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Authors

Stone, Lindsey B
Mennies, Rebekah J
Waller, Jennifer M
et al.

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Help me Feel Better! Ecological Momentary Assessment of Anxious Youths' Emotion Regulation with Parents and Peers

Lindsey B. Stone[1] · Rebekah J. Mennies[2] · Jennifer M. Waller[5] · Cecile D. Ladouceur[3] · Erika E. Forbes[3] · Neal D. Ryan[3] · Ronald E. Dahl[4] · Jennifer S. Silk[5]

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Abstract

Anxious youth often have trouble regulating negative affect (NA) and tend to over-rely on parents when faced with challenges. It is unclear how social interactions with parents or peers actually helps or hinders anxious youths' success in regulating NA. The aim of this study was to examine whether the success of anxious youths' emotion regulation strategies differed according to social context. We compared the effectiveness of co-ruminating, co-problem solving and co-distracting with parents/peers for regulating anxious youth's NA in response to stress in their daily lives. We also examined the benefit of attempting each strategy socially vs. non-socially (e.g., co-ruminating vs. ruminating). One-hundred-seventeen youth (9–14) with a current diagnosis of Separation Anxiety Disorder, Generalized Anxiety Disorder, and/or Social Phobia completed an ecological momentary assessment (14 calls over 5 days), reporting on recent stressors, their affective state, presence of others, and emotion regulation strategies within the prior hour. Mixed linear models revealed that co-distracting was the most effective social strategy for reducing NA, but only for boys. Co-rumination was the least effective social strategy for regulating NA. Regarding social context, only co-distracting was more effective for regulating NA over distracting alone, but only among anxious boys. Results suggest that co-rumination is an ineffective use of social support for regulating NA. Anxious boys may benefit from social support by co-distracting with parents/peers, but improper use may reflect avoidance and contribute to long-term anxiety maintenance. Results extend research on gender differences in interpersonal relationships and emotion regulation.

Keywords Ecological Momentary Assessment · Social support · Emotion regulation · Child anxiety · Coping strategies

Difficulty regulating negative affect (NA) is a hallmark of childhood anxiety disorders (Southam-Gerow and Kendall 2002). When confronted with negative events, anxious youth react more strongly than non-anxious youth; they experience more intense NA (anger, sadness, or nervousness) (Mor et al. 2010; Tan et al. 2012; Walz et al. 2014) which they struggle to regulate (Suveg and Zeman 2004). The emotion regulation literature has found that strategies differ in effectiveness (problem solving, distraction, and rumination) for reducing youths' NA (Connor-Smith et al. 2000; Langrock et al. 2002; Wadsworth and Compas 2002). We propose that comparing the *social* form of regulation strategies (e.g., co-problem solving, vs. co-ruminating with parents or peers) may clarify important differences in when social support is beneficial vs. ineffective for reducing or magnifying NA during youth's initial response to stress.

Anxious youth tend to have over-involved parents who provide support that inadvertently exacerbates their child's anxiety, presumably by fostering behavioral avoidance and lowering perceived control (Barrett et al. 1996; Chorpita et al. 1998; Hudson et al. 2009). However, anxious youth may also *seek* support from parents and peers in ineffective ways (e.g., seeking reassurance or avoiding challenging stimuli by engaging others), and the impact of their support-seeking strategies on emotion regulation is less understood. Before

✉ Lindsey B. Stone
Lindsey.Stone@cnu.edu

[1] Department of Psychology, Christopher Newport University, Forbes Hall, 1 Avenue of the Arts, Newport News, VA 23606, USA

[2] Department of Psychology, Temple University, 1701 North 13th St, 6th Floor Weiss Hall, Philadelphia, PA 19122, USA

[3] Department of Psychiatry, University of Pittsburgh School of Medicine, 3811 O'Hara St, Pittsburgh, PA 15213-2593, USA

[4] Community Health Sciences, School of Public Health, University of California, 50 University Hall, #7360, Berkeley, CA 94720-7360, USA

[5] Department of Psychology, University of Pittsburgh, 210 S Bouquet St, Pittsburgh, PA 15260, USA

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clinicians can harness the potential benefits of youths' social resources (reduce distress without enabling avoidance), clarifying when social support is beneficial vs. ineffective for regulating anxious youths' NA is warranted. Using cell-phone ecological momentary assessment (EMA), the primary aim of the current study was to compare the effectiveness of three social strategies (co-problem solve, co-distract, co-ruminate with parents or peers) for regulating anxious youth's NA in their daily lives. Second, we also examined the relative benefits of attempting each strategy socially vs. non-socially (e.g., co-problem solving vs. problem-solving).

Research suggests that some emotion regulation strategies are more effective at reducing NA than others and are also more likely to convey risk for internalizing symptoms in children and adolescents. Among both community and high-risk populations (children of depressed parents), active efforts to understand a stressor (problem-solve) or intentionally disengage from a stressor (distract, e.g., play video games) have been associated with more effective NA regulation (Silk et al. 2003) and with lower youth depressive and anxiety symptoms (Connor-Smith et al. 2000; Langrock et al. 2002; Wadsworth and Compas 2002). In comparison, rumination, or the tendency to passively perseverate on dysphoric mood and reactions (Nolen-Hoeksema et al. 2008), has been consistently linked with higher internalizing symptoms (Langrock et al. 2002) and poorer NA regulation in both community and clinically anxious populations (Silk et al. 2003; Tan et al. 2012). The merits of engaging in the social form of these strategies for regulating NA are unclear. For clarity purposes, we refer to problem solving, distraction and rumination as strategies that are attempted individually (non-socially) whereas co-problem solving, co-distraction and co-rumination refer to when youth engage in each strategy socially (with a parent/peer).

Comparing the effectiveness of social strategies specifically for regulating NA is warranted given recent evidence that social strategies exert unique effects on youths' affective functioning. Co-rumination, which involves socially ruminating with parents or peers by rehashing reactions to ongoing problems, is predictive of youth anxiety and depressive symptoms (Hankin et al. 2010; Jose et al. 2012; Rose 2002; Waller and Rose 2010, 2013) and depressive episode onsets even after covarying for rumination (Stone et al. 2011). Further, social support strategies may also be implicated in symptom maintenance. Adolescents who co-ruminate experience longer depressive episode durations (Stone et al. 2011), and currently depressed youth report co-ruminating more with parents and peers versus co-problem solving less compared to healthy youth (Waller et al. 2014). But *how* does co-ruminating foster youth anxiety and depression? Initial research supports Rose's hypothesis that co-ruminating with peers increases internalizing risk by fostering the tendency to ruminate in privacy (Stone and Gibb 2015). We propose that co-rumination may also foster risk by serving as an ineffective emotion regulation strategy that generates or maintains distress. To date, only one study has examined the short-term impact of social strategies on emotion regulation (Zelic et al. 2016). Healthy undergraduates assigned to co-ruminate with the experimenter reported an increase in NA, whereas those who co-problem-solved or co-distracted did not. The current study provides the first examination of anxious youths' social strategies for regulating NA in response to stress.

Clarifying specific strengths (and further limits) of social support within this population is critical given that alterations in the quality and quantity of interpersonal processes are implicated in etiological models of childhood anxiety (Alden and Taylor 2004; Chorpita et al. 1998; Rapee et al. 2009). That is, anxious youth tend to have 'helicopter parents' who are over-involved or over-protective and lower in autonomy granting (McLeod et al. 2007; Rapee 1997). This overabundance of social support can increase anxiety via lowering children's perceived control (Chorpita et al. 1998). Deficits in the quality of parental support have also emerged. Parents of anxious youth tend to engage in less problem-solving (Suveg et al. 2008) greater co-rumination (Waller and Rose 2013) and provide less encouragement of bravery prior to stressors (Silk et al. 2013). It is perhaps not surprising, therefore, that when anxious youth are presented with ambiguous scenarios they are actually more likely to select avoidant strategies after conferring with parents compared to when deciding alone (Barrett et al. 1996). Taken together, multiple alterations in when and how parents of anxious youth provide support have been identified. There is also evidence, though, of reciprocal effects. Anxious youth are not merely passive receptors of social support but tend to *elicit* less effective parenting styles such as over-involvement (Alden and Taylor 2004; Hudson et al. 2009). Thus, understanding how youth contribute to their social support, by selecting specific strategies, may reveal important distinctions for when social support may be beneficial vs. particularly ineffective for regulating NA in the immediate wake of daily stressors. Although parental interactions are emphasized in anxiety development, it is noteworthy that during the social transition in late childhood/early adolescence, peers also become a primary source of support and companionship (Furman and Buhrmester 1992). With recent research indicating that how youth seek support with parents generalizes to peer relationships (Waller and Rose 2013), we examined the effect of social strategies among both parents and peers in our sample of currently anxious youth.

In the current study we examined the effectiveness of three emotion regulation strategies (problem solving, distraction, rumination) that have identifiable social correlates (co-problem solving, co-distraction, co-rumination). EMA (ecological momentary assessment) was used to assess clinically anxious youths' regulation strategies in response to stress in their daily lives. EMA involves conducting assessments 'in the moment' as participants go about their daily activities, in their natural

settings. Thus, EMA assessments are more ecologically valid than assessments collected in the laboratory (Stone et al. 1998). In the current study, EMA allowed youth to report on: negative events within the past hour, their peak NA, type of strategies attempted, social context (with parent or peer vs. alone) and current NA at the time of the call. This approach extends prior work in the following ways: (1) assessments are not limited to retrospective reports over long periods of time, and (2) a more fine-tuned test of social influences on emotion regulation is provided based on hourly NA regulation (versus changes in internalizing symptoms over weeks/months) (Levine and Safer 2002; Wirtz et al. 2003). The current study builds on initial analyses conducted on a subset of this sample (65 of 135 anxious youth) (Tan et al. 2012), which compared the rates and effects of regulation strategies between healthy and clinically anxious youth. We previously found that rumination was a less effective regulation strategy for anxious youth compared to healthy youth (Tan et al. 2012), perhaps because anxious youth ruminate on their symptoms, which may serve to maintain distress. However, we did not examine the social context of regulation strategies. To our knowledge no one has tested whether attempting a strategy socially is more effective for down-regulating NA than when attempting to self-soothe with the same strategy alone. Further, the relative benefits vs limits of engaging in different social regulation strategies has not yet been examined.

The primary aim was to compare the effectiveness of three social strategies for regulating NA in response to a negative event. We anticipated that co-problem solving, as the most proactive strategy for confronting problems and reactions, would be the most beneficial for reducing NA. In contrast, although the social benefits of co-rumination (Rose 2002) *could* serve to reduce NA, we hypothesized that the negative focus of discussion would make co-rumination the least effective social regulation strategy. We expected co-distraction to fall between the two (less effective than co-problem solving but not as ineffective as co-rumination). Our second aim was to compare the relative benefit of employing each strategy socially vs non-socially (e.g., co-ruminate vs. ruminate). We hypothesized that the social form of each strategy would be more effective (reduce youths' NA more) than non-social regulation. As social animals, humans have basic needs to affiliate and feel validated by others. Thus, even with theoretically less effective social strategies such as co-rumination, the adaptive aspects of this strategy (e.g., high levels of comfort, validation, intimacy), which has socially reinforcing effects for increasing friendship quality (Rose et al. 2007) should confer short-term affective benefits compared to ruminating in privacy.

We also considered whether gender moderated the effect of social context and/or social strategy type on NA regulation. It is worth highlighting that girls and boys utilize social support differently. Girls tend to develop more intimate peer relationships that are maintained via high levels of self-disclosure (Rose and Rudolph 2006). Therefore, it is not surprising that girls tend to co-ruminate (a form of negative self-disclosure) with peers and parents more than boys (Hankin et al. 2010; Rose 2002; Waller and Rose 2010). In contrast, boys tend to engage with peers via companionship-based activities (Rose and Rudolph 2006). These activities, (e.g., fishing or basketball) could reflect co-distraction when distressed. With established gender differences in the way girls and boys seek social support and companionship, we examined whether the immediate effects of co-rumination, co-problem solving, and co-distraction for regulating NA differed between boys' and girls' relationships.

Method

Participants

The current analyses focus on pre-treatment EMA data of 117 anxious youth drawn from a treatment study of pediatric anxiety. Youth ages 9–14 and their primary caregivers were recruited through community advertisements, referrals from other research studies, and directly from psychiatric clinics. For inclusion, youth had to meet DSM-IV criteria for a primary diagnosis of generalized anxiety disorder ($N = 82$), separation anxiety disorder ($N = 31$), and/or social phobia ($N = 23$). Exclusion criteria included: primary diagnosis of major depressive disorder (MDD), developmental delays, learning disabilities, ongoing treatment with psychoactive medications, co-morbid diagnoses of obsessive-compulsive, post-traumatic stress, or conduct disorder, substance abuse or dependence, or lifetime diagnoses of autism spectrum, bipolar, psychotic, schizophrenia, or schizoaffective disorders. Youth were also excluded if they had previously completed a course of cognitive-behavioral therapy.

Of the 117 anxious youth, 35 met criteria for multiple anxiety disorders, and 14 had comorbid disorders: enuresis (N = 3), attention-deficit hyperactivity disorder, inattentive type ($N = 4$), tic disorders (N = 4), oppositional defiant disorder (N = 3) and depressive disorder in partial remission ($N = 1$). Of the 117 participants 56% were female, with a mean age of 10.98 ($SD = 1.47$). Regarding race and ethnicity, 90% were Caucasian, 7% Biracial, 3% African American, and 3% Hispanic. The median household income was $70,000–$80,000.

Procedure

Youth and their caregivers completed a 2-hour baseline laboratory visit. After informed consent and assent was obtained from both participating caregiver and child respectively, they completed diagnostic interviews and self-report surveys.

Qualifying youth completed a pre-treatment EMA protocol assessing their naturally-occurring emotions and regulation strategies. The EMA protocol was collected in 5 five-day blocks during the study. The current analyses focus on block 1, data collected prior to treatment commencement. The University of Pittsburgh Institutional Review Board approved all study procedures.

Assessments

Structured Diagnostic Interviews Youth and their caregivers each completed the Schedule for Affective Disorders and Schizophrenia in School-Age Children—Present and Lifetime version (K-SADS-PL) (Kaufman et al. 1997). Interviewers met with parents and youth separately, integrating data from both informants to arrive at a final diagnosis. Trained BA- and MA-level research clinicians carried out all interviews. Interview results were presented at a consensus case conference with a child psychiatrist, who reviewed the preliminary diagnosis and provided a final diagnosis based on DSM-IV criteria (American Psychiatric Association 1994). Inter-rater reliability between interviewers was calculated for 16% of interviews. Reliability for anxiety diagnoses was high (Kappa = 0.97).

Ecological Momentary Assessment Youth were equipped with answer-only cellular phones on which they received calls from a trained interviewer. Interviewers contacted youth to complete 14 calls during the 5-day sampling block, from Thursday after school through the following Monday evening. Weekday calls occurred twice daily at random times between 4 pm—9:30 pm (Thursday, Friday and Monday). Calls on Saturday and Sunday occurred four random times between 11 am—9:30 pm to provide a valid assessment of daily activities and affect. This method was established via pilot testing (Axelson et al. 2004). To ensure that data were representative, only participants who completed a minimum of 50% of the baseline calls (7 or more of the 14 calls) were included in the current analyses. Thus, 5 (or 4%) were excluded for completing less than 50% of calls. Missing EMA calls were dropped (data was not estimated or imputed).

Each call consisted of a brief (5 min) structured interview (Silk et al. 2003, 2011) that assessed the social context and behaviors linked with changes in youths' affect. In the current study, the primary variables of interest were youths' emotion regulation strategies in social vs. non-social contexts in response to negative events in the past hour. First, youth were asked to rate their current emotion on a subset of 5-point scales adapted from the Positive and Negative Affect Schedule for Children, ranging from (1) "very slightly or not at all" to (5) "extremely" (PANAS-C) (Laurent et al. 1999). In the current study, Current NA reflects the highest rated negative emotion: sad, angry, nervous, and upset. Next, youth were asked whether a negative event occurred in the previous hour, and to rate how sad, angry, nervous, and upset they felt at 'the worst point' (Peak NA). In the current assessment, only calls containing a negative event and a Peak NA rating ≥ 3 on any of the four negative emotions were included (1025 or 61% of all calls). This threshold ensured that analyses targeted youths' response to events that were at least moderately distressing, thus necessitating regulation. Youth also estimated when the negative event occurred in 15-min intervals, ranging from (1) "right before the call" to (5) "about one hour ago" (Time).

Six regulation strategies adapted from the Responses to Stress Questionnaire (RSQ; Connor-Smith et al. 2000) were then assessed: distraction, cognitive restructuring, problem-solving, acceptance, avoidance, and rumination. Distraction was defined by engagement in another activity, "*Did you keep mind off the problem by doing something else? What did you do?*" Co-distraction was present when youth reported engaging in said activity with a parent or peer. Rumination was assessed by asking, "*Were you unable to stop thinking about how you were feeling- thoughts about 'event' keep popping in your mind?*" Problem solving was assessed by asking, "*Did you do something to fix the problem or think of a way to make things better?*" Co-rumination and co-problem solving were coded based on two questions: "Was someone with you when you did those strategies?" (parent/peer) and "Did this person talk with you about the negative event?" To assess the relative benefits of social support (aim 2), effectiveness of co-rumination, co-distraction, and co-problem-solving were compared to calls in which each strategy was attempted when youth were alone. Figure 1 outlines the identification of 269 'social regulation' calls and 226 'non-social regulation' calls. Of the 495 calls included in analysis, the 117 participants on average had 4 calls ($M = 4.23$, $SD = 4.21$; *median* = 4), with a range (1—10).

Youth could endorse multiple regulation strategies during each call. Therefore, to examine Aim 1, three dummy variables were created among the social regulation calls to examine the effects of specific strategies. For example, to test the relative effectiveness of co-rumination to other social calls, we compared co-rumination calls (1) to calls where the they engaged in either co-problem solving, co-distraction or both (0). We refer to these predictors (Co-Problem Solve; Co-Distract; Co-Ruminate) collectively as the 'Social Strategy' variables. To examine the social context of each strategy (Aim 2), three additional dummy variables were created to identify when a strategy occurred socially or non-socially [e.g., co-rumination calls (1), rumination calls (0)], which we refer to below as 'Social Context' variables.

Data Analytic Plan

Hypotheses were evaluated via mixed linear models (MLM) in order to account for the hierarchical nature

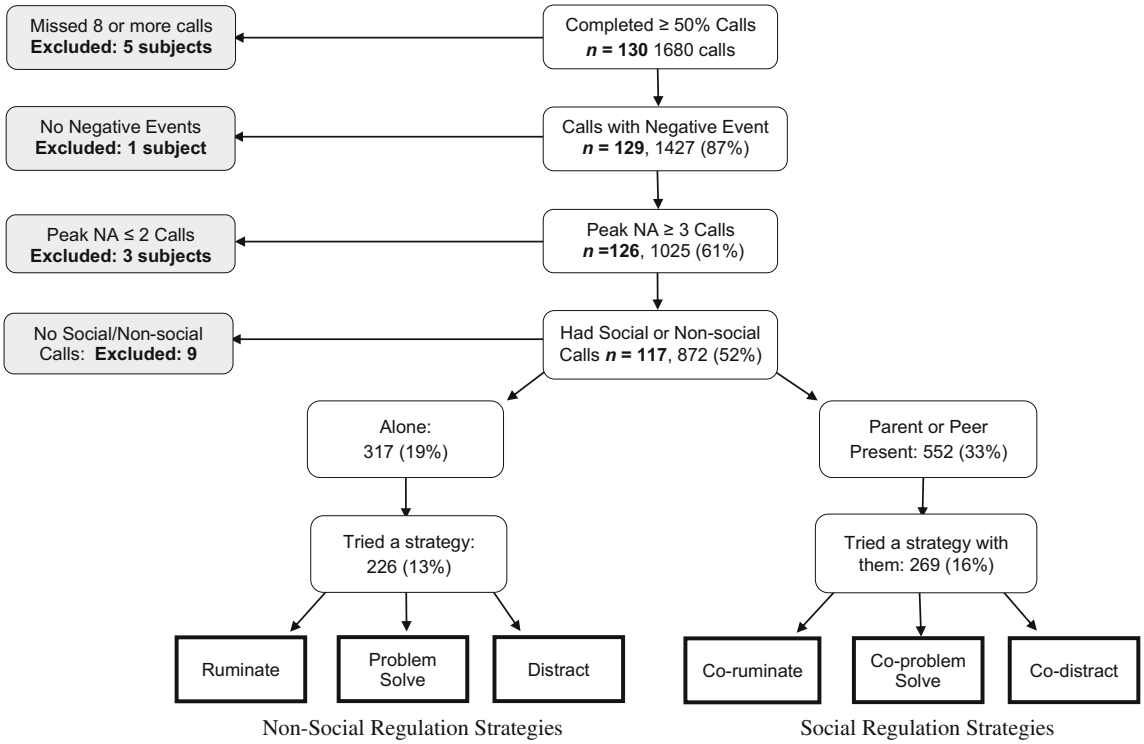

Fig. 1 Ecological momentary assessment (EMA) of social & non-social emotion regulation strategies [*N*, Calls (%)]

of the data (Raudenbush and Bryk 2002). EMA calls (Level 1) were nested within subjects (Level 2). All models included a random intercept to control for subject effects. To assess changes in NA, we entered Current NA as the dependent variable, and covaried for Level 1 variance by entering retrospective Peak NA and Time (since event occurred) as fixed effects. All models also covaried for the effect of subject gender on the intercept. To test Aim 1 we ran three separate models with each Social Strategy predictor. Therefore, the current models capture the amount of change in NA (rather than rate of change). Positive effects for a particular social strategy would indicate *less* effective NA regulation, i.e., youth maintained *higher* Current NA when attempting that strategy compared to other social strategies. Conversely, a negative effect would indicate *greater* regulation effectiveness such that youth report *lower* Current NA for a specific strategy. Finally, we also tested whether gender moderated social strategy effectiveness in all models. Non-significant interaction parameters were removed to achieve model parsimony and aid interpretation of lower order effects.

Level 1 equation.

$$CurrentNA_{ti} = \pi_{0i} + \pi_{1i}(\text{Social Strategy}) + \pi_{2i}(\text{PeakNA}) + \pi_{3i}(\text{Time}) + e_{ti}$$

Level 2 equation.

$$\pi_{0i} = \beta_{00} + \beta_{01}(\text{Gender}) + r_{0i}$$
$$\pi_{1i} = \beta_{10} + \beta_{11}(\text{Gender})$$
$$\pi_{2i} = \beta_{20}$$
$$\pi_{3i} = \beta_{30}$$

Mixed Model.

$$CurrentNA_{ti} = \beta_{00} + \beta_{01}(\text{Gender}) + \beta_{10}(\text{Social Strategy}) + \beta_{11}(\text{Social Strategy} \times \text{Gender}) + \beta_{20}(\text{PeakNA}) + \beta_{30}(\text{Time}) + r_{0i} + e_{ti}$$

Aim 2 was tested with three identical models except the primary predictor in each model was the Social Context variable (rather than Social Strategy).

Results

First, we examined the rates of social regulation and isolation calls. Only 99 youth had social regulation calls ($M = 2.72$, $SD = 1.90$; *median* = 3), with a range (1—8). Of the 269 social regulation calls, youth reported attempting strategies with a peer during 106 calls (39%), with a parent during 195 calls (72%). There was overlap during 32 calls (12%) where youth reported attempting strategies with both a parent and peer in the past hour. Of the 269 social regulation calls: 144 calls

involved Co-problem solving with a peer or parent (84 or 58%, co-occurred with another social regulation strategy), 89 calls involved Co-distraction (22% occurring with another social regulation strategy), and 134 involved Co-ruminating with a peer or parent (73 calls or 54% co-occurred with another social regulation strategy). Regarding the 226 non-social regulation calls, 121 involved Problem solving (86 or 69% co-occurred with another non-social regulation strategy), 124 involved Distraction (65 or 52% co-occurred with another non-social strategy), and 120 calls involved Rumination (47 or 39% co-occurred with another non-social strategy).

The models comparing the effectiveness of social regulation strategies (Aim 1) are displayed in Table 1. Co-problem solving (Model A) did not differ in effectiveness compared to the other social strategies, nor were effects qualified by gender. Looking next at co-distraction (Model B), the effectiveness of this social strategy was moderated by gender, $F(1, 218) = 4.38$, $p = 0.037$, and is displayed in Fig. 2. Pairwise comparisons within boys revealed that when they co-distracted NA was reduced significantly more than when they co-ruminated or co-problem-solved ($M_{Co\text{-}distract} = 1.43$ vs. $M_{Social\text{-}other} = 2.47$, $p < 0.001$, Cohen's $d = 0.73$). Among anxious girls, co-distraction was not significantly more effective for reducing NA than other social strategies, ($M_{Co\text{-}distract} = 2.05$ vs. $M_{Social\text{-}other} = 2.35$, $p = 0.14$, Cohen's $d = 0.22$). Finally, co-rumination exhibited a significant main effect (Model C, see Fig. 3) relative to co-distraction or co-problem solving, $F(1, 223) = 4.12$, $p = 0.043$, Cohen's $d = 0.23$, (Current NA; $M_{Co\text{-}Rum} = 2.38$ vs. $M_{Social\text{-}other} = 2.05$). Co-ruminating was the least effective social strategy for both anxious girls and boys.

We next compared the effects of social vs. non-social context of each regulation strategy (Aim 2). Results are displayed in Table 2. Social regulation did not exhibit benefits over non-social strategies for either problem solving (Model A) or rumination (Model C). However, as seen in Model B, the effectiveness of co-distraction vs. distraction was qualified by gender, $F(1, 157) = 9.21$, $p = 0.003$. Pairwise comparisons revealed that among boys co-distracting was more effective for reducing NA than distracting when alone ($M_{Co\text{-}distract} = 1.45$ vs. $M_{Distract} = 1.97$, $p = 0.013$, Cohen's $d = 0.39$). Among girls, co-distraction was marginally *less* effective than distraction ($M_{Co\text{-}distract} = 1.99$ vs. $M_{Distract} = 1.69$, $p = 0.89$, Cohen's $d = 0.28$). The gender × social context interaction is displayed in Fig. 4.

Finally, additional tests for run to ensure the robustness of findings and explore potential sources of moderation. First, given the wide age range (9—14) we re-ran the six models covarying for age on the intercept to ensure results held. All significant effects were maintained. Second, we also tested whether the source of support mattered (parental calls: $n = 182$, Peak NA $M = 3.99$, $SD = 0.81$; vs. peer calls: $n = 87$, Peak NA $M = 3.91$, $SD = 0.80$). All six models were re-run examining if the effectiveness of social strategies or social context differed between parents vs. peers (entered parent/peer and parent/peer × social predictor on L1). None were significant.

Discussion

The current study examined the effectiveness of clinically anxious youths' social and non-social strategies for regulating NA in response to stressors in their daily lives. We found that co-distracting with parents or peers was the most effective social strategy for reducing NA, but only among anxious boys. In contrast, co-ruminating was the least effective social strategy, such that when anxious girls or boys co-ruminated in response to a recent stressor, they maintained higher NA than when they co-distracted or co-problem solved. Contrary to hypothesis, social support did not consistently confer benefits for reducing NA over and above non-social regulation strategies. Of the three social-regulation strategies, only co-distraction exhibited greater effectiveness for reducing NA (but only among boys) than its non-social counterpart (distraction). Results have potential clinical implications for maximizing the benefits of social networks within each gender.

Our finding that co-distracting, not co-problem solving, was most beneficial for short-term social regulation extends research on emotion regulation and parenting strategies of anxious youth. Although both strategies are effective for regulating anxious and non-anxious youth's NA (Tan et al. 2012), results have more consistently supported the immediate benefits of distraction, likely since this strategy involves actively disengaging from the stressor (Connor-Smith et al. 2000; Langrock et al. 2002; Silk et al. 2003). In comparison, co-problem solving involves actively engaging with an ongoing stressor (Connor-Smith et al. 2000), which should contribute long term benefits for navigating stressors. However, given the problem solving deficits that parents of anxious youth sometimes exhibit (Barrett et al. 1996; Silk et al. 2013; Suveg et al. 2008), this strategy may not always be effectively utilized in the families of youth with anxiety disorders.

Although distraction has the potential to be misused to avoid stressors, our study suggests potential benefits that are worth unpacking. We found that co-distraction was anxious boys' most effective social means of reducing distress. Additionally, the social context analysis suggests that co-distracting with parents or peers is more effective than when anxious boys distract alone. Taken together, this indicates that the emotion regulation benefits of co-distraction are not driven entirely by behavioral avoidance, but partially by social mechanisms. Clinically, one implication is that in addition to targeting alterations in anxious boys' social support, clinicians may also maximize current assets by refining *when* boys utilize co-distraction. There are many circumstances when co-

Table 1 Comparing anxious youths' social regulation strategies for reducing negative affect

			Current negative affect			
			Unconditional means model		Final model	
			β	SE	β	SE
A. Co-problem solving model						
Fixed parameters						
Level 1	β00	Intercept	2.17 ***	(0.10)	0.99 *	(0.46)
	β10	Co-problem solve			0.09	(0.16)
	β20	Peak NA			0.41 ***	(0.10)
	β30	Time			−0.11	(0.06)
Level 2	β01	Gender			−0.13	(0.19)
Random parameters						
	r_{oi}	Intercept	0.34 **	(0.13)	0.23 *	(0.12)
	e_{ti}	Level 1-Error	1.24 ***	(0.14)	1.20 ***	(0.14)
		−2 LL	734.9		717.1	
		$\chi^2(4)$			35.6 ***	
B. Co-distract model						
Fixed parameters						
Level 1	β00	Intercept	2.17 ***	(0.10)	0.76	(0.46)
	β10	Co-distract			−0.30	(0.20)
	β20	Peak NA			0.40 ***	(0.10)
	β30	Time			−0.10	(0.06)
Level 2	β01	Gender			−0.62 *	(0.30)
	β11	Co-distract × Gender			−0.74 *	(0.35)
Random parameters						
	r_{oi}	Intercept	0.34 **	(0.13)	0.18	(0.10)
	e_{ti}	Level 1-Error	1.24 ***	(0.14)	1.16 ***	(0.13)
		−2 LL	734.9		703.2	
		$\chi^2(5)$			63.4 ***	
C. Co-rumination model						
Fixed parameters						
Level 1	β00	Intercept	2.17 ***	(0.10)	1.12 *	(0.48)
	β10	Co-ruminate			0.33 *	(0.16)
	β20	Peak NA			0.37 ***	(0.10)
	β30	Time			−0.10	(0.06)
Level 2	β01	Gender			0.11	(0.19)
Random Parameters						
	r_{oi}	Intercept	0.34 **	(0.13)	0.22 *	(0.11)
	e_{ti}	Level 1-Error	1.24 ***	(0.14)	1.19 ***	(0.14)
		−2 LL	734.9		713.2	
		$\chi^2(4)$			43.4 ***	

Co-problem solve = co-problem solve calls (1) vs. co-ruminate or co-distract calls (0); Co-ruminate = co-ruminate calls (1) vs. co-problem solve or co-distract calls (0); Co-distract = co-distract calls (1) vs. co-problem solve or co-ruminate calls (0)

*$p \leq 0.05$, **$p < 0.01$, ***$p < 0.001$

distraction may function adaptively and not serve as avoidance. When a stressor may not be immediately confronted or resolved, choosing to intentionally disengage may be an effective way to both reduce distress as well as minimize worrying/dreading upcoming events. Indeed, the social presence of parents or peers may explain why co-distraction is a more successful means of re-focusing attention away from worries/ ruminative thoughts than when anxious boys attempt

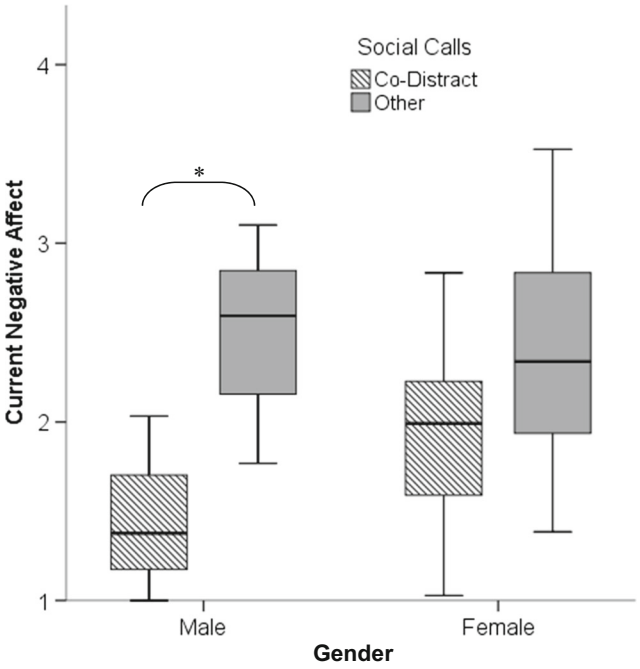

Fig. 2 The effectiveness of co-distracting with parents or peers is moderated by gender *$p < 0.05$

to distract alone. The benefits of involving parents in anxious youths' treatment are unclear (Breinholst et al. 2012). Thus, targeting effective social regulation strategies such as co-distraction is another way to emphasizing skills and choices under the child's control (e.g., teaching anxious boys to engage his parent/peer in a fun activity when he starts to worry).

Consistent with hypotheses, co-rumination was the least effective social strategy for regulating both anxious boys' and girls' NA. This finding aligns with prior work demonstrating that involuntary strategies such as rumination are ineffectual for regulating NA (Silk et al. 2003; Tan et al. 2012). On the surface, as a necessarily voluntary strategy co-rumination appears pro-active since it involves seeking support and a willingness to discuss negative events and emotions. However, the need for co-ruminators to continually re-hash discussion of events and fears makes it likely that co-rumination actually functions as an avoidance strategy from confronting stressors. The impact of co-ruminating on NA did not differ according to whether youth were socially regulating with a parent or peer, which aligns with prior research that co-ruminating with parents is also associated with higher internalized distress (Waller and Rose 2013). Taken together, this result extends initial evidence that co-rumination, as a socially reinforcing strategy that fosters the tendency to ruminate, (Stone and Gibb 2015) may also foster internalized distress (Hankin et al. 2010; Jose et al. 2012) by functioning as an ineffective regulation strategy (Waller et al. 2014). Replication is needed in future research, but this pattern of results indicates that co-rumination may be reinforced largely by social benefits (validation, intimacy) rather than affective relief.

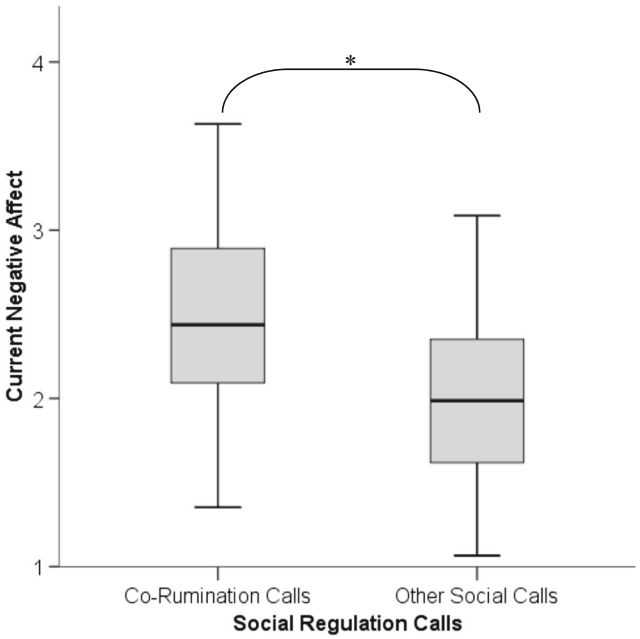

Fig. 3 Co-rumination is less effective at reducing negative affect than other social strategies *$p < 0.05$

Finding that co-distraction was more effective than other social strategies at regulating NA, but only among anxious boys, extends research on established gender differences in peer interactions. Boys tend to base relationships on companionship activities (Rose and Rudolph 2006). Thus, when they are distressed, a shared activity (e.g., fishing or playing basketball together) may serve as natural co-distraction. Conversely, the literature supports that girls tend to co-ruminate more with peers and parents compared to boys (Hankin et al. 2010; Rose 2002). In the current sample of anxious youth, girls did *not* report co-ruminating more frequently with parents or peers than boys. Therefore the lack of effectiveness for girls' co-distraction attempts (compared to distracting alone) for regulating NA is perplexing. Future research with a more fine-grained analysis of how co-distraction is implemented may clarify why co-distraction is more effective for anxious boys than anxious girls. Collectively, the pattern of results suggests that for youth with anxiety, the *type* of support sought is more critical than the *source* and indicates that clinicians should discourage co-rumination with either parents or peers and strengthen co-problem solving interactions to reduce avoidance.

To our knowledge, the current study provides the first examination of whether engaging in a strategy socially is more beneficial for regulating NA than attempting the same strategy alone (self-soothe). We found that only anxious boys benefited from social support, and only in the context of co-distracting (as opposed to distracting alone). Anxious girls did *not* benefit from co-distracting and were actually marginally more distressed than when distracting alone. This gender

Table 2 Comparing anxious youths' social vs. non-social strategies for regulating negative affect

			Current negative affect			
			Unconditional means model		Final model	
			β	SE	β	SE
A. Co-problem solving model						
Fixed parameters						
Level 1	β00	Intercept	2.06 ***	(0.10)	1.05 *	(0.46)
	β10	Co-problem solve vs. Problem solve			−0.10	(0.15)
	β20	Peak NA			0.34	*** (0.10)
	β30	Time			−0.06	(0.05)
Level 2	β01	Gender			−0.11	(0.20)
Random parameters						
	r_{oi}	Intercept	0.49 ***	(0.15)	0.40 **	(0.14)
	e_{ti}	Level 1-Error	0.93 ***	(0.12)	0.90 ***	(0.11)
		−2 LL	655.7		641.9	
		$\chi^2(4)$			25.6 ***	
B. Co-distract model						
Fixed parameters						
Level 1	β00	Intercept	1.82 ***	(0.09)	1.45	(0.40)
	β10	Co-distract vs. Distract			−0.30	(0.18)
	β20	Peak NA			0.09	(0.10)
	β30	Time			0.06	(0.05)
Level 2	β01	Gender			−0.53	* (0.23)
	β11	Co-distract vs. Distract × Gender			−0.82 **	(0.27)
Random parameters						
	r_{oi}	Intercept	0.37 **	(0.10)	0.34 ***	(0.10)
	e_{ti}	Level 1-Error	0.52 ***	(0.08)	0.48 ***	(0.07)
		−2 LL	439.4		428.1	
		$\chi^2(5)$			22.6 ***	
C. Co-rumination model						
Fixed parameters						
Level 1	β00	Intercept	2.29 ***	(0.12)	0.67	(0.50)
	β10	Co-ruminate vs. Ruminate			−0.11	(0.18)
	β20	Peak NA			0.53 ***	(0.11)
	β30	Time			−0.14 *	(0.06)
Level 2	β01	Gender			0.08	(0.22)
Random parameters						
	r_{oi}	Intercept	0.62 **	(0.19)	0.40 **	(0.15)
	e_{ti}	Level 1-Error	1.16 ***	(0.14)	1.09 ***	(0.13)
		−2 LL	686.3		658.5	
		$\chi^2(4)$			55.6 ***	

*$p \leq 0.05$, **$p < 0.01$, ***$p < 0.001$

difference aligns with our interpretation above: boys are more effective at co-distracting and thus benefit from social support when employing this regulation strategy, whereas girls' greater tendency to co-ruminate (Hankin et al. 2010; Rose 2002; Stone et al. 2011) may hinder co-distracting attempts. This may explain the current result indicating that girls report greater reduction in NA when distracting alone compared to when with parents/peers. There are *potential* implications for intervention to note regarding social support. Clinicians working with anxious girls may focus on decreasing co-rumination and emphasize that anxious girls should instead use support to problem solve or engage in exposures. Ultimately though,

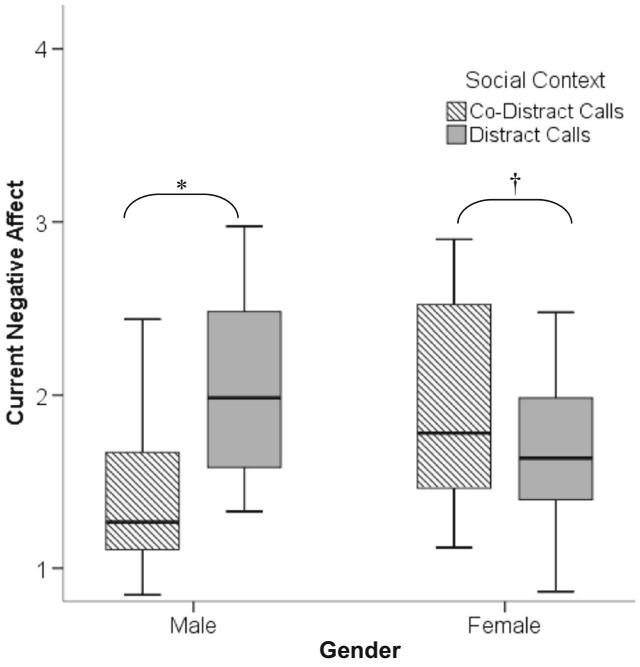

Fig. 4 The benefits of social regulation differed between anxious boys and girls. †$p < 0.09$ *$p < 0.05$

future research is needed to replicate this pattern and examine the extent to which girls vs. boys are more likely to engage in multiple social strategies, participating partner factors (are male partners better at encouraging co-distraction activities versus are females more likely to encourage co-rumination), and if the effects of one strategy (co-rumination) overshadow the benefits of another (co-distraction).

Although higher social support is generally viewed as protective, the current results contribute to a growing literature indicating that anxious youths' social support is not inherently beneficial. In the current sample, non-social strategies of rumination and problem-solving were equally effective for reducing anxious youths' NA as their social counter-parts (co-rumination and co-problem solving respectively). The lack of superiority of anxious youths' social strategies (over self-soothing alone) extends prior research indicating that anxious youths' parental support qualitatively differs from parental support of non-anxious youth in ways that can hinder effective NA regulation. Parents of anxious youth engage in problem solving less (Suveg et al. 2008) and when they do problem-solve, youth become *more* likely to select avoidant strategies than when problem solving alone (Barrett et al. 1996). One potential explanation for this effect is that parents of anxious youth are less likely to encourage bravery in approaching stressors (Silk et al. 2013). However, it is worth highlighting that parents of anxious youth are capable of providing more adaptive support: they express greater encouragement and warmth with non-anxious children versus higher levels of negativity with their own anxious child (Hudson et al. 2009). This suggests a cyclical relation whereby anxious youth elicit parental over-involvement (McLeod et al. 2007; Rapee 1997) and parents adapt to providing support in ways designed to reduce their child's immediate distress (Hudson and Rapee 2004). Taken together, this indicates that parents of anxious youth may benefit from inclusion in cognitive behavioral interventions (by bolstering their support via promoting exposures and problem-solving), but the literature is mixed regarding whether parental involvement in child anxiety treatment is superior for predicting long-term gains (for review see Barmish and Kendall 2005). We propose that parental involvement is ideal, but ultimately the current results suggest that anxious youth will benefit from learning to elicit social support effectively by (a) reducing over-reliance on parents and peers, (b) utilizing support to co-problem-solve or assist in exposures, and (c) relying on co-distraction when problems cannot be confronted or resolved.

There are several limitations to the current study. First, EMA limits retrospective bias by asking youth to recall events and emotions within the past hour, but reliance on youth report is still subject to biases, such as their current affective state (Monroe 2008). Second, although the current study assessed the social context and strategies of anxious youth's NA regulation, we did not examine these effects within the broader context of youth's social network. Since anxious youth tend to have over-protective parents who may limit their social environment, assessing the amount of peers and extent to which anxious youth have access to peers may be important contextual factors that moderate the effect of peer support on NA regulation, and should be prioritized in future research. For instance, parents of socially anxious youth are thought to be particularly restrictive, and there is some evidence that co-ruminating with online friends is linked with lower depressive symptoms among SAD youth (Van Zalk and Tillfors 2017). Third, exploratory analyses examining the unique effect effects of parent vs. peer regulation were not significant, but the sample size limited analytic power to detect small to moderate effects in the current study. Thus, these null results should be interpreted with caution and warrant examining in larger samples. Fourth, it is worth noting that siblings are also frequent companions and a ready source of support. The impact of siblings on youth anxiety has not been extensively studied and warrants future attention. Fifth, another consideration is that EMA data did not enable us to test if the source of the negative event qualified the effectiveness of social support (e.g., if youth reported fighting with a parent, the effectiveness of regulating NA with that parent may have differed than if the fight was with a peer). Furthermore, we did not directly observe youth engaging in social regulation strategies, and youth could report using multiple strategies in response to negative events, making it possible that multiple strategies occurred together. On the other hand, this may indicate that the significant benefit of co-distracting and ineffectiveness of co-ruminating for reducing NA have overriding effects on

youths' NA regulation when other strategies are attempted. Finally, future research comparing the social context of regulation strategies between clinical and non-clinical samples is warranted to determine if the current pattern of results generalize to non-anxious youth, and high-risk youth of anxious or depressed mothers.

In summary, results indicate that for clinically anxious youth, social support is not beneficial for regulating NA above and beyond non-social strategies. The *type* of strategy undertaken appears to matter more. Results provide initial evidence that co-rumination functions as an ineffective social regulation strategy for youth that may maintain initial distress. Co-distraction was the most effective social strategy and also was more beneficial than non-social distraction for reducing NA in response to stress, but for boys. Overall, these results highlight potential intervention targets for anxious youth via (a) reducing ineffective social strategies (co-rumination) and (b) maximizing the benefits of effective social regulation by utilizing co-distraction under proper conditions. Further work is needed to clarify how to alter girls' social support strategies.

Compliance with ethical standards

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Conflict of Interest The authors have no conflicts of interest to report.

Ethical Approval Study procedures were approved by the Institutional Review Board of the University of Pittsburgh School of Medicine.

Informed consent Informed consent and assent was obtained from all participating caregivers' and children respectively.

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