t(140) = 1.42$, $p = .001$. Similarly, women reported higher levels of co-rumination via cellphone ($M = 22.39$, $SD = 7.34$, $n = 112$) than men ($M = 18.40$, $SD = 6.19$, $n = 30$), $t(140) = 1.46$, $p = .007$.

Hierarchical regression analyses were conducted to predict each of the two criterion variables, positive mental health and social burnout, with variables entered as follows: 1) gender; 2) perceived interpersonal stress; 3) face-to-face co-rumination or co-rumination via cellphone; and 4) perceived interpersonal stress \times co-rumination interaction term. Predictor variables were centered at their means. Gender did not account for significant variance in any regression equation.

Positive mental health

Results for the regression analyses predicting positive mental health are provided in Table 2. Perceived interpersonal stress was significantly negatively associated with positive mental health, accounting for 9% of the variance. In the first model, neither face-to-face co-rumination nor the interaction term was significant. In the second model, co-rumination via cellphone was not a significant predictor but the interaction of perceived interpersonal stress \times co-rumination via cellphone was significant, accounting for a unique 4% of the variance in positive mental health.

To decompose this significant interaction, separate simple regressions were conducted to assess the association between perceived interpersonal stress and positive mental health for students reporting low ($n = 68$, range = 8–20) versus high ($n = 74$, range = 21–39) levels of co-rumination via cellphone. In the low co-rumination via cellphone group, perceived interpersonal stress did not account for significant variance in positive mental health ($B = -1.15$, $SE B = 1.40$, $\beta = -.10$, $p = .41$). In the high co-rumination via cellphone group, higher levels of perceived interpersonal stress were significantly associated with lower levels of positive mental health, accounting for 24% of the variance ($B = -5.35$, $SE B = 1.14$, $\beta = -.49$, $p < .001$).

Simple slope analyses yielded a similar pattern of findings. Perceived interpersonal stress was not significantly associated with positive mental health at low levels of co-rumination via cellphone (one *SD* below the mean; $B = -.12$, $SE B = .15$, $p = .43$), but it was significantly and negatively associated with positive mental health at both average ($B = -.36$, $SE B = .89$, $p = .001$) and high levels of co-rumination via cellphone (one *SD* above the mean; $B = -.59$, $SE B = .13$, $p < .001$). Results are presented in Fig. 1.

Social burnout

Results for the regression analyses predicting social burnout are provided in Table 3. Perceived interpersonal stress was significantly and positively associated with social burnout, accounting for 6% of the variance. In the first regression model, neither face-to-face co-rumination nor its interaction term was significant. In the second model, co-rumination via cellphone was not a significant predictor but the interaction of perceived interpersonal stress \times co-rumination via cellphone was marginally significant, accounting for a unique 2% of the variance in social burnout.

This marginally significant interaction was decomposed with simple regressions. In the low co-rumination via cellphone group, perceived interpersonal stress did not account for significant variance in social burnout ($B = 2.31$, $SE B = 1.90$, $\beta = .15$, $p = .23$). In the high co-rumination via cellphone group, higher levels of perceived interpersonal stress were significantly associated with higher levels of social burnout, accounting for 11% of the variance ($B = 4.59$, $SE B = 1.53$, $\beta = .33$, $p = .004$).

Simple slope analyses yielded a similar pattern of findings. Perceived interpersonal stress was not significantly associated with social burnout at low levels of co-rumination via cellphone (one *SD* below the mean; $B = .15$, $SE B = .20$, $p = .45$).

Table 1
Inter-correlations among descriptive and primary study variables.

	1.	2.	3.	4.	5.	6.	7.
1. Estimated cellphone use	–	–.09	–.06	–.01	.11	.03	–.05
2. Perceived interpersonal stress		–	.89**	.17*	.05	–.30**	.24**
3. Number of interpersonal stressors			–	.10	–.03	–.26**	.21*
4. Face-to-face co-rumination				–	.49***	.04	–.04
5. Co-rumination via cellphone					–	–.05	–.03
6. Positive mental health						–	–.58***
7. Social burnout							–

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

Table 2
Hierarchical multiple regression analyses predicting positive mental health ($N = 142$).

Predictors	R^2	ΔR^2	β	t	p
Block 1:	.00	.00			
Gender			.03	.35	.73
Block 2:	.09	.09***			
Gender			.01	.11	.91
Perceived interpersonal stress			-.30	3.67	.00
Block 3:	.10	.01			
Gender			.04	.42	.67
Perceived interpersonal stress			-.31	3.80	.00
Face-to-face co-rumination			.10	1.15	.25
Block 4:	.10	.00			
Gender			.03	.34	.74
Perceived interpersonal stress			-.32	3.86	.00
Face-to-face co-rumination			.09	1.08	.28
Perceived interpersonal stress \times Face-to-face co-rumination			.06	.71	.48
Block 1:	.00	.00			
Gender			.03	.35	.73
Block 2:	.09	.09***			
Gender			.01	.11	.91
Perceived interpersonal stress			-.30	3.67	.00
Block 3:	.09	.00			
Gender			.00	.03	.98
Perceived interpersonal stress			-.30	3.64	.00
Co-rumination via cellphone			-.03	.35	.72
Block 4:	.13	.04**			
Gender			.05	.55	.59
Perceived interpersonal stress			-.27	3.30	.00
Co-rumination via cellphone			.02	.21	.83
Perceived interpersonal stress \times co-rumination via cellphone			-.21	2.56	.01

** $p < .01$, *** $p < .001$.

Perceived interpersonal stress was significantly and positively associated with social burnout at both average ($B = .38$, $SE B = .14$, $p = .009$) and high levels of co-rumination via cellphone (one SD above the mean; $B = .61$, $SE B = .18$, $p = .001$). Results are presented in Fig. 2.

Supplemental data analyses

Supplemental analyses were conducted in order to explore if findings could be accounted for by participants' overall cellphone use or by the subjective nature of the interpersonal stress measure. First, regression models were tested with the estimated daily cellphone use composite entered as a control variable in step one. The pattern of results did not change except that in the regression model of co-rumination via cellphone predicting social burnout, the interaction term was statistically significant ($p = .04$) instead of marginally significant.

Next, in order to consider the current results within the context of previous studies examining interpersonal stressor frequency, hypothetical models were re-tested with the number of interpersonal stressors substituted for perceived interpersonal stress. The results replicated the pattern of findings with perceived interpersonal stress but the amount of variance accounted for in each model was attenuated.

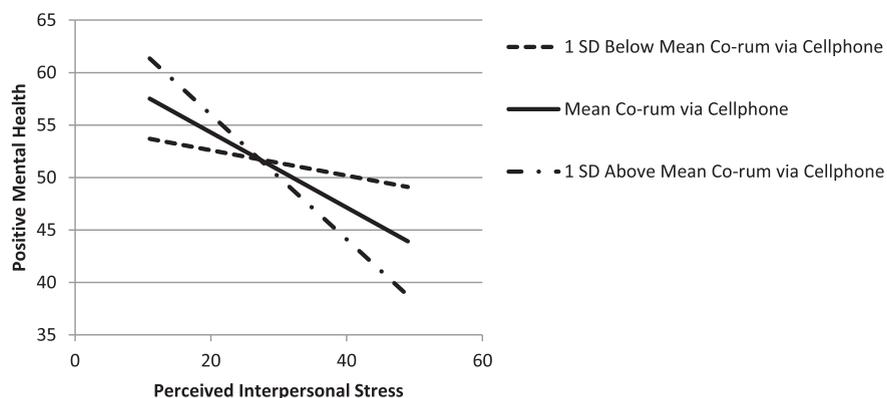


Fig. 1. Differential association between interpersonal stress and positive mental health below, at, and above the mean level of co-rumination via cellphone.

Table 3
Hierarchical multiple regression analyses predicting social burnout ($N = 142$).

Predictors	R^2	ΔR^2	β	t	p
Block 1:	.00	.00			
Gender			.01	.07	.94
Block 2:	.06	.06**			
Gender			.02	.27	.79
Perceived interpersonal stress			.24	2.89	.00
Block 3:	.06	.00			
Gender			.00	.02	.99
Perceived interpersonal stress			.25	2.99	.00
Face-to-face co-rumination			-.08	.90	.37
Block 4:	.07	.01			
Gender			.01	.14	.89
Perceived interpersonal stress			.26	3.10	.00
Face-to-face co-rumination			-.07	.80	.43
Perceived interpersonal stress \times Face-to-face co-rumination			-.09	1.03	.31
Block 1:	.00	.00			
Gender			.01	.07	.94
Block 2:	.06	.06**			
Gender			.02	.27	.79
Perceived interpersonal stress			.24	2.89	.00
Block 3:	.06	.00			
Gender			.01	.16	.88
Perceived interpersonal stress			.24	2.90	.00
Co-rumination via cellphone			-.04	.49	.62
Block 4:	.08	.02			
Gender			-.02	.21	.84
Perceived interpersonal stress			.22	2.63	.01
Co-rumination via cellphone			-.08	.88	.38
Perceived interpersonal stress \times co-rumination via cellphone			.15	1.78	.08

** $p < .01$.

In the first regression model testing the number of interpersonal stressors and face-to-face co-rumination, a total of 8% of the variance was accounted for in positive mental health. In the second model testing co-rumination via cellphone, a total of 10% of the variance was accounted for in positive mental health and the interaction of number of interpersonal stressors \times co-rumination via cellphone was marginally significant, accounting for a unique 2% of the variance. In the low co-rumination via cellphone group, the number of interpersonal stressors accounted for only 2% of the variance in positive mental health ($B = -1.52$, $SE B = 1.39$, $\beta = -.13$, $p = .28$). In the high co-rumination via cellphone group, a greater number of interpersonal stressors was significantly associated with lower levels of positive mental health, accounting for 14% of the variance ($B = -4.10$, $SE B = 1.20$, $\beta = -.37$, $p < .01$). In simple slope analyses, the number of interpersonal stressors was not significantly associated with positive mental health at low levels of co-rumination via cellphone (one SD below the mean; $B = -.51$, $SE B = .56$, $p = .37$), but it was significantly and negatively associated with positive mental health at both average ($B = -1.19$, $SE B = .39$, $p = .003$) and high levels of co-rumination via cellphone (one SD above the mean; $B = -1.87$, $SE B = .51$, $p < .001$).

In regression analyses testing the number of interpersonal stressors in the prediction of social burnout, a total of 5% of the variance was accounted for in the face-to-face co-rumination model and 5% was accounted for in the co-rumination via cellphone model. Neither of the interaction terms of number of interpersonal stressors with co-rumination was statistically significant or marginally significant.

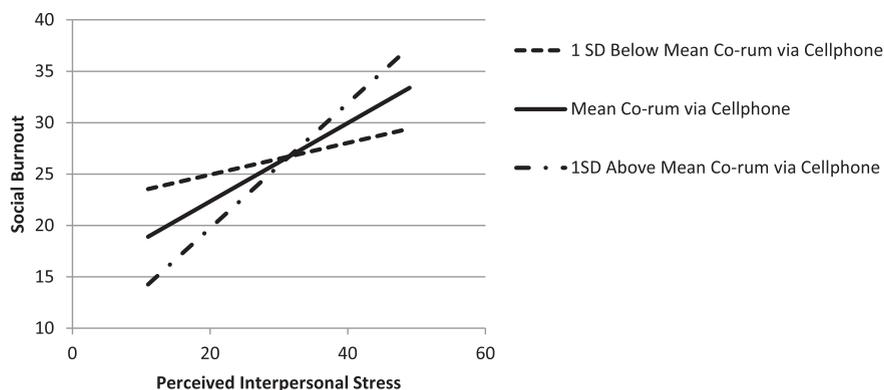


Fig. 2. Differential association between interpersonal stress and social burnout below, at, and above the mean level of co-rumination via cellphone.

Discussion

College students in this sample endorsed co-ruminating in face-to-face as well as cellphone-mediated interactions. Women reported higher levels of both modes of co-rumination than men, and face-to-face co-rumination and co-rumination via cellphone were moderately positively correlated for women, but not for men. Thus as expected, cellphones were utilized as vehicles for co-rumination among emerging adults in this sample.

The pattern of results for other hypotheses differed between the two modes of co-rumination. Contrary to expectations, face-to-face co-rumination was neither directly nor interactively associated with indicators of psychosocial well-being. However, as hypothesized, co-rumination via cellphone moderated the association between perceived interpersonal stress and indicators of psychosocial well-being at statistically significant (positive mental health) and marginally significant (social burnout) levels. Perceived interpersonal stress was associated with lower levels of positive mental health and higher levels of social burnout only at higher levels of co-rumination via cellphone.

One may wonder if the significant findings regarding co-rumination via cellphone could be driven by the volume of cellphone use. That is, individuals who use cellphones more frequently may have more opportunity to co-ruminate via cellphone, or may have poorer psychosocial well-being by virtue of their heavy cellphone use alone. However, in the current sample, a quantitative indicator of cellphone use (calls and text messages) was not significantly correlated with co-rumination via cellphone or with either indicator of psychosocial well-being. Furthermore, moderational findings did not change when cellphone use was controlled in the first step of the hierarchical regression analyses. This suggests that the using one's cellphone for the particular purpose of co-rumination was problematic, as opposed to heavy cellphone use more generally.

There are several possible explanations for the disparate findings regarding face-to-face co-rumination and co-rumination via cellphone. One interpretation is that there are qualitative differences between co-rumination via cellphone and face-to-face co-rumination. For instance, cellphone-mediated communication lacks (texting) and/or minimizes (phone talking) nonverbal content, and this may decrease interaction synchrony or increase misunderstandings (Coyne et al., 2011). Thus co-rumination via cellphone, when compared to face-to-face co-rumination, may carry more costs to psychosocial functioning, deplete one's internal resources for generating successful social interactions to a greater degree, and/or wear out social relationships more readily. Alternately, the strength of the association between interpersonal stress and psychosocial well-being may be greater for those who co-ruminate via cellphone because of the constant accessibility of cellphones. When compared to face-to-face interactions, there are fewer natural boundaries around when, where, or with whom cellphone interactions – and therefore co-rumination – may occur. A cellphone-focused lifestyle may invite or perpetuate the occurrence of co-ruminative interactions. This may not necessarily translate into more frequent cellphone-mediated co-rumination when compared to face-to-face-rumination; in fact, mean levels of co-rumination via cellphone were slightly lower than mean levels of face-to-face co-rumination in the current sample. Instead, higher levels of co-rumination via cellphone may reflect more extensive or intensive cumulative use of co-rumination as a coping strategy. This interpretation is supported by a significant positive correlation between face-to-face and cellphone-mediated co-rumination among women in this sample. That is, the significant moderating role of co-rumination via cellphone may reflect an expansion of co-rumination into multiple modes of communication among those individuals with the strongest tendency to cope with stress through co-rumination.

The significant moderational findings for co-rumination via cellphone are partially consistent with those of White and Shih's (2012) test of moderational hypotheses in a week-long daily diary study of college students. These authors found that the frequency of stressful life events was significantly associated with depressed mood, as we found that perceived interpersonal stress was significantly associated with both positive mental health and social burnout in the expected directions. White and Shih (2012) found that after controlling for the frequency of stressful life events, daily co-rumination was still significantly associated with within-day increases in depressed mood. In contrast, we found no significant unique associations of co-rumination with psychosocial well-being once perceived interpersonal stress was controlled. Finally, White and Shih found that initial levels of co-rumination, but not daily reports of co-rumination, moderated the association between frequency of daily life stressors and depressed mood. We found that co-rumination via cellphone, but not face-to-face co-rumination, moderated the associations of perceived interpersonal stress with positive mental health and social burnout. Our findings were replicated in supplemental analysis of the number of interpersonal stressors, rather than perceived interpersonal stress, in the prediction of positive mental health.

Taken together, these results suggest that high levels of co-rumination may exacerbate stress, but further research is necessary to pin down the subtleties of co-ruminative interactions, and/or the measurement of co-rumination, that help to explain how it functions in different contexts of stress. Given the evidence provided by Hankin et al. (2010) for transactional associations across time among interpersonal stress, co-rumination, and psychological functioning in early adolescents, future longitudinal research should investigate interpersonal stress not only as a context for co-rumination in emerging adults, but also as a potential outcome of it. Future research should continue to explore both subjective and frequency measures of interpersonal stress.

As another mechanism for understanding co-rumination within an individual's context of stress, future research should explore the content of co-ruminative interactions in face-to-face as well as cellphone-mediated contexts. For instance, Nicolai et al. (2013) found that co-rumination about interpersonal-dependent stressors, but not about nonsocial or independent stressors, was prospectively associated with depressive symptoms among adolescents. Rudiger and

Winstead (2013) found that body-related co-rumination was associated with disordered eating and body image cognitive distortions among undergraduate women. In order to clarify the contexts in which co-rumination is most problematic for emerging adults, it will be helpful to identify patterns in co-ruminative content and its association with specific aspects of well-being.

The current study has provided an initial indication of how interpersonal stress and co-rumination interact with respect to positive mental health and burnout. It is interesting to note that no significant bivariate correlations emerged between measures of co-rumination and measures of psychosocial well-being. Although co-rumination has been directly correlated with symptoms of psychopathology (Rose et al., 2007) and burnout (Boren, 2014) in some studies, in others no significant bivariate correlation has emerged (e.g., Dam, Roelofs, & Muris, 2013) and instead, the psychological implications of co-rumination have depended on specific characteristics of the co-ruminative interaction and/or the contexts in which it occurred (e.g., Calmes & Roberts, 2008; Haggard, Robert, & Rose, 2011). Given that the presence of positive mental health, or flourishing, has been associated with a variety of indicators of health and productivity (Keyes, 2007), it is important for research to further explore how multiple qualities of co-rumination are associated with emotional, psychological, and social well-being as well as psychopathology.

Limitations and future directions

Conclusions from this study are limited by its cross-sectional design and use of self-report measures. A brief co-rumination measure was utilized to assess interactions with a nonspecified close other about a problem either the respondent or close other was having. Previous research has independently assessed the targeted problems in co-rumination (i.e., the respondent's problems versus the close other's problems) and/or different types of close others and confidants such as same-sex friends, opposite-sex peers, or parents (Barstead, Bouchard, & Shih, 2013; Calmes & Roberts, 2008; Waller & Rose, 2013). Thus, as opposed to eliciting respondents' memories of co-ruminative interactions in specific situations, the current measure may have assessed a more dispositional tendency toward co-rumination and/or toward other personality characteristics that could affect psychosocial well-being.

In order to control for possible confounding effects of overall cellphone use in the association between co-rumination via cellphone and psychosocial well-being, a cellphone use composite variable was created in this study reflecting respondents' estimated volume of calls and texts. This variable was not correlated with positive mental health or social burnout, a result that is inconsistent with some previous findings of negative associations between indicators of cellphone use and aspects of well-being (e.g., Murdock, 2013; Thomee, Harenstam, & Hagberg, 2011). However, the current findings are consistent with Lepp et al.'s (2014) recent results. Although these authors found that undergraduates' overall cellphone use and texting were associated with grade point average and anxiety, which in turn were associated with life satisfaction, bivariate correlations of cellphone use and texting with life satisfaction were nonsignificant. As college students' frequency of text messaging has been significantly correlated with other social networking behaviors available on smartphones (Davila et al., 2012), future theoretical models involving co-rumination via cellphone should include sensitive and exhaustive measures of smartphone functions in order to fully rule it out as a potential confounding variable.

The generalizability of the current findings is limited because of the demographic characteristics of the sample, including unequal representation of women (79%) and men. It should be noted that in previous research, mixed results have been found regarding gender differences in rates of co-rumination and in the association between co-rumination and mental health. Although not a focus of this study, some gender-specific findings emerged in the current sample. Rates of face-to-face co-rumination and co-rumination via cellphone were significantly correlated for women, but not for men. Furthermore, women reported higher levels of co-rumination than men, which is consistent with gender differences found in previous studies of adolescents (Dam et al., 2013; Hankin et al., 2010; Rose et al., 2007; Tompkins et al., 2011) and emerging adults (Bouchard & Shih, 2013; Calmes & Roberts, 2008). Previous studies of emerging adults have found that gender differences in co-rumination depend on the specifics of how co-rumination is measured (Barstead et al., 2013; White & Shih, 2012). There is some evidence that among emerging adults, the psychosocial sequelae of co-rumination can be more problematic for women than men (Barstead et al., 2013; Ciesla et al., 2011). Clearly, possible gender-specific processes should be explored in future research on cellphone-mediated co-rumination.

In spite of these limitations, this study contributes to a small existing literature on co-rumination during the developmental period of emerging adulthood, a pivotal time of transition between adolescence and early adulthood. In a co-rumination literature that has focused primarily on the prediction of psychopathology within adolescent populations, this study addressed two more normative aspects of psychosocial well-being, positive mental health and social burnout. Finally, this study appears to be the first to examine co-ruminative interactions on cellphones, which are central modes of communication for adolescents and early adults. As part of a nascent literature on the psychosocial implications of cellphone use, these findings can begin to help emerging adults make health-promoting choices with regard to their use of wireless telecommunication devices.

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