Anxious Solitude and Peer Exclusion Predict Social Helplessness, Upset Affect, and Vagal Regulation in Response to Behavioral Rejection by a Friend*

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Abstract:

Competent social interaction requires adaptive responding to occasional social challenges—for instance, having a social invitation declined by a social partner. This investigation examined the propensity for anxious solitary children to respond adaptively or helplessly to an instance of perceived behavioral rejection by a friend. Although there is some support for the notion than anxious solitary children are more likely than other children to demonstrate social helplessness in the face of social challenge on average (Stewart & Rubin, 1995), this investigation goes beyond such between-group comparisons to examine heterogeneity among anxious solitary children. Consistent with a diathesis–stress perspective in which maladaptive functioning is expected to result when an individual with a vulnerability or diathesis (e.g., anxious solitude) encounters stress (e.g., peer difficulties; Biederman & Spencer, 1999), it is hypothesized that anxious solitary children who experience heightened peer stress (i.e., peer exclusion) in the course of their daily lives are most likely to respond to a social challenge in a helpless manner. This investigation examines not only which anxious solitary children are most likely to display social helplessness, but why. That is, processes that may mediate the relation between anxious solitude and social helplessness are examined. Specifically affective, social–cognitive, and regulatory processes are examined as potential mediators. It is expected that maladaptive processes are most likely to occur and to contribute to social helplessness in children who display the dual individual and interpersonal risks of anxious solitude and peer exclusion, whereas children who display a single risk (either an individual risk, such as anxious solitude, or an interpersonal risk, such as peer exclusion) were expected to display more modest difficulty in responding to social challenge.

Article:

Socially Helpless Behavior

Social helplessness—the belief that one cannot influence personally relevant social events (Goetz & Dweck, 1980)—is behaviorally manifested by both failing to take initiative in social situations and giving up easily in the face of social challenges. Goetz and Dweck (1980) operationalized helpless social behavior in a pen pal paradigm experiment as children's responses to being asked to extend (a) an initial social invitation to be evaluated by a child who was a member of a pen pal selection committee and (b) a second social invitation after their initial social invitation was rejected on the basis of insufficient information (see also Erdley, Loomis, Cain, Dumas-Hines, & Dweck, 1997). Although the display of initial helplessness in making the first social invitation (declining to make an initial invitation) was rare, social helplessness in response to the subsequent setback (e.g., declining to try again) was more common. In a similar paradigm, Downey, Lebolt, Rincon, and Freitas (1998) examined children's responses to being asked to invite a friend to join them in an interview and subsequently

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being told that the friend did not want to come. Although Downey et al.'s paradigm was initially designed to capture rejection sensitivity, it could easily be modified to assess social helplessness as well by asking children to make a second invitation after the initial behavioral rejection.

Although past investigations have evoked social helplessness in response to an unfamiliar peer (Erdley et al., 1997; Goetz & Dweck, 1980), in the current investigation we planned to evoke social helplessness in response to a friend. We made this change for several reasons. First, because evidence indicates that anxious solitary children experience more peer sociometric rejection and exclusion from classmates than other children do (e.g., Gazelle, 2008; Gazelle & Ladd, 2003; Gazelle et al., 2005), it is important to understand processes involved in such peer difficulties among familiar peers. Second, there is increasing interest in how well anxious solitary children function in the context of friendships with peers (Gazelle, 2008; Gazelle & Ladd, 2003; Panella & Henggeler, 1986; Pedersen, Vitaro, Barker, & Borge, 2007; Rubin, Wojslawowicz, Rose-Krasnor, Booth-LaForce, & Burgess, 2006; Schneider, 1999). Third, because anxious solitary children are likely to be especially sensitive to rejection (London, Downey, Bonica, & Paltin, 2007), we aimed to construct an experimental situation that would increase the chances that the behavioral rejection would be perceived as mild. It was expected that a behavioral rejection involving a friend would be perceived as mildly stressful because a recent study indicated that anxious solitary children exhibited less maladaptive social–cognitive patterns in response to hypothetical scenarios when vignettes involved a friend rather than other peers (Burgess, Wojslawowicz, Rubin, Rose-Krasnor, & Booth-LaForce, 2006). Thus, it was expected that anxious solitary children's responses to behavioral rejection from a friend would present an opportunity for them to display their highest behavioral, emotional, and social–cognitive competencies in response to a mild social challenge.

Anxious Solitude and Social Helplessness

Anxious solitary children are identified by frequent shy, solitary onlooking (watching peers without joining them) and by verbally inhibited behavior among familiar peers (Gazelle & Ladd, 2003). These children are at risk for relational and internalizing problems (for a review, see Rubin, Coplan, & Bowker, 2009), and there is reason to expect that anxious solitary children would be particularly prone to socially helpless behavior. Anxious solitary children are conceptualized as wanting to interact with peers but being blocked by fears that they will not perform well or will be poorly evaluated by peers (Asendorpf, 1990; Coplan, Rubin, Fox, Calkins, & Stewart, 1994; Gazelle & Rudolph, 2004). Children who experience such difficulty entering peer interaction would also be expected to have difficulty responding adaptively when they encounter a challenging peer situation, such as having a social invitation declined. At least one study has supported the notion that anxious solitary children, in comparison to other children, are likely to display socially helpless behaviors on average. In a laboratory-based study of children's dyadic interaction with an unfamiliar peer, anxious solitary children were found to make lower risk social bids than other children and were less likely to persist with social problem solving following failure (Stewart & Rubin, 1995). Although these findings support the connection between the affective–behavioral profile of anxious solitude and social helplessness on average, it is important to examine the variation that may exist among anxious solitary children's propensity toward social helplessness and the factors that may be linked to such variation.

Anxious Solitude and Peer Exclusion

On the basis of a diathesis–stress model (Alloy, Hartlage, & Abramson, 1988; Alloy, Kelly, Mineka, & Clements, 1990; Biederman & Spencer, 1999), we hypothesized that children's propensity to demonstrate social helplessness in response to an experience of behavioral peer rejection (a specific interpersonally stressful event) is influenced not only by their individual vulnerability or diathesis (anxious solitude), but also by the ongoing level of interpersonal stress (i.e., peer exclusion) they encounter in peer interaction. Peer exclusion occurs when peers leave a child out of their activities (e.g., don't approach or speak to a child at recess) and ignore or refuse to allow a child to participate if he or she should make an attempt to join (e.g., "you can't sit here"). Peer exclusion is a form of behavioral rejection, or an act that communicates peer dislike for a child. It is important to distinguish behavioral rejection—acts that communication dislike—from sociometric rejection—the attitude of dislike (Boivin & Hymel, 1997), which may or may not be manifested in peer actions.

According to a diathesis–stress model, exclusion may contribute to socially helpless behavior both because it confirms anxious solitary children's fears that they will not be well received by social partners (an affective mechanism) and indicates that they should not expect their social overtures to be met with a contingent response by social partners (a social–cognitive mechanism). In other words, a child who is often not acknowledged by peers may come to believe that they have little ability to engage with social partners or positively influence the course of a social interaction (low social self-efficacy).

The experimental paradigm used in the present study resembles previous investigations in that a dyadic interaction is used to examine behavioral differences among children who differ in group-level peer relations (rejection; Goetz & Dweck, 1980). We acknowledge that there is a substantial literature that differentiates between group- and dyadic-level peer relations and suggests that these constructs have differential associations with children's adjustment (e.g., Peets, Hodges, Kikas, & Salmivalli, 2007). However, this literature is mostly nonexperimental, whereas the pragmatics of experiments often require that peer interaction be operationalized as dyadic interaction. Beyond pragmatics, it is also important to acknowledge that group status or treatment may be communicated to a child through many separate dyadic interactions with multiple peers. For instance, a child may conclude that he or she is excluded by peers when multiple peers decline his or her dyadic social invitations. On the basis of this rationale, we expected that excluded versus nonexcluded anxious solitary children would react less adaptively to a perceived behavioral rejection from a friend.

Although there is initial support for the joint effect of anxious solitude and peer exclusion on children's socially helpless behavior (Gazelle & Rudolph, 2004), potential affective and social–cognitive mediators of this relation have not been tested. Moreover, existing evidence is based on teachers' assessments of all constructs. Although teacher reports on children's behavior are helpful, teachers may have limited awareness of peer interaction because it can be subtle and can occur outside of their purview (e.g., at recess; Achenbach, McConaughy, & Howell, 1987). Additionally, teachers vary in their sensitivity to the nuances of children's peer interactions. Thus, behavioral evidence of social helplessness and other aspects of social functioning is of great value. This study used rigorous methods (i.e., peer assessment of exclusion and behavioral assessment of social helplessness) and permitted meditational tests. Additionally, the relations among anxious solitude, peer exclusion, and helpless social behavior were examined while controlling for externalizing behavior to eliminate potential confounds. In addition, sex differences were tested.

Affective Mediation

We expected that anxious solitary and excluded children would exhibit social helplessness because, compared with other children, they experience more upset affect in the face of social challenge. Anxious solitude is conceptualized as habitual worry about whether one's social behavior is competent or if social partners will react positively to one's overtures. Because anxious solitary children are expected to be primed with pre-existing fears, when they encounter a social challenge their affective response may be rapidly stepped up, thus impeding adaptive social behavior. In contrast, other children who are less primed by social anxiety may experience more moderate affective responses to social challenge, which permit them to generate more constructive behavioral responses. Likewise, children who are habitually excluded may also be primed to experience strong affective responses to social challenge because such occurrences may trigger their feelings about many similar experiences. Consequently, children who are both anxious solitary and excluded may be doubly primed.

Social–Cognitive Mediation

Social–cognitive processes have long been studied as mechanisms in socially helpless behavior. With regard to cognitions about the self, theory and evidence support low perceived social self-efficacy (the belief that one has low ability to accomplish one's social goals) as a predictor of social helplessness (Bandura, 1988, 1991; Caprara et al., 1999; Dweck & Leggett, 1988). The rationale is that if children believe that they have low social ability, they are unlikely to try to achieve their goals. Because they do not attempt to achieve their social goals, they do not have the opportunity for experiences that would contradict their self-perceptions of low social ability. By extension, it is possible that low social self-efficacy may underlie anxious solitary children's pattern of helpless

responding to social challenge. Although social self-efficacy has not often been studied in anxious solitary children, there is evidence that they report low self-efficacy for assertive (Wichmann, Coplan, & Daniels, 2004) and prosocial behaviors (Erdley & Asher, 1996). However, social self-efficacy has yet to be tested as a mediator of the relation between anxious solitary excluded status and social helplessness.

With regard to cognitions about others, children who endorse high compared to low levels of angry expectations of rejection in response to ambiguous hypothetical vignettes have been found to subsequently report more emotional distress following experimentally manipulated behavioral rejection and to demonstrate acting out behaviors at school (Downey et al., 1998). Also, recent evidence indicates that high levels of anxious expectations of rejection among middle school students predict increased self-reported social anxiety 4 months later (London et al., 2007). Yet, the ability of anxious and angry expectations of rejection to predict helpless social behavior has not yet been examined. Downey et al. (1998) speculated that "whereas angry expectations (of rejection) promote aggressive behavior, anxious expectations (of rejection) may promote social withdrawal… (and) make a child more vulnerable to helplessness… when they perceive rejection" (p. 1088). The rationale is that children who are expecting peer rejection may detect it at lower thresholds (e.g., in ambiguous situations) and may therefore feel hurt and be quicker than other children to either give up or act out in challenging situations. The present investigation examines both anxious and angry expectations of rejection in relation to anxious solitude, exclusion, and behavioral and emotional responses to behavioral rejection. However, we did not assume that anxious solitary children would endorse only anxious but not angry expectations of rejection. Children whose overall behavioral orientation is characterized by social anxiety may nevertheless feel angry in response to behavioral rejection, although they would not be expected to act on this feeling in the same way as aggressive children.

A notable feature of the constructs of angry and anxious expectations of rejection (both assessments of rejection sensitivity) is that the constructs link cognition and emotion (they are computed by multiplying the child's self-reported affect by his or her expectations). That this cognitive–affective construct has successfully predicted emotional response to behavioral rejection (Downey et al., 1998) suggests that emotional processes are involved in socially helpless responding. Children who experience emotional upset may give up in response to a social challenge because this relieves their upset, even though the initial goal of interaction is abandoned in the service of this relief. More mechanistic knowledge is needed about how emotion regulation processes operate in socially challenging situations to produce social helplessness. In this investigation, we look below the surface of children's affective displays to examine the physiological systems that may mediate their responses to interpersonal stress. Although little information was available to guide our hypotheses about the influence of everyday interpersonal stress on physiological mechanisms of emotion regulation, there is a growing literature linking emotion regulation and anxiety.

Regulatory Mediation

Emotion regulation is defined as efforts on the part of the individual to manage, modulate, inhibit, and enhance emotions and occurs at multiple levels, including physiology, cognition, and behavior (Calkins & Fox, 2002). Investigations of potential physiological mechanisms of emotion regulation have increasingly found relations between anxiety and cardiac vagal tone. Vagal tone is an index of parasympathetic nervous system engagement and serves to maintain homeostasis when an organism is at rest. Vagal tone is estimated from a component of heart rate (HR) variability. In the absence of situational challenge, or rest, HR varies in synchrony with the breathing cycle (this component of HR variability is referred to as respiratory sinus arrhythmia or RSA). High resting RSA is linked with the ability to engage actively and flexibly with the environment and with competent emotional reactivity. Conversely, low resting RSA is linked to anxiety (Beauchaine, 2001; Friedman, 2007). In the face of situational challenge, moderate suppression of RSA, through regulatory signals from the vagus nerve, reflects disengagement of the parasympathetic nervous system. This disengagement is believed to permit engagement of the sympathetic nervous system and physiological processes, including increased HR, that allow the child to shift from maintaining homeostasis to enacting more demanding internal processes, such as the generation of coping strategies to control affect and behavior (Calkins, Graziano, & Keane, 2007). There is growing research evidence to indicate that anxious individuals demonstrate excessive suppression of RSA in

response to situational challenge (Beauchaine, 2001; Friedman, 2007). Although much of this evidence stems from research on adults, several studies have produced similar results with children.

Children high in behavioral inhibition—early-occurring wariness toward unfamiliarity and challenge that is believed to be a risk factor for later anxious solitude—demonstrate low resting RSA (Kagan, Reznick, & Snidman, 1987; Rubin, Hastings, Stewart, & Henderson, 1997). Complementary findings indicate that inhibited children also demonstrate high stable HRs (Kagan et al., 1990). Similarly, 3-year-olds with low resting RSA, in comparison to those with high resting RSA (as well as high behavioral activity and low distractibility), subsequently demonstrated more stable solitary play and less increase in interactive play during the first weeks of preschool (Fox & Field, 1989). Likewise, 6- to 8-year-old boys with low compared to high resting RSA were rated as less sociable by their teachers and less emotionally regulated by their parents, although similar results were not obtained for girls (Eisenberg, Fabes, Murphy, & Maszk, 1995). Although few studies have examined the relation between vagal suppression and anxiety in children, results from research with adults link excessive vagal suppression with anxiety (Beauchaine, 2001; Friedman, 2007). Thus, it was expected that anxious solitude would be linked with low resting vagal tone, excessive vagal suppression, and elevated HR in response to an interpersonal stressor. Furthermore, consistent with a diathesis–stress hypothesis, it was expected that the relation between anxious solitude and vagal regulation in response to an interpersonal stressor would be moderated by the ongoing level of interpersonal stress in children's daily lives, such that hypothesized patterns would be most likely to occur in dual-risk anxious solitary excluded children.

Supplementary Behavioral, Affective, and Regulatory Processes as Outcomes

Assessment of affective and regulatory processes that occur as children respond to social challenge not only permits examination of these processes as mediators of the relation between dual anxious solitary excluded status and social helplessness, but also provides the opportunity to examine the relation between anxious solitary excluded status and dynamic affective and regulatory processes in their own right. It was expected that dual-risk anxious solitary excluded children, relative to normative and/or single-risk children, would demonstrate more upset affect, greater vagal tone suppression, and more elevated HR in response to social challenge. Additionally, examination of linkages among process variables was also planned.

The Present Study

The present study examined the contribution of child behavior (anxious solitude), interpersonal stress (peer exclusion), and affective (self-reported and observed affect), social–cognitive (social self-efficacy and expectations of rejection), and regulatory processes (RSA, HR) to social helplessness and dynamic change in emotional functioning in response to an adapted version of Downey et al.'s (1998) experimental behavioral peer-rejection paradigm. Child–interpersonal stress groups that were expected to respond differently to behavioral rejection were identified on the basis of joint anxious solitude (child) and peer exclusion (interpersonal stress) criteria that predated the experiment. We hypothesized that anxious solitary excluded children would self-report more anticipation of rejection and demonstrate more social helplessness prior to behavioral rejection than would normative children (although this initial helplessness was expected to be rare) and that they would demonstrate more socially helpless behavior, more feelings of rejection, and more observed emotional upset after behavioral rejection than would normative children. Further, anxious solitary excluded children were expected to demonstrate excessive and sustained suppression of RSA and elevated HR relative to average patterns of more moderate and less sustained RSA suppression and HR elevation. In contrast, single-risk anxious solitary or excluded children were expected to display more moderate elevation in socially helpless behavior and lower levels of emotional upset, including less excessive vagal suppression and HR elevation. Additionally, it was anticipated that children who had high expectations of peer rejection, low self-efficacy for social initiation, and heightened feelings of rejection during the experiment would also demonstrate elevated socially helpless behavior, heightened emotional responses to behavioral rejection, and nonnormative regulatory functioning in response to behavioral rejection. The final aim of the investigation was to examine the extent to which affective, social–cognitive, and regulatory processes accounted for linkages between child-stress profiles and socially helpless behavior and emotional functioning.

Method

Participants

Study children (n = 163) were selected from 688 peer sociometric screening participants with informed parental consent (age at the outset of the study: M = 8.66 years, SD = 0.50) drawn from 46 third-grade classrooms in seven public schools in primarily suburban and some rural regions of the Southeastern United States. The screening sample comprised 80% (688/856) of children in participating classrooms (and at least 70% of children per classroom). The screening sample was diverse in children's sex (354, or 51.5%, were female; 334, or 48.5%, were male), race/ethnicity (62% European American, 20% African American, 16% Latino, and 2% Asian American), and socioeconomic status (30% of children received free or reduced school lunch). Third-grade children were targeted because social–cognitive patterns associated with social helplessness were expected to be present by this age (Downey et al., 1998; Erdley et al., 1997; Goetz & Dweck, 1980), and this grade level corresponds to the first age at which there is evidence that peer sociometrics are reliable assessments of anxious solitude (Younger, Schwartzman, & Ledingham, 1985, 1986).

Approximately half of participants (n = 80) were selected because they scored at or above 1 SD in peer-reported anxious solitude in the fall of third grade (this measure is described in greater detail later). All children who met this criteria were invited to participate in a more in-depth study that included the experiment (unless they were disqualified on the basis of having an Autism-spectrum disorder or having an extremely low level of English proficiency that would not have allowed them to speak with the experimenter; n = 10 or 1.5% of the screening sample). Of the 87 anxious solitary children who were invited, 80, or 92%, accepted the invitation. No demographic (age, sex, ethnicity, free/reduced lunch status), behavioral, or relational differences were found between those anxious solitary children who participated versus those who declined participation in the in-depth portion of the study. An approximately equal number of children were selected as demographically matched controls (n = 83) to eliminate demographics as a confound for any differences between anxious solitary and nonanxious solitary children. Controls were selected on the basis of scoring below 1 SD in peer-reported anxious solitude in the fall of third grade and being the closest match for an anxious solitary child with regard to sex, ethnicity, age, classroom, and free- or reduced-lunch status. Selected children did not differ from nonselected children in the screening sample with regard to age (selected M = 8.70 years, SD = 0.55; nonselected M = 8.65 years, SD = 0.48), $t(686) = 0.94$, ns or in the rate at which they received free or reduced lunch (selected = 31%, nonselected = 29%), $\chi 2(1, N = 688) = 0.23$, ns.

There was a higher frequency of female (59%) than male (41%) selected children, in comparison to nonselected screening children (female = 49%, male = 51%), $\chi 2 = 4.74$, $p < .05$. Although equal prevalence of elevated anxious solitude among boys and girls is typically found in the developmental literature—particularly when anxious solitude is assessed in early childhood (Coplan, Gavinski-Molina, Lagace-Seguin, & Wichmann, 2001)—a few recent developmental studies have reported a greater prevalence of anxious solitude in girls (Burgess et al., 2006; Rubin et al., 2006), and clinically significant social anxiety is more common among girls than boys (Albano & Krain, 2005). Thus, it is not surprising that the current difference in prevalence favors girls. The race/ethnicity of the selected sample is diverse and resembles the composition of the screening sample except that marginally more Latino children, $\chi 2(1, N = 688) = 3.53$, $p < .10$, and significantly fewer African American children, $\chi 2(1, N = 688) = 6.19$, $p < .05$, were selected (selected vs. nonselected: 64% vs. 61% European American, 14% vs. 23% African American, 21% vs. 15% Latino, and 2% vs. 2% Asian American). Ethnic differences were not hypothesized and are not necessarily related to culture. The tendency toward elevated anxious solitude among Latino children may be related to stressful economic or acculturation conditions. Because children were selected on the basis of elevated anxious solitude scores (or having demographics that matched those of children with elevated anxious solitude scores), demographic discrepancies between the screening and selected samples are a result of differential prevalence of elevated anxious solitude among demographic groups in this sample.

Of 163 selected study participants, 162 completed the experiment, 160 had usable observational and self-report experimental data, and 154 had usable physiological data. Thus, all analyses are based on these 160 children, except those predicting physiological outcomes for which the sample is 154. Missing physiological data were

most often caused by equipment malfunction (e.g., the chest band came loose during the experiment). Thus, complete data were available for 98% of participants for most experimental measures and for 95% of participants for physiological measures. No significant differences were obtained for those with complete versus missing data.

Procedure

Sociometric screening and self-report measures

Sociometric screening was conducted in the fall and spring of third grade. Spring sociometric assessments were used in analyses because they were most proximal in time to the experiment and demonstrated superior predictive validity relative to fall or combined fall and spring data. Peer nominations were administered simultaneously to participating children in each classroom. Each nomination was read aloud to the class, and then children selected classmates' names on their individual class rosters. Nominations were unlimited and cross-sex nominations were allowed because these procedures result in superior psychometric properties (Foster, Bell-Dolan, & Berler, 1986; Terry & Coie, 1991). Children's scores on each item were equal to the total number of nominations they received from classmates. These scores were standardized by classroom to control for variation in classroom size. Although some investigators standardize sociometric scores by sex, it was considered preferable to preserve sex differences so that they could be explicitly tested in analyses. Multi-item composites were computed as detailed later.

In the spring, children also completed self-report questionnaires (described later) in small groups (5 children or less) with the aid of research assistants who read all measures aloud. Each child participated in the experiment individually.

Experimental behavioral peer rejection analogue

The experimental behavioral peer rejection analogue was adapted from a procedure developed by Geraldine Downey et al. (1998). Downey et al.'s extensive pilot work determined this method to be the least severe behavioral rejection manipulation that would yield a detectable increase in distress among rejection-sensitive children. The experimental manipulation involves a mild perceived behavioral rejection (which is corrected at the end of the study) similar to rejections that children may encounter during peer interactions in their daily lives.

Children participated in the behavioral rejection analogue individually with an experimenter in a room at their school (for an overview of the experiment, see Figure 1). The experimenter was a graduate student trained by Heidi Gazelle. The experimenter first established rapport with the child while walking him or her to the room where the experiment was to take place and settling the child into a seat opposite herself across a small table. The experimenter then asked the child to put on a chest band and explained that it would record the child's heart beat. The experimenter invited the child to listen to his or her heart beat as indicated by beeps from the vagal monitor (an experience children seemed to enjoy) to increase his or her comfort with the equipment. She then silenced the beeping (but cardiac data were continuously recorded throughout the remainder of the experiment) and asked the child to wait quietly as she finished some work. After this 2-min period during which baseline cardiac data were recorded, the experimenter announced that it would be helpful to continue the interview with a friend and asked the child to name a classmate whose company he or she would enjoy during the interview. In the rare instances in which a child did not identify a friend, the experimenter asked a follow-up question to provide the child with a second chance to volunteer a friend. If the child did not identify a friend after the second prompt, the experimenter suggested a classmate (see selection procedure under the Measures used to identify a friend only if child initially declined to do so section) and asked the child's permission to ask this friend to join the interview.

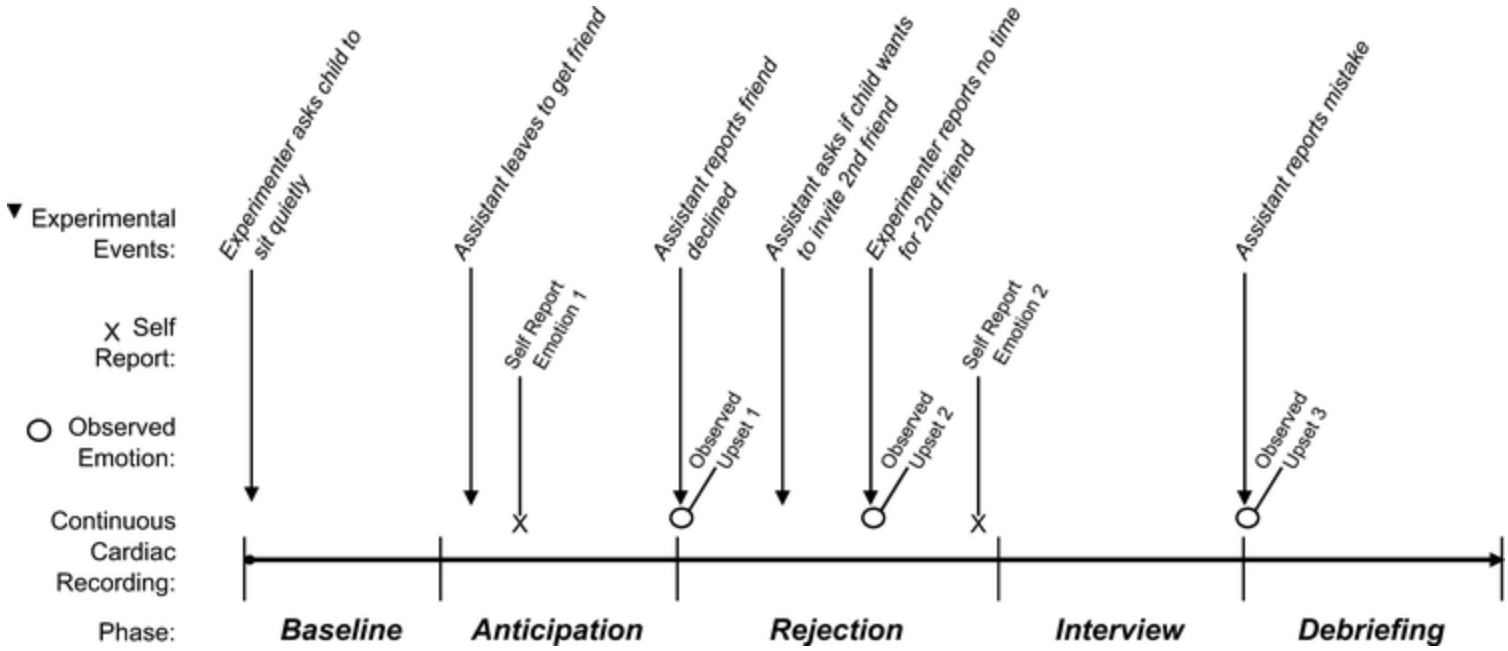

Figure 1. Timeline of experimental events.

After a friend was identified, the experimenter then called her assistant into the room and asked that she bring the friend. During the assistant's brief absence, the experimenter asked the child to complete a short self-report emotional distress questionnaire and explained that it was a questionnaire that his or her classmates completed on another day while the child was out of the classroom. After the child completed the questionnaire, the assistant returned and reported, "Your friend said he/she didn't want to come." The experimenter then asked, "What?" The assistant repeated the message and then asked the child, "Do you want me to ask someone else?" After the child responded, the experimenter stated, "That's OK. We don't have enough time." The assistant then left the room. Immediately after the assistant's exit, the experimenter gave the child another short emotional distress measure (with the same questions in a counterbalanced order), completed the interview, and offered the child a small gift. The assistant then returned and explained that she made a mistake because she was unfamiliar with the school: She asked a child she saw in the hall to join the interview and then afterward realized it was the wrong child. 1 She apologized profusely. Downey et al. (1998) reported that most children find the assistant's error amusing, and we also found this to be true. The experimenter then spent extra time interacting with the child to unobtrusively check that he or she had no ill feelings toward his or her friend and was in a good mood when he or she returned to class. The experimenter also checked that the child had believed the behavioral rejection manipulation at this point, and all children indicated that they did. The experimenter rated the child's observed affect at the time of the putative behavioral rejection, being told that there was no time for a second friend, and debriefing (rating scale described later). The assistant also rated the child's affect at the time of behavioral rejection and debriefing (but not when the child was told there was no time for a second friend because the child was looking away from the assistant at that time). Each of the measures that was derived from the experiment or used to predict differential performance during the experiment is described later.

Measures Administered Prior to the Experiment

Measures used to identify a friend only if child initially declined to do so. The experimenter relied on the following data to suggest a friend to invite for the experiment only in the event that the child declined to do so. Peers nominated an unlimited number of classmates who "are your close friends." When children chose each other as close friends, they were counted as reciprocal friends. If no reciprocated friend could be identified through sociometric data (n = 1), the experimenter referred to a back-up list of children who the child had been observed to play with at recess during a separate 25-min observational component of the study.

Anxious solitude

The anxious solitude composite is composed of three peer nominations. Peers nominated classmates who (a) "act really shy around other kids. They seem to be nervous or afraid to be around other kids and they don't talk much. They often play alone at recess"; (b) " watch what other kids are doing but don't join in. At recess they watch other kids playing but they play by themselves"; and (c) "are very quiet. They don't have much to say to other kids." These nominations were adapted from previous investigations (e.g., Gazelle & Ladd, 2003). This composite demonstrated adequate reliability in the fall and spring (α = .76–.86) as well as fall-to-spring 6-month stability (r = .72, $p < .001$).

Exclusion

Peers nominated classmates who (a) "get left out when other kids are talking or playing together. They don't get invited to parties or chosen to be on teams or to be work partners" and (b) "ask if they can play and other kids say 'no' and won't let them play." This composite demonstrated adequate reliability at each time point (α = .73–.83) and 6-month stability (r = .68, $p < .001$). Anxious solitude and peer exclusion have been shown to be positively correlated but separate constructs (for confirmatory factor analyses, see Bowker, Bukowski, Zargarpour, & Hoza, 1998; Gazelle & Ladd, 2003). Consistent with previous findings, present results also indicate that these constructs were positively correlated (rs = .56–.68, $p < .001$; see Table 1 for intercorrelations among all study measures).

Table 1
Intercorrelations Among All Variables

Variable	Peer sociometrics				Sex	Self-report					Observed upset		
	1	2	3	4	5	6	7	8	9	10	11	12	13
M	0.60	0.33	1.28	−0.17	−0.19	1.46	1.43	6.33	7.01	2.92	1.31	1.21	1.05
SD	1.44	1.30	2.59	0.95	0.99	0.58	0.63	3.65	3.66	0.61	0.48	0.43	0.27
Peer sociometrics													
1. Anxious solitude	1.00												
2. Exclusion	.68***	1.00											
3. Anxious Solitude × Exclusion	.58***	.64***	1.00										
4. Externalizing behaviors	−.13	.15†	.04	1.00									
Sex													
5. Child sex	.06	.18*	.21**	.24**	1.00								
Self-report													
6. Anticipatory feelings of rejection	.29***	.35***	.28***	.06	.06	1.00							
7. Reactionary feelings of rejection	.20**	.24**	.23**	.10	−.03	.81***	1.00						
8. Angry expectations of rejection	.02	.10	.08	.09	.08	.24**	.29***	1.00					
9. Anxious expectations of rejection	−.05	.03	−.04	.08	−.08	.15†	.19*	.53***	1.00				
10. Social self-efficacy for initiation	−.05	.05	.09	.12	.17*	−.17*	−.21**	−.17*	−.39**	1.00			
Observed upset													
11. Rejection	.19*	.19*	.10	.02	.06	.13†	.17*	.00	.04	−.02	1.00		
12. No time for second friend	−.02	−.04	.00	.14	.03	−.05	−.02	.19*	.12	−.08	.19*	1.00	
13. Debriefing	.08	.13	.15†	−.03	.18*	.01	.00	.24**	.01	−.06	.27***	.14	1.00
Vagal tone as indexed by RSA													
14. Baseline	−.03	−.02	.01	.13	.03	.12	.15†	.05	−.05	.02	−.01	.04	−.08
15. Anticipation of rejection change from baseline	.00	.04	−.12	−.09	.00	.05	.02	.21**	.06	−.02	.13	.06	.11
16. Reaction to rejection change from baseline	.00	−.01	−.15†	−.07	.04	.07	.02	.20*	.04	−.03	.07	.02	−.01
17. Interview change from baseline	−.02	.08	−.09	.10	.01	.02	−.05	.15†	.05	.03	.05	−.02	.18*
18. Debriefing change from baseline	−.03	−.10	−.21*	−.14†	−.09	.01	−.04	.19*	.16*	−.05	−.02	.02	−.03
Heart period													
19. Baseline	−.01	−.01	−.10	.10	−.01	.10	.12	.03	.04	−.02	−.05	−.10	−.09
20. Anticipation of rejection change from baseline	.12	.19*	.12	.03	.13†	−.02	−.04	.09	−.09	.05	.02	.11	.06
21. Reaction to rejection change from baseline	.10	.10	.08	−.03	.09	−.05	−.03	.11	−.10	.10	.07	.09	.09
22. Interview change from baseline	.03	.07	.02	−.09	.19*	−.02	−.03	.05	−.13	.06	.08	.08	.08
23. Debriefing change from baseline	−.01	−.08	−.03	−.13	−.03	−.09	−.09	.07	−.11	.09	−.04	.03	.05
Discrete behaviors													
24. Social helplessness before rejection	.19*	.13†	.16*	−.04	−.09	.15†	.15†	.07	.07	−.12	.05	−.05	−.02
25. Social helplessness after rejection	.19*	.16*	.17*	.00	.20*	.01	.06	.09	.06	.09	.20*	—	.06

Note. $N = 160$, except for (a) observed upset when children were told there was no time for a second friend ($n = 122$) because 36 children did not choose a second friend and (b) physiological data ($n = 154$). A dash indicates that a correlation could not be computed because of restricted variation. RSA = respiratory sinus arrhythmia.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Intercorrelations Among All Variables

Table 1 (*continued*)

Vagal tone					Heart period					Discrete behaviors	
14	15	16	17	18	19	20	21	22	23	24	25
6.11	−0.26	−0.30	−0.39	−0.42	673.34	−34.77	−31.97	−34.56	−28.32	0.01	0.24
1.17	0.78	0.74	0.81	0.94	102.98	44.85	47.37	57.39	54.85	0.11	0.43
1.00											
−.20*	1.00										
−.25**	.79***	1.00									
−.40***	.61***	.64***	1.00								
−.26***	.55***	.60***	.58***	1.00							
.71***	.02	.03	−.07	−.02	1.00						
−.42***	.08	.04	.06	.16†	−.57***	1.00					
−.42***	.09	.11	.08	.21**	−.58***	.87***	1.00				
−.34***	.20*	.16*	.12	.18*	−.53***	.69***	.75***	1.00			
−.29***	.22**	.22**	.21**	.46***	−.48***	.61***	.70***	.63***	1.00		
−.02	.00	−.03	.00	−.01	−.05	.12	.06	.01	.17*	1.00	
.09	.06	.02	−.05	−.02	.16*	−.04	−.03	−.04	−.09	.07	1.00

Intercorrelations Among All Variables Group identification

The following mutually exclusive groups were identified from spring sociometric data. Normative children were below the top tertile in both anxious solitude and peer exclusion. Anxious solitary excluded children were above or at the top tertile in both anxious solitude and peer exclusion. Anxious solitary children were above or at the top tertile in anxious solitude but were below the top tertile in peer exclusion, and excluded children were above or at the top tertile in peer exclusion but were below the top tertile in anxious solitude. Tertiles were determined relative to the whole spring screening sample. See Table 2 for group sizes, sex distributions by group, and a summary of identification criteria.

Table 2
Group Frequency, Sex, and Identification Criteria

Group	*N*	% female	Above or below top spring tertile: Anxious solitary	Above or below top spring tertile: Excluded
Normative group	83	59	<	<
Anxious solitary excluded group	34	47	≥	≥
Anxious solitary group	27	74	≥	<
Excluded group	16	63	<	≥
Total	160	59		

Group Frequency, Sex, and Identification Criteria Externalizing behaviors

Externalizing behaviors were assessed to control for this possible confound in the relation between groups and cognitive and emotional responses to behavioral rejection. Peers nominated classmates who (a) "start fights, call kids bad names, say mean things, and hit other kids," (b) "make up stories about other kids that aren't true and spread rumors about kids in their class," and (c) "get out of their seats a lot, act wild, and make a lot of noise. They bother people who are trying to work." This composite demonstrated adequate reliability (α = .80–.83) and 6-month stability (r = .73, $p < .001$).

Rejection sensitivity

Children's sensitivity to peer rejection was assessed on an abbreviated form of the Children's Rejection Sensitivity Questionnaire (Downey et al., 1998). Children were presented with five peer-related vignettes in which they were asked to imagine that they had made a social overture toward a peer or were in a social situation and were awaiting a peer response. Scores are calculated by multiplying the expectation rating (e.g., "do you think the kid will want to talk to you?" which ranged from 1 = yes, definitely to 5 = no, definitely not) by the affect rating (e.g., "how mad/ nervous would you feel about whether or not the kid will want to talk with you?" which ranged from 1 = not mad/nervous to 5 = very, very mad/nervous) for each situation (angry expectations score = expectancy of rejection × anger; anxious expectations score = expectancy of rejection × anxiety). The mean was then computed across situations (angry expectations: M = 6.33, SD = 3.65; anxious expectations: M = 7.01, SD = 3.66). Higher scores indicate stronger angry or anxious expectations of rejection. Angry and anxious expectations of rejection were moderately correlated (r = .53, $p < .001$).

Social self-efficacy

Children reported on their self-efficacy for making social initiations toward peers on an abbreviated version of the Children's Self-Efficacy for Peer Interactions Scale (Wheeler & Ladd, 1982). Children rated how easy or hard it would be for them on a 4-point scale (1 = very hard to 4 = very easy) to verbally make a social overture with a peer in a given situation (6 items, α = .68; e.g., "You want to start a game. How easy or hard is it for you to ask other kids to play the game?"; Kim & Cicchetti, 2003; Wheeler & Ladd, 1982). Scores were calculated as the mean (M = 2.92, SD = .61), with higher scores indicating greater social self-efficacy for initiation.

Measures Collected During the Experiment

Observed upset

Experimenter 1 rated the extent to which the child displayed upset affect on a 3-point scale (1 = not upset, 2 = a little upset, 3 = very upset) when three events occurred during the experiment: behavioral rejection (M = 1.31, SD = 0.48), the child being told there is no time for a second friend (M = 1.21, SD = 0.43), and debriefing (M = 1.05, SD = 0.27). Higher scores indicate more observed upset. Both experimenters rated affect for all children for the first and last events, and their ratings demonstrated excellent interrater reliability (behavioral rejection κ = .96, debriefing κ = .91).

Self-reported feelings of rejection

Children reported how they were feeling on the Distress Questionnaire (Downey et al., 1998) at two time points—during the anticipation of their friend's arrival and after their response to being asked whether they would like to choose another friend after the first friend declined. A feelings-of-rejection composite was computed from six items: "I feel… left all alone," "like I wish I had more friends," "left out," "like other kids don't like me," "like nobody understands me," and "like nobody cares about me." Items were rated on a 4-point scale ranging from 1 = not at all true to 4 = very true (anticipation: M = 1.46, SD = 0.58; reaction: M = 1.43, SD = 0.63). Higher scores indicate more feelings of rejection. This composite demonstrated good reliability for both the anticipation and behavioral rejection phases of the experiment (α = .80–.85).

Social helplessness in initiating social contact

Social helplessness in initiating social contact was coded from the child's response when he or she was first asked to name a friend to invite to join in the interview. When children chose a friend, their response was coded as 0, and when children stated that they did not have a friend to invite, their response was coded as 1. Higher scores indicate more social helplessness in initiating social contact.

Social helplessness in response to a social setback

Social helplessness in response to a setback was coded from the child's response when he or she was asked to name a second friend to invite to participate in the interview after the child was told that the first friend he or she named did not want to come. Children who chose a second friend were coded as 0 and children who did not were coded as 1. Higher scores indicate social helplessness in response to a setback.

Heart period (HP) and vagal tone

Child HP and vagal tone are indicative of emotional reactivity and regulation and were continuously recorded with an electrocardiogram (EKG) during the in-school experiment to index physiological reactivity and regulation (Calkins, 1997; Calkins & Dedmon, 2000). HP is time elapsed between heart beats in milliseconds (the interbeat interval) and is inversely related to HR (a shorter HP is indicative of faster HR). HP is the product of both the sympathetic nervous system and parasympathetic nervous system in addition to other influences, such as motor activity (Beauchaine, 2001). Vagal tone is a component of parasympathetic control and was measured as the amplitude (difference between the peak and mean values) of RSA. At the beginning of the experiment, the child was asked to sit quietly for 2 min to generate resting measures of HP and RSA. Event markers were inserted into the data file during recording when the experimenter unobtrusively pressed a button on the vagal tone monitor to indicate the onset and offset of separate phases of the experiment (baseline, anticipation, behavioral rejection, interview, and debriefing).

The experimenter asked the child to wear a chest band with two embedded electrodes. Electrodes were connected to a preamplifier, the output of which was wirelessly transmitted to a vagal tone monitor (Series 2000 Mini-Logger, Mini Mitter Co., Inc., Bend, OR), which was placed on the table in front of the experimenter. After the experiment, a data file containing the interbeat intervals for the entire period of collection was transferred from the vagal tone monitor to a computer for later artifact editing (resulting from child movement) and analysis. With the software program MXEDIT (Delta Biometrics, Inc., Bethesda, MD), the files were edited by scanning the data for outlier points relative to adjacent data and by replacing these points by dividing or summing them so that they would be consistent with surrounding data. Data files that required editing more than 10% of the data were not included in analyses (n = 6). Edited data files were analyzed to derive mean HP and the RSA component of HP variance. 2 Descriptive statistics for HP and RSA for the baseline and subsequent experimental phases are reported in Table 1.

Results

Analytic Overview

Analyses were aimed at examining children's socially helpless behavior and multimodal affective/regulatory functioning during the experiment. In each analysis, criteria are first predicted from child-stress (anxious solitary excluded) groups only and then from additional multimodal affective, social–cognitive, and regulatory processes. First, children's socially helpless responses to discrete experimental events were examined with

hierarchical binary logistic regression. Second, children's self-reported feelings of rejection during two experimental events (anticipation of and response to behavioral rejection) were examined in a series of repeated measures analyses of covariance. Third, growth curves of children's observed affect during three experimental events (anticipation of and response to behavioral rejection and debriefing) were modeled with hierarchical linear modeling (Raudenbush & Bryk, 2002). Fourth, growth curves of children's vagal tone (RSA) and HP throughout the experiment (at five time points: baseline, anticipation of behavioral rejection, response to behavioral rejection, interview, and debriefing) were analyzed with hierarchical linear modeling. Growth curve analyses included tests of significant differences among particular trajectories during specific experimental events as computed in SAS PROC MIXED. Sex and externalizing behaviors were controlled in all analyses.

Social Helplessness During the Experiment

In hierarchical binary logistic regression, socially helpless responses to discrete experimental events were first predicted from groups (in Block 1) and then to test mediation, affective, social–cognitive, and regulatory variables (in Block 2: angry expectations of rejection, social efficacy for initiation, self-reported anticipatory and reactionary feelings of rejection, observed upset during behavioral rejection, and vagal tone during behavioral rejection), and controls (child sex and externalizing behavior) were added. Only those process and control variables that produced the strongest test statistic (Wald chi-square) achieved entry in analyses.

As expected, the demonstration of initial social helplessness prior to behavioral rejection was rare (see Table 3). Because only anxious solitary excluded children and no reference normative children (or children in any other groups) demonstrated initial social helplessness, it was not possible to calculate odds ratios or logistic regression for this criterion. Therefore, the proportion of anxious solitary excluded versus normative children demonstrating initial social helplessness was tested through regular chi-square tests and found to be significant, consistent with expectations (see Table 3). Interestingly, the two anxious solitary excluded children who initially declined to name friend to join them in the interview both had reciprocated best friends that they could have chosen (as determined by peer friendship nominations).

Table 3
Hierarchical Binary Logistic Regression of Group on Social Helplessness, With Affective Mediators

Predictor	Yes	No	Yes/no ratio	Focal/normative odds ratio	6	*SE*	Wald χ^2
Social helplessness in initiating social contact[a]							
Groups (regular χ^2)							
Normative (norm)	0	83	0.00				
Anxious solitary excluded vs. norm	2	32	0.06	—	—	—	4.96*
Anxious solitary vs. norm	0	27	0.00	—	—	—	—
Excluded vs. norm	0	16	0.00	—	—	—	—
Mediator (supplementary *t* test)							
Anticipatory feelings of rejection							14.04***
Social helplessness in response to a social setback							
Block 1: Groups							
Norm	13	70	0.19				
Anxious solitary excluded vs. norm	11	23	0.48	2.58	0.95	0.47	3.97*
Anxious solitary vs. norm	9	18	0.50	2.69	0.99	0.51	3.80*
Excluded vs. norm	5	11	0.45	2.45	0.90	0.62	2.10
Block 2: Groups and mediator							
Anxious solitary excluded vs. norm				2.08	0.73	0.49	2.21
Anxious solitary vs. norm				2.49	0.91	0.52	3.12*
Excluded vs. norm				2.18	0.78	0.63	1.53
Observed upset at rejection				2.15	0.77	0.39	3.96*

Note. $N = 160$. Directional hypotheses permitted one-tailed tests.
[a] A regular chi-square rather than Wald chi-square is reported for group effects; process variables were examined through *t* test in this analysis only.
* $p < .05$. *** $p < .001$.

Hierarchical Binary Logistic Regression of Group on Social Helplessness, With Affective Mediators

Because it was not possible to directly test process variables as mediators of initial social helplessness through logistic regression (see the previous paragraph), t tests examining mean differences between children who did versus did not display initial social helplessness were computed. Results revealed that children who did versus

did not demonstrate initial social helplessness reported significantly more anticipatory feelings of rejection (M = 3.00 vs. 1.81, respectively), $t(157) = 14.04$, $p < .001$; no other process variables were significant. Although mediation could not be directly tested, these results are consistent with the interpretation that anxious solitary excluded children demonstrated initial social helplessness because of heightened anticipatory feelings of rejection. Although no significant sex difference was obtained, it is also noteworthy that the two children who demonstrated initial social helplessness were girls.

Additional analysis indicated a significant increase in social helplessness after versus before behavioral rejection for the sample as a whole, as indexed by the number of children who declined to identify a friend after versus before behavioral rejection (24% after vs. 1% before, $Z = 2.71$, $p < .01$). Furthermore, both anxious solitary excluded and anxious solitary children demonstrated significantly elevated rates of social helplessness after behavioral rejection relative to normative children (see Table 3); for the overall model, $\chi2(3) = 6.32$, $p < .05$. Both anxious solitary excluded and anxious solitary children were over 2.5 times more likely than normative children to demonstrate social helplessness after behavioral rejection. Of the 38 children who demonstrated social helplessness after rejection by declining to name a second friend, 76.8% thought they had another friend (made additional friendship nominations), and 51.7% of these children did have another reciprocated friend—other than the first friend they chose—that they could have invited. Thus, as argued by Goetz and Dweck (1980), social helplessness can be found among children with different levels of social success and is not simply a reflection of social success.

Results further indicated that heightened observed upset affect significantly predicted social helplessness after behavioral rejection (a one unit increase in observed upset predicted an odds ratio of more than twice the size) and that the anxious solitary excluded group effect was reduced to nonsignificance after upset affect was entered (see Table 3), which supports mediation; for the overall model, $\chi2(4) = 10.19$, $p < .05$ (see Figure 2). (The final criteria for mediation according to Baron & Kenny, 1986—that anxious solitary excluded group membership should predict upset affect during behavioral rejection—was also confirmed with a supplemental regression analysis; see Figure 2.) These results are consistent with the interpretation that anxious solitary excluded children demonstrated helpless responses to behavioral rejection because of heighted upset affect.

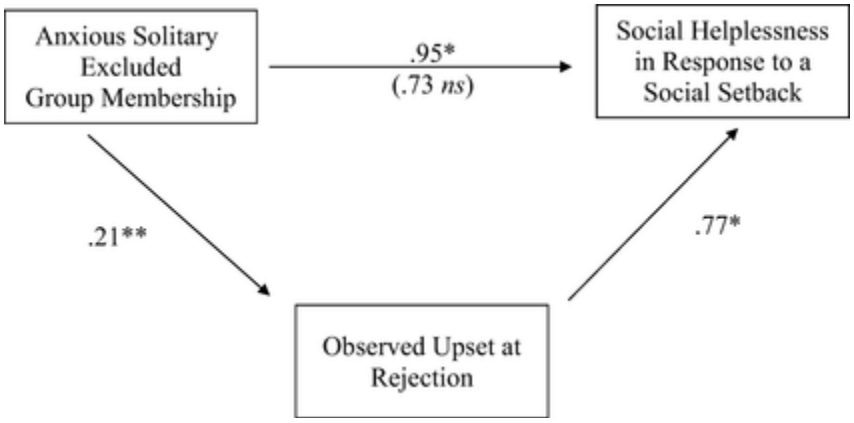

Figure 2. The relation between anxious solitary excluded group membership and social helplessness in response to a social setback was mediated by observed upset during rejection.
The beta indicating the ability of anxious solitary excluded group status to predict socially helpless responses to social setback was reduced to nonsignificance once observed upset during rejection was entered in the logistic regression model. The beta outside versus inside parentheses indicates the relation between anxious solitary group status and social helplessness before versus after observed upset was added to the model, respectively. * $p < .05$. ** $p < .01$.

Children's sex also achieved subsequent entry into the analysis, with boys demonstrating more social helplessness than girls in response to behavioral rejection: odds ratio = 1.67, Wald $\chi2(1) = 6.38$, $p < .05$; for the overall model, $\chi2(5) = 6.78$, $p < .01$. Other variables retained their significance levels from the first step of

Block 2. Because this sex difference was not hypothesized nor found in other similar investigations (see Erdley et al., 1997; Goetz & Dweck, 1980), it is not clear whether this is a reliable sex difference or if there is a compelling explanation for its occurrence. It may be that having dyadic social bids declined is more typical for girls than boys of this age, because boys spend more time playing in larger groups (Benenson, 1993; Benenson, Apostoleris, & Parnass, 1997; Maccoby & Jacklin, 1987). Boys may therefore have less practice with constructive responses to declined dyadic social bids.

Self-Reported Feelings of Rejection During the Experiment

Consistent with hypotheses, results indicate that anxious solitary excluded children self-reported significantly more feelings of rejection during the experiment than did normative children (see Table 4 for main group effect). Anxious solitary excluded children, relative to normative children, reported elevated feelings of rejection both as they anticipated the arrival of their friend (M = 1.78 vs. 1.30), t(41.57) = 3.58, p < .001, and after they were told there was no time for a second friend (M = 1.69 vs. 1.31), t(47.93) = 2.59, p < .05. Although this group demonstrated a slight decline in mean feelings of rejection between anticipation and learning that there was no time for a second friend, this change was not significant (see Time × Group interaction in Table 4). Additionally, anxious solitary and excluded children displayed moderate elevation in feelings of rejection, but these effects were not significant relative to normative children (for anticipation, Ms = 1.51–1.56), ts(33.54, 17.72) = 1.63, 1.68, ns, respectively (for reaction, Ms = 1.40–1.50), ts(108, 97) = 0.75, 1.21, ns, respectively. There were no significant differences between anxious solitary excluded, anxious solitary, and excluded groups.

Table 4
Repeated Measures Analyses of Covariance of Feelings of Rejection in Response to Experimental Events

	Initial model		Model with expectations		Model with efficacy		Model with vagal tone		Full model	
Predictors of feelings of rejection	*F*	$p\ \eta^2$	*F*	$p\ \eta^2$	*F*	$p\ \eta^2$	*F*	$p\ \eta^2$	*F*	$p\ \eta^2$
Between subjects										
Group	4.95**	0.09	4.67**	0.08	5.23**	0.09	5.51**	0.10	5.34**	0.10
Between-subjects covariates										
Angry expectations of rejection			11.85***	0.07					6.96**	0.04
Externalizing behavior			0.35	0.00					0.36	0.00
Social self-efficacy for initiation					7.37**	0.05			5.81*	0.04
Vagal tone							5.97*	0.04	4.23*	0.03
Within subjects										
Time	2.87†	0.02	2.40	0.02	1.01	0.01	0.54	0.00	0.30	0.00
Time × Group	1.08	0.02	1.12	0.02	1.31	0.02	1.09	0.02	1.27	0.02
Time × Angry Expectations of Rejection			2.23	0.01					1.43	0.01
Time × Externalizing Behavior			0.39	0.00					0.52	0.00
Time × Social Self-Efficacy for Initiation					2.09	0.01			1.57	0.01
Time × Vagal Tone							0.13	0.00	0.01	0.00

Note. $N = 160$. Child sex was tested as a covariate but was nonsignificant and thus removed from the final models.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Repeated Measures Analyses of Covariance of Feelings of Rejection in Response to Experimental Events

In addition to these group effects, angry expectations of rejection, social self-efficacy for peer initiation, and vagal tone were significant and unique covariate predictors of children's self-reported feelings of rejection during the experiment (see Table 4). Significantly more self-reported feelings of rejection were reported by children (a) high versus low in angry expectations of rejection (children in the top vs. bottom tertile; for anticipation, M = 1.59 vs. 1.36, respectively), t(110) = 2.13, p < .05 (for reaction, M = 1.60 vs. 1.31), t(110) = 2.30, p < .05; (b) low versus high in social self-efficacy for initiation (children in the bottom vs. top tertile; for anticipation, M = 1.59 vs. 1.31, respectively), t(114) = 2.50, p < .05 (for reaction, M = 1.63 vs. 1.28, respectively), t(113.81) = 2.95, p < .01; and (c) high versus low in vagal tone at behavioral rejection (children in the top vs. bottom tertile; for anticipation, M = 1.65 vs. 1.39, respectively), t(80.51)= 2.13, p < .05 (for reaction, M = 1.62 vs. 1.33, respectively), t(67.35) = 2.03, p < .05. Although there was a slight increase in the difference between these means at the second experimental event (learning that there was no time for a second friend), these effects were not significant (see Time × Angry Expectations, Time × Social Self-Efficacy, and Time ×

Vagal Tone interaction terms in Table 4). Despite the significance of expectation, efficacy, and vagal tone main effects, the group effect size (partial η squared: pη2) was not reduced after adding these process variables, suggesting that groups and processes were additive contributors to children's feelings of rejection during the experiment. Also, anxious expectations of peer rejection were significant only before angry expectations of rejection were controlled. Sex was likewise tested but nonsignificant. Therefore, both anxious expectations and sex were dropped from the final models in Table 4. Finally, externalizing behavior was also controlled as a covariate but did not account for a significant amount of variance or modify the significance of other effects.

Preliminary Analysis for Growth Curve Models

Prior to testing hypothesized effects for each criterion (observed upset affect, vagal tone, HP) in a growth curve analysis an initial unconditional model (a model with no Level 2 predictors) was performed. Because this analysis indicated that there was significant individual variation in intercepts and slopes over time, analyses testing the hypothesized models were then conducted. Similar to previous analyses, only process variables that achieved significance were retained.

Observed Affect During the Experiment

Consistent with hypotheses and children's self-reports, results of growth curve analyses indicated that anxious solitary excluded children demonstrated significant elevation in observed upset affect relative to normative children at the time of behavioral rejection, $\beta = 0.29$, $t(155) = 3.58$, $p < .001$ (see Table 5 and Figure 3). They subsequently demonstrated a decline in observed upset (a significant linear decline that was decelerated by a significant quadratic effect), such that they were less upset and did not differ significantly from normative children when they were told that there was no time for a second friend or at debriefing, $\beta = -0.06$, $t(272) = -0.66$, ns; $\beta = 0.04$, $t(272) = 0.50$, ns, respectively. 3 No other significant differences among groups emerged at any time.

Table 5
Growth Curve Analysis of Observed Upset Affect in Response to Experimental Events by Group

	Initial model			With angry expectations of rejection			Controlling for externalizing behaviors		
Predictor of observed upset affect	β	*SE*	*t*	β	*SE*	*t*	β	*SE*	*t*
Model for initial status of observed upset, π_{0i}									
Normative group, β_{00}	1.21	0.04	27.51***	1.21	0.04	27.69***	1.21	0.04	28.26***
Anxious solitary excluded group, β_{01}	0.29	0.08	3.58***	0.29	0.08	3.61***	0.29	0.08	3.70***
Anxious solitary group, β_{02}	0.13	0.09	1.52	0.13	0.09	1.53	0.13	0.09	1.54
Excluded group, β_{03}	0.17	0.11	1.58	0.17	0.11	1.59	0.17	0.11	1.62
Child sex, β_{04}	0.02	0.03	0.60	0.02	0.03	0.62	0.02	0.03	0.62
Angry expectations of rejection, β_{05}				0.00	0.01	−0.20	0.00	0.01	−0.20
Externalizing behavior, β_{06}							0.00	0.03	−0.04
Model for linear change in observed upset, π_{1i}									
Normative group, β_{10}	0.14	0.11	1.33	0.15	0.11	1.36	0.16	0.11	1.51
Anxious solitary excluded group, β_{11}	−0.58	0.21	−2.76**	−0.60	0.21	−2.89**	−0.62	0.20	−3.05**
Anxious solitary group, β_{12}	−0.13	0.23	−0.56	−0.08	0.23	−0.36	−0.05	0.23	−0.23
Excluded group, β_{13}	−0.51	0.28	−1.81†	−0.46	0.28	−1.66†	−0.48	0.27	−1.77†
Child sex, β_{14}	−0.03	0.08	−0.37	−0.04	0.08	−0.50	−0.06	0.08	−0.68
Angry expectations of rejection, β_{15}				0.05	0.03	2.06*	0.05	0.03	1.81†
Externalizing behavior, β_{16}							0.11	0.09	1.19
Model for quadratic change in observed upset, π_{2i}									
Normative group, β_{20}	−0.11	0.05	−2.16*	−0.11	0.05	−2.18*	−0.12	0.05	−2.37*
Anxious solitary excluded group, β_{21}	0.23	0.10	2.24*	0.24	0.10	2.34*	0.25	0.10	2.49*
Anxious solitary group, β_{22}	0.03	0.11	0.31	0.01	0.11	0.09	−0.01	0.11	−0.07
Excluded group, β_{23}	0.22	0.14	1.61	0.20	0.14	1.47	0.21	0.13	1.58
Child sex, β_{24}	0.02	0.04	0.56	0.03	0.04	0.66	0.04	0.04	0.88
Angry expectations of rejection, β_{25}				−0.02	0.01	−1.74†	−0.02	0.01	−1.46
Externalizing behavior, β_{26}							−0.06	0.04	−1.38

Note. $N = 160$.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Growth Curve Analysis of Observed Upset Affect in Response to Experimental Events by Group

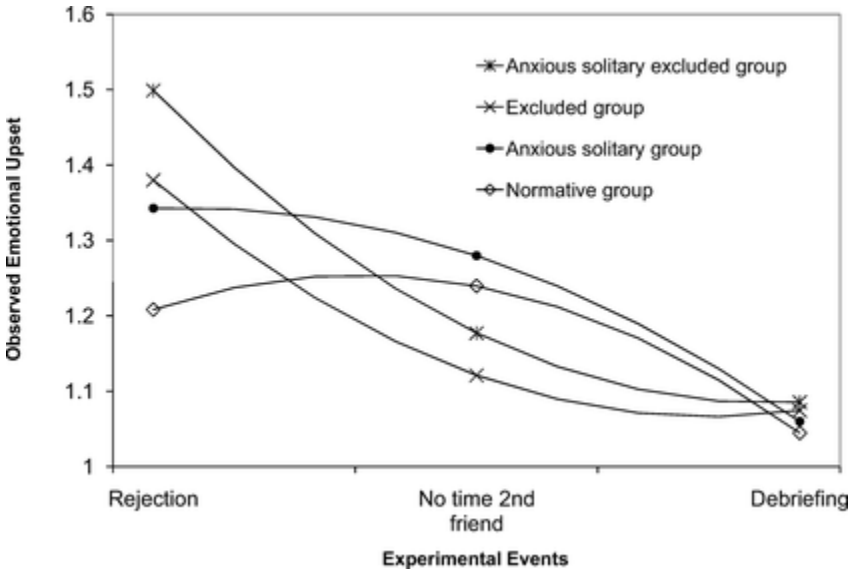

Figure 3. Observed emotional upset in response to experimental events by group.

Similar to previous results, both anxious solitary and excluded children demonstrated somewhat elevated upset affect at behavioral rejection and then a decline in upset affect over time, but these effects were not significant relative to normative children. These results are consistent with expectations that these single-risk groups would demonstrate milder responses to the experiment than the double-risk anxious solitary excluded group.

Additional versions of these analyses were performed, which included affective (self-reported feelings of rejection), social–cognitive (expectations and efficacy), and regulatory (vagal tone) process variables in addition to group. Because social self-efficacy and vagal tone (a time-varying covariate) were not significant predictors of observed upset affect trajectories, they were dropped from analyses. Self-reported reactionary feelings of rejection significantly predicted an elevated observed upset intercept at the time of behavioral rejection, $\beta = 0.17$; $t(153) = 2.02$, $p < .05$, but no significant pattern of change over time and is therefore not depicted. Both anxious and angry expectations of rejection were significant predictors of observed upset trajectories, but consistent with previous findings, only angry expectations of rejection were significant when both types of expectations were entered together. Table 5 displays a model in which only groups and angry expectations of rejection were retained. High angry expectations of rejection predicted no significant difference in observed upset at the time of behavioral rejection relative to the reference normative group, but did predict a significant subsequent increase in observed upset (see Table 5 and Figure 4). Children high in angry expectations, compared to normative children, displayed significantly more upset affect when they learned that there was no time for a second friend, $\beta = 0.15$, $t(270) = 2.47$, $p < .05$, and this difference was somewhat diminished but nevertheless tended to persist at debriefing as well, $\beta = 0.09$, $t(270) = 1.93$, $p < .10$. Anxious solitary excluded group effects remained virtually unchanged after controlling for angry expectations of rejection.

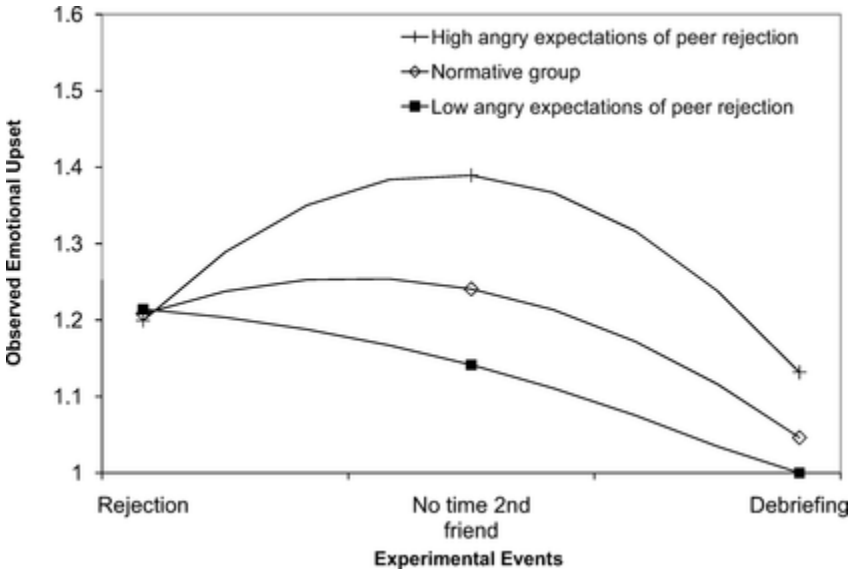

Figure 4. Observed emotional upset in response to experimental events predicted by angry expectations of rejection prior to experiment.

A final version of these analyses was performed while controlling for externalizing behavior, and results were again largely unchanged. The linear effect for the anxious solitary excluded group was not reduced, suggesting that the pattern of observed upset demonstrated by this group was not attributable to externalizing behaviors. However, the linear effect for angry expectations of rejection was reduced to marginal significance, although additional analyses did not support mediation (Baron & Kenny, 1986). Additionally, child sex was nonsignificant in each analysis.

Vagal Tone During the Experiment

Preliminary analysis of patterns of change in vagal tone over the course of the experiment revealed that they were systematically related to group membership, except during the interview phase of the experiment, when this relation became disorganized. This likely occurred because all experimental events except the interview were designed to elicit thoughts and feelings about behavioral rejection in children with varying degrees of rejection sensitivity. Therefore, vagal tone growth curves were modeled after deletion of the interview phase of data. All group effects were modeled for the intercept (baseline) and linear change, but only the reference group (normative group trajectory) was modeled for quadratic change because initial descriptive analyses revealed an overall quadratic curve to trajectories, but unconditional analyses revealed no significant individual differences in quadratic change.

Results of growth curve analysis revealed that there was no significant difference in vagal tone among groups at baseline; however, anxious solitary groups demonstrated distinctive patterns of change over the course of the experiment (see Table 6 and Figure 5). Whereas normative children demonstrated a significant linear decline in (suppression of) vagal tone and most other groups demonstrated a parallel declining pattern, the anxious solitary group demonstrated a significant linear increase in vagal tone relative to the trajectory of normative children, such that they demonstrated more vagal tone during both behavioral rejection (a tendency) and debriefing: for behavioral rejection, $\beta = 0.49$, $t(447) = 1.82$, $p < .10$; for debriefing, $\beta = 0.63$, $t(447) = 2.16$, $p < .05$. As a consequence both of this increase in vagal tone in anxious solitary children and of a decline in vagal tone in anxious solitary excluded children that paralleled the normative decline, anxious solitary excluded children demonstrated less vagal tone (more suppression of vagal tone) than anxious solitary children from the anticipation (a tendency) through debriefing phases of the experiment: for anticipation, $\beta = -0.59$, $t(447) = -1.95$, $p < .10$; for behavioral rejection, $\beta = -0.78$, $t(447) = -2.49$, $p < .05$; for debriefing, $\beta = 0.97$, $t(447) = -2.85$, $p < .01$.

Table 6
Growth Curve Analyses: Vagal Tone in Response to Experimental Events

Predictor of vagal tone	Initial model			With expectations of rejection prior to experiment			With feelings of rejection during experiment		
	β	*SE*	*t*	β	*SE*	*t*	β	*SE*	*t*
Model for initial vagal tone status, π_{0i}									
Normative group, β_{00}	6.10	0.13	46.40***	6.10	0.13	46.64***	6.12	0.13	46.58***
Anxious solitary excluded group, β_{01}	−0.21	0.24	−0.87	−0.25	0.24	−1.04	−0.28	0.25	−1.14
Anxious solitary group, β_{02}	0.17	0.27	0.62	0.24	0.27	0.88	0.24	0.27	0.90
Excluded group, β_{03}	0.20	0.32	0.63	0.18	0.32	0.58	0.08	0.32	0.24
Child sex, β_{04}	0.07	0.10	0.70	0.03	0.10	0.32	0.06	0.10	0.63
Externalizing, β_{05}				0.18	0.10	1.71†	0.15	0.10	1.43
Angry expectations of rejection, β_{06}				0.02	0.03	0.83	0.02	0.03	0.64
Anticipatory feelings of rejection, β_{07}							−0.14	0.12	−1.19
Reactionary feelings of rejection, β_{08}							0.30	0.13	2.37*
Model for linear change in vagal tone, π_{1i}									
Normative group, β_{10}	−0.25	0.08	−3.35***	−0.25	0.07	−3.35***	−0.25	0.07	−3.35***
Anxious solitary excluded group, β_{11}	−0.05	0.06	−0.88	−0.06	0.06	−0.97	−0.06	0.06	−0.97
Anxious solitary group, β_{12}	0.14	0.07	2.15*	0.13	0.06	1.99*	0.13	0.07	1.92†
Excluded group, β_{13}	−0.01	0.08	−0.09	0.01	0.08	0.11	0.02	0.08	0.23
Child sex, β_{14}	0.00	0.02	−0.11	0.00	0.02	−0.08	−0.01	0.02	−0.25
Externalizing, β_{15}				−0.02	0.02	−0.95	−0.02	0.03	−0.79
Angry expectations of rejection, β_{16}				0.02	0.01	2.59*	0.02	0.01	2.59*
Anticipatory feelings of rejection, β_{17}							0.03	0.03	0.92
Reactionary feelings of rejection, β_{18}							−0.04	0.03	−1.23
Model for quadratic change in vagal tone, π_{2i}									
Normative group, β_{20}	0.04	0.02	1.63	0.04	0.02	1.61	0.04	0.02	1.61

Note. $N = 154$.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Growth Curve Analyses: Vagal Tone in Response to Experimental Events

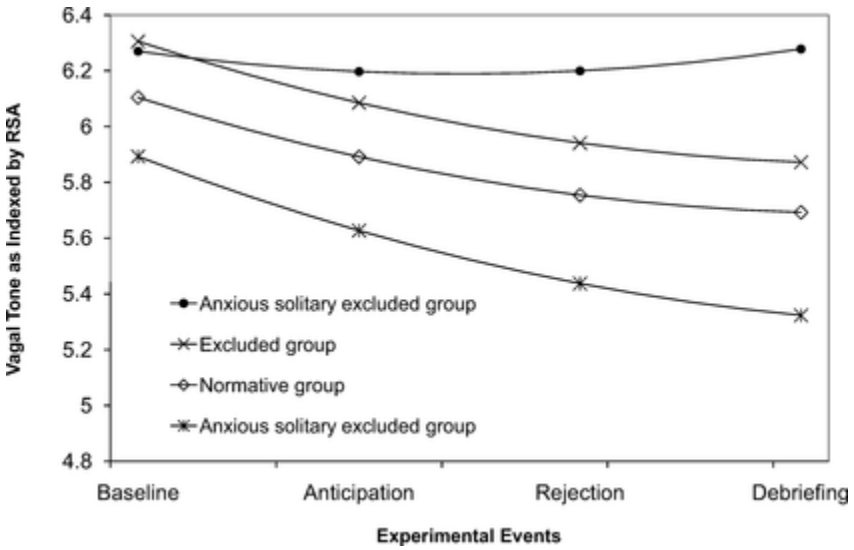

Figure 5. Vagal tone in response to experimental events by group. RSA = respiratory sinus arrhythmia.

After accounting for group effects, high angry expectations of rejection that predated the experiment predicted a significant linear deceleration in the decline of vagal tone over the course of the experiment (see Table 6). Additionally, high reactionary feelings of rejection during the experiment predicted significant elevation in initial vagal tone at baseline (see Table 6). However, results of additional analyses suggest that these effects did not mediate group effects (Baron & Kenny, 1986).

HP During the Experiment

In contrast to vagal tone data, HP data showed a consistent pattern of relation to group status at all time points; thus, HP trajectories were modeled across all five successive experimental events. Unexpectedly, results of growth curve analysis revealed that the anxious solitary and excluded groups demonstrated slower HRs (longer

HP; marginally longer for excluded children) than normative children at baseline (see Table 7 and Figure 6) and throughout most of the rest of the experiment: For the anxious solitary group, $\beta = 48.73$, $t(596) = 2.43$, $p < .05$, for anticipation; $\beta = 46.03$, $t(596) = 2.26$, $p < .05$, for behavioral rejection; $\beta = 42.00$, $t(596) = 2.04$, $p < .05$, for the interview; $\beta = 36.63$, $t(596) = 1.69$, $p < .10$, for the debriefing. For the excluded group, $\beta = 46.79$, $t(596) = 1.94$, $p < .10$, for anticipation; $\beta = 44.76$, $t(596) = 1.82$, $p < .10$, for behavioral rejection; the interview and debriefing were nonsignificant. In contrast and consistent with expectations, the anxious solitary excluded group demonstrated significantly faster HRs (shorter HPs) than both anxious solitary, $\beta = -64.95$, $t(149) = -2.70$, $p < .01$, and excluded groups, $\beta = -61.77$, $t(149) = -2.24$, $p < .05$, at baseline. Furthermore, anxious solitary excluded children continued to demonstrate more rapid HRs than anxious solitary children: $\beta = -53.33$, $t(596) = -2.27$, $p < .05$, for anticipation; $\beta = -48.27$, $t(596) = -2.06$, $p < .05$, for behavioral rejection; $\beta = -49.75$, $t(596) = -2.06$, $p < .05$, for the interview; $\beta = -57.79$, $t(596) = -2.27$, $p < .05$, for debriefing. In addition, anxious solitary excluded children tended to demonstrate more rapid HR than excluded children throughout the experiment: $\beta = -51.39$, $t(596) = -1.91$, $p < .10$, for anticipation; $\beta = -46.99$, $t(596) = -1.72$, $p < .10$, for behavioral rejection; $\beta = -48.55$, $t(596) = -1.75$, $p < .10$, for the interview; $\beta = -56.08$, $t(596) = -1.92$, $p < .10$, for debriefing. This pattern of contrasts resulted because the anxious solitary excluded group demonstrated the most rapid HR at baseline and throughout the experiment, despite a less rapid decline in HR in the middle of the experiment (perhaps a ceiling effect) and augmented by less of a recovery (less of a return to slower HR) at debriefing (these effects are captured by the combination of a significant linear deceleration in decline and a significant quadratic deceleration in upturn; see Table 7 and Figure 6).

Table 7
Growth Curve Anlyses: Heart Period Trajectories During Experimental Events by Group

	Initial model			Controlling for externalizing and feelings of rejection		
Predictor of heart period	β	*SE*	*t*	β	*SE*	*t*
Model for initial heart period status, π_{0i}						
Normative group, β_{00}	661.53	10.12	65.34***	661.36	10.16	65.09***
Anxious solitary excluded group, β_{01}	−15.12	18.59	−0.81	−20.76	19.15	−1.08
Anxious solitary group, β_{02}	49.99	20.36	2.46*	56.67	20.70	2.74**
Excluded group, β_{03}	46.78	24.47	1.91†	41.94	24.64	1.70†
Child sex, β_{04}	4.10	7.46	0.55	0.63	7.56	0.08
Externalizing, β_{05}				19.51	7.87	2.48*
Anticipatory feelings of rejection, β_{06}				3.05	7.00	0.44
Model for linear change in heart period, π_{1i}						
Normative group, β_{10}	−29.87	4.06	−7.35***	−32.80	4.08	−8.05***
Anxious solitary excluded group, β_{11}	14.60	7.46	1.96*	19.25	7.70	2.50*
Anxious solitary group, β_{12}	−0.70	8.18	−0.09	0.21	8.31	0.03
Excluded group, β_{13}	0.78	10.00	0.08	4.82	10.09	0.48
Child sex, β_{14}	7.53	3.00	2.51*	8.33	3.04	2.74**
Externalizing, β_{15}				−3.84	3.17	−1.21
Anticipatory feelings of rejection, β_{16}				−5.79	2.81	−2.06*
Model for quadratic change in heart period, π_{2i}						
Normative group, β_{20}	6.40	0.97	6.58***	7.09	0.98	7.26***
Anxious solitary excluded group, β_{21}	−4.07	1.79	−2.27*	−5.03	1.85	−2.72**
Anxious solitary group, β_{22}	−0.65	1.96	−0.33	−1.02	2.00	−0.51
Excluded group, β_{23}	−0.89	2.42	−0.37	−1.76	2.44	−0.72
Child sex, β_{24}	−1.87	0.72	−2.59**	−1.98	0.73	−2.72**
Externalizing, β_{25}				0.44	0.76	0.58
Anticipatory feelings of rejection, β_{26}				1.30	0.68	1.92†

Note. $N = 154$.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Growth Curve Anlyses: Heart Period Trajectories During Experimental Events by Group

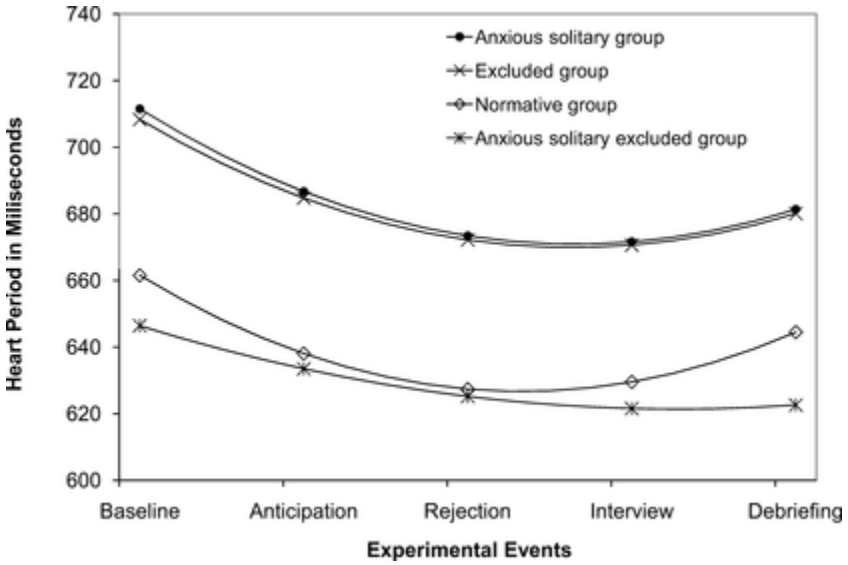

Figure 6. Heart period in response to experiment by group.

Additional effects include less of an increase in HR (less of a decrease in HP) among boys and initially slower HR (longer HP) among children high in externalizing behaviors at baseline. Group effects remained after controlling for these factors, and there was no evidence of mediation. Of interest, anticipatory feelings of rejection also predicted a more rapid acceleration in HR (more rapid decline in HP) during the experiment. However, there was no evidence to suggest that anticipatory feelings of rejection mediated group effects—rather, controlling for these effects appeared to augment group effects.

Discussion

Consistent with the diathesis–stress hypothesis, the combined influence of children's affective–behavioral tendencies (anxious solitude) and their interpersonal stress (peer exclusion) predicted the most socially helpless behavior, multimodal emotional upset, and excessive vagal regulation in response to experimentally manipulated behavioral peer rejection. Moreover, affective responses to behavioral rejection mediated the relation between anxious solitary excluded status and social helplessness in response to a setback. Additionally, child-stress group and affective, social–cognitive, and regulatory processes contributed to dynamic affective/regulatory trajectories during the experiment in an additive manner. Results illustrate multilevel behavioral, experiential, affective, social–cognitive, and physiological processes that act together to produce children's adaptive versus helpless responding to social challenge.

Anxious Solitary Excluded Children and Social Helplessness

Anxious solitary excluded children demonstrated the hypothesized pattern of helpless responding to the initial social challenge of identifying a friend, and this pattern was exacerbated when they encountered a setback (their friend declined to join them). Thus, anxious solitary excluded children were more likely than normative children to exhibit both components of social helplessness—hesitancy to make social initiations and failure to persist following a setback. As expected, social helplessness prior to experiencing behavioral rejection was rare and occurred only in a small number of children at dual individual and interpersonal risk. In contrast, both anxious solitary groups were more likely than normative children to demonstrate helplessness after behavioral rejection. Taken together, findings suggest that social helplessness is not just a function of children's anxious tendencies, but rather of both child and interpersonal stress. Thus, anxious solitary children appear to have a propensity for social helplessness, but this pattern appears to become strongly established (e.g., show a consistent pattern of statistical significance) and rise to the level of social impairment (e.g., such that a child would hesitate to extend a social invitation even to a friend) only when they experience peer stress (i.e., exclusion). Moreover, that it was possible to induce social helplessness in anxious solitary children who were not habitually excluded by peers through brief exposure to behavioral rejection confirms the role of social experience in eliciting socially helpless behavior.

Furthermore, results support feelings of rejection as the process mediating the relation between anxious solitary excluded group status and social helplessness. Appropriately, anticipatory feelings of behavioral rejection were the best candidate for the process mediating the relation with initial social helplessness prior to behavioral rejection (but note that a direct test of mediation was not possible for initial social helplessness), and observed upset affect during behavioral rejection mediated the relation with social helplessness after behavioral rejection. Thus, affect related to behavioral rejection appeared to mediate the relation between dual-risk status and social helplessness, and—in each case—affect just preceding these behaviors was predictive. These results support the hypothesis that emotional upset overwhelms dual-risk children's capacity for constructive response to social challenge, thus resulting in helpless behavior. These results are also compatible with the view that helpless behavior is directed at alleviating fears of rejection by avoiding interpersonal interaction.

Present findings are unique in demonstrating that helplessness occurs not only in interactions with unfamiliar (Stewart & Rubin, 1995) and familiar peers (Gazelle & Rudolph, 2004), but also with friends. This is particularly striking in light of recent findings indicating that anxious solitary children show more adaptive social–cognitive patterns (i.e., less self-blame for a negative interpersonal event) in hypothetical situations that involve friends versus other peers (Burgess et al., 2006). It may be that helpless behavior with friends was found the present study, despite the more adaptive social–cognitive functioning with friends found in Burgess et al. (2006), because (a) there is an imperfect relation between social cognition and social behavior, (b) emotional processes must also be taken into account when predicting social behavior, (c) the present study simulated an actual behavioral rejection, whereas Burgess et al.'s study involved hypothetical social situations, and (d) Burgess et al's study did not distinguish between children experiencing different levels of interpersonal stress (i.e., exclusion). Consistent with anxious solitary children's display of social helplessness (an avoidant strategy) in relation to a friend in the present study, Burgess et al. found that anxious solitary children endorsed avoidant interpersonal problem-solving strategies regardless of whether they were considering an interaction with a friend or another peer. Thus, the correspondence between peer difficulties at the group (i.e., exclusion) and dyadic (social helplessness with a friend) levels in the present study is consistent with previous evidence of consistency in anxious solitary children's relational difficulties across multiple levels of peer relations (Gazelle, 2008). Finally, present findings illustrate how rapidly some anxious solitary excluded children give up when they encounter interpersonal difficulty (after one declined social bid) and that this tendency may provide them with little practice with nonavoidant methods of interpersonal problem solving.

Anxious Solitary Excluded Children and Emotional Upset and Regulation

Consistent with conceptualizations of anxious solitude as the manifestation of fear about how social partners may respond to one's social overtures, results indicate that anxious solitary excluded children experienced heightened self-reported feelings of rejection while they were anticipating the response of a friend to a social invitation (as well as after behavioral rejection). The obtained pattern of results further suggests that habitual peer exclusion exacerbates such social concerns among anxious solitary children, because only anxious solitary excluded and not anxious solitary children reported anticipatory feelings of rejection that were significantly elevated compared to those of normative children. Additionally, observational results indicate that anxious solitary excluded children's subjective feelings of rejection were observable to others during behavioral rejection, raising the possibility that these children's emotional reactions may influence the course of their social interactions. Finally, physiological results are also consistent with self and observer affective indices in indicating that anxious solitary excluded double-risk children, compared to anxious solitary single-risk children, engaged in excessive vagal suppression and elevated HR in response to the series of events involving peer behavioral rejection (although there were no baseline differences). It is interesting that anxious solitary excluded children also demonstrated less recovery in HR (less return to slower HR) by the end of the experiment—suggesting that that they differed from other children not only in the intensity of their reactions to interpersonal challenge, but also in the sustained nature of their reaction. This suggests that anxious solitary excluded children had to engage more internal resources to cope with the perceived behavioral rejection over a longer period of time. This appears to occur because they were more reactive to (upset by) behavioral rejection.

This reactivity would seem to be justified (rather than a bias) in the sense that it was linked to objective evidence of ongoing adverse interpersonal experiences (habitual exclusion).

It may appear contradictory that although anxious solitary excluded children were not observably more upset than other children when they were told there was no time for a second friend, just afterward they reported a degree of rejected feelings that was similarly heightened relative to those they reported during the anticipation of their friend's response. To interpret these findings it is important to recognize that self-reported and observed affect were not capturing exactly the same emotional content. This is because children were reporting on the degree to which they felt rejected and alone at that moment during the experiment, whereas observers were reporting on a more global index of emotion (overall upset) at particular times during the experiment. Thus, it is possible that anxious solitary excluded children were still feeling rejected when they were told there was no time for a second friend but that they also experienced relief that they would not have to go through with another social bid and this was detected by the experimenter as a decrease in emotional upset. An alternative explanation is that anxious solitary excluded children gained better control of their emotional expression over time, such that their upset may no longer have been observable at this later time in the experiment. This latter possibility is consistent with anxious solitary excluded children's excessive vagal regulation.

Results also indicate that social–cognitive processes predicted emotional functioning. Low social self-efficacy predicted heightened self-reported anticipatory and reactionary feelings of rejection. Similarly, angry expectations of rejection prior to the experiment predicted heightened self-reported feelings of rejection in anticipation and response to behavioral rejection, heightened observed upset after behavioral rejection, and, unexpectedly, slightly decelerated vagal tone suppression during the experiment.

Multimodal assessments of emotion and emotion regulation processes also predicted one another. For example, self-reported heightened feelings of rejection during behavioral rejection predicted concurrent heightened observed upset affect. Also, children with higher vagal tone during behavioral rejection (suggesting less vagal tone suppression and active engagement in coping with behavioral rejection) reported heightened feelings of rejection. Finally, children's self-reported feelings of rejection were predictive of vagal tone and HP trajectories during the experiment, with anticipatory feelings of rejection predicting acceleration in HR and reactionary feelings of rejection predicting high baseline vagal tone. These results suggest that whereas anticipatory feelings of rejection are linked with greater reactivity to social challenge, reactionary feelings of rejection appear more normative (elevated baseline vagal tone is associated with adaptive responding; Beauchaine, 2001; Friedman, 2007). Thus, expecting behavioral rejection without cause appears to be linked to heightened stress reactivity, whereas detecting behavioral rejection with cause appears compatible with adaptive responses to stress. These interrelations among emotion and emotion-regulation processes support the multilevel nature of emotion as a subjective, physiological, and behavioral phenomenon. Further, compatible findings involving multimodal indices of emotion functioning lend confidence to findings. However, it is important to note that these average patterns, which characterize dominant patterns in the sample as a whole, are not necessarily representative of the trajectories of anxious solitary excluded children, who displayed heighted anticipatory and reactionary affective responses to behavioral rejection and displayed heightened observed upset affect during behavioral rejection (which subsequently appeared to dissipate) coupled with excessive vagal regulation over the course of the experiment.

Finally, although evidence supports hypothesized patterns of emotional upset, results are nonetheless consistent with the expectation that the upset experienced during the experiment was mild. Specifically, the means for the highest scoring group were below a score of 2 for both self-reports and observations, corresponding to ratings below a tiny bit true for self-reported feelings of rejection and a little upset for observed upset. Furthermore, emotional upset was short in duration, such that there were no systematic differences in observed affect between groups at debriefing. Thus, consistent with expectations, the experiment exposed children to a situation characterized by minimal risk similar to that which they are likely to experience as they interact with peers in their daily lives.

Developmental Considerations

Present results suggest that heightened emotional and behavioral responses to behavioral rejection are present in anxious solitary children who are habitually excluded by peers by third grade and that, once present, these responses likely serve to maintain social and emotional difficulties. In fact, evidence suggests that heightened emotional and behavioral responses to peer difficulties continue to occur in anxious solitary children throughout middle childhood and early adolescence (Gazelle & Rudolph, 2004). However, we do not know whether these tendencies were in place prior to the onset of exclusion (which often occurs soon after kindergarten entry; Gazelle & Ladd, 2003); therefore, we do not assume that they necessarily increased initial risk for exclusion. Additional work is needed to examine these response patterns prior to exclusion onset and to determine how quickly exposure to exclusion in the early school years may trigger these patterns of emotional and behavioral responding in anxious children. We would expect that anticipatory feelings/expectations of rejection, in particular, would be less well established in younger children prior to experiencing exclusion but would become more firmly established with repeated exposure to peer adversity and advancing social–cognitive development.

Contributions and Limitations

The present study contributes to extant literature by demonstrating that (a) socially helpless behavior is elevated in anxious solitary children, particularly those who habitually experience interpersonal stress in the form of peer exclusion, (b) the relation between social helplessness and anxious solitary excluded status is mediated by heighted upset affect connected with feelings of rejection, and (c) both child-stress groups and affective, social–cognitive, and regulatory processes contribute additively to dynamic emotional upset and regulation trajectories as children cope with a social challenge. By investigating anxious solitary children who differ in peer difficulties, the current investigation contributes to better understanding of heterogeneity among anxious solitary children. However, it is important to acknowledge that this approach also involves studying groups of children—albeit more refined groups.

Present findings suggest that interventions designed to ameliorate anxious solitary children's peer relations must be multilevel, with regard to addressing multiple interconnected systems both within the child (emotional, cognitive, and physiological regulation systems) and in his or her interpersonal environment (e.g., socialization of classmates about the acceptability of excluding others). It may be helpful to design intervention methods (e.g., coaching children in constructive strategies for responding to declined social invitations) that explicitly aim to assist the child with both emotion regulation and social cognition. Additionally, assessing children's physiological regulation as they practice such skills may provide an additional window on their efficacy.
In the future, several methodological improvements could be made to the behavioral-rejection paradigm used here and to measures used in conjunction with the experiment to maximize the opportunity to make linkages between multilevel processes. For instance, it would be helpful to assess friendship quality in conjunction with this experiment to account for this potential influence on children's performance. However, the relation between exclusion and experimental performance is not likely attributable to friendship quality, because the correlation between exclusion and components of friendship quality assessed at a subsequent time was modest ($rs = -.18$ to $-.28$, $p < .05$). Additionally, videotaping the experiment would permit more continuous observational assessment of affect, and playing back such a videotape to participants and soliciting their self-reports about what they were thinking and feeling during certain events would permit more continuous assessment of emotional and social–cognitive processes without interrupting the flow of experimental events. Nonetheless, the experimental paradigm had many strengths. Although there is typically a trade-off between experimental control and ecological validity in field research, this investigation maximized the ecological validity of the experiment by conducting it in children's everyday school context and invoking children's responses related to an existing peer relationship. Although the experiment does not involve actual peer interaction, it is likely to more closely approximate children's responses to naturalistic peer interactions than do children's responses to hypothetical questionnaires. Likewise, evidence indicates that all children believed the experiment in the present study and that this paradigm has been successful in evoking processes related to children's naturalistic peer experiences in the past (Downey et al., 1998). In summary, the experiment appears to have been successful in capturing key behavioral, affective, social–cognitive, and regulatory processes that occur in quick succession as children engage in challenging peer interactions.

Present findings suggest that anxious solitary children carry past peer experiences into new social situations. Whereas Gazelle et al. (2005) indicated that anxious solitary children showed improved behavior when the treatment they received by unfamiliar peers was better than they typically received by familiar peers, this study illustrates the opposite. When a new situation with a familiar preferred peer appeared to present the opportunity for an experience of behavioral rejection similar to that which these children might encounter in their everyday lives, they demonstrated an increase in helplessness. The principle that can be extracted from both these studies is that anxious solitary children, particularly those who have encountered peer exclusion, approach new social encounters with both peers and friends with caution, and they are especially reactive to the reception they receive, such that their behavior improves more than that of other children with positive treatment and deteriorates more than that of other children with negative treatment. This stress sensitivity underscores the particularly salient role of interpersonal support and adversity in contributing to anxious solitary children's capacity to form and maintain healthy peer relationships that ultimately impact their emotional health.

Footnotes

1 This experiment was carefully constructed to encourage children to feel good about the experiment rather than to explain, from an adult perspective, why the experiment was done. Downey et al. (1998) and others who have conducted similar experiments have concluded that many 8-year-old children cannot fully comprehend the nature of these experiments and the deception involved. At this age, many children are unlikely to understand why the deception was necessary to make the experiment work and, perhaps most important, they are unlikely to understand that benevolent intentions can motivate deception. Children are likely to equate experimental deception with lying and to believe that all lying is bad and motivated by bad intentions. Thus, a full debriefing is likely to confuse the child, and the idea that an adult has lied may also be distressing to the child, whereas the empirical evidence indicates that the reattribution technique is successful at satisfying children's curiosity about the experiment and creating an experience that is enjoyable for the child (Downey et al., 1998).

2 RSA was calculated from the interbeat interval data according to the Porges (1985) method. This method applies an algorithm to sequential HP data. The algorithm uses a moving 21-point polynomial to remove wave patterns in HP slower than RSA. A filter then extracts the variance of HP within the typical frequency band of respiration in children, 0.24–1.04 Hz. RSA is estimated by calculating the natural log (ln) of this variance and is reported in units of ln (ms2). HP and RSA were calculated every 30 s (an epoch) during each phase of the experiment (baseline, anticipation, behavioral rejection, interview, debriefing), except that 15-s epochs were used in the final debriefing phase because of its brevity. These epoch durations are typical for studies of short tasks (Calkins et al., 2007). The mean RSA of the epochs in each phase was used in subsequent analyses. The standard deviation of RSA values within each phase was less than 1.00, indicating variability within the expected range during each phase and confidence in the validity of mean RSA values.

3 A common rule of thumb for growth curve analysis is that the number of parameters estimated for the individual trajectories should be one less than the number of repeated measures (e.g., one would use a linear model if there are three time points; Burchinal, Nelson, & Poe, 2006). Although this strategy has distinct advantages, like all rules of thumb there are also important exceptions. One such exception occurs here—there are three repeated measures, but the form of change is clearly not linear. We thus used a growth model with a quadratic form for the fixed effects and a random intercept. This model reproduces the group means exactly (it is saturated in the means), thus recovering the nonlinear mean trends. Although somewhat unusual for a hierarchical linear modeling growth curve analysis, it is worth noting that this model is of the same form as a repeated measures analysis of variance with a polynomial trend analysis. It nevertheless retains the many advantages of hierarchical linear modeling, for instance, accommodating missing data without casewise deletion.

References

Achenbach, T. M., McConaughy, S. H., & Howell, C. T. (1987). Child/adolescent behavioral and emotional problems: Implications of cross-informant correlations for situational specificity. Psychological Bulletin, 101, 213–232.
Albano, A. M., & Krain, A. (2005). Anxiety and anxiety disorders in girls. In D. J.Bell, S. L.Foster, & E. J.Mash (Eds.), Handbook of behavioral and emotional problems in girls (pp. 79–116). New York: Kluwer.
Alloy, L. B., Hartlage, S., & Abramson, L. Y. (1988). Testing the cognitive diathesis–stress theories of depression: Issues of research design, conceptualization, and assessment. In L. B.Alloy (Ed.), Cognitive processes in depression (pp. 31–73). New York: Guilford.
Alloy, L. B., Kelly, K. A., Mineka, S., & Clements, C. M. (1990). Comorbidity of anxiety and depressive disorders: A helplessness–hopelessness perspective. In J. D.Maser & C. R.Cloninger (Eds.), Comorbidity of mood and anxiety disorders (pp. 499–543). Washington, DC: American Psychiatric Press.
Asendorpf, J. B. (1990). Beyond social withdrawal: Shyness, unsociability, and peer avoidance. Human Development, 33, 250–259.
Bandura, A. (1988). Self-efficacy conception of anxiety. Anxiety Research, 1, 77–98.
Bandura, A. (1991). Self-efficacy conception of anxiety. In R.Schwarzer & R. A.Wicklund (Eds.), Anxiety and self-focused attention (pp. 89–110). New York: Harwood.
Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology, 51, 1173–1182.
Beauchaine, T. P. (2001). Vagal tone, development, and Gray's motivational theory: Toward an integrated model of autonomic nervous system functioning in psychopathology. Development and Psychopathology, 13, 183–214.
Benenson, J. F. (1993). Greater preference among females than males for dyadic interaction in early childhood. Child Development, 64, 544–555.
Benenson, J. F., Apostoleris, N. H., & Parnass, J. (1997). Age and sex differences in dyadic and group interaction. Developmental Psychology, 33, 538–543.
Biederman, J., & Spencer, T. (1999). Depressive disorders in childhood and adolescence: A clinical perspective. Journal of Child and Adolescent Psychopharmacology, 9, 233–237.
Boivin, M., & Hymel, S. (1997). Peer experiences and social self-perceptions: A sequential model. Developmental Psychology, 33, 135–145.
Bowker, A., Bukowski, W., Zargarpour, S., & Hoza, B. (1998). A structural and functional analysis of a two-dimensional model of social isolation. Merrill Palmer Quarterly, 44, 447–463.
Burchinal, M., Nelson, L., & Poe, M. (2006). Growth curve analysis: An introduction to various methods for analyzing longitudinal data. Monographs of the Society for Research in Child Development, 71, 65–87.
Burgess, K. B., Wojslawowicz, J. C., Rubin, K. H., Rose-Krasnor, L., & Booth-LaForce, C. (2006). Social information processing and coping strategies of shy/withdrawn and aggressive children: Does friendship matter?Child Development, 77, 371–383.
Calkins, S. D. (1997). Cardiac vagal tone indices of temperamental reactivity and behavioral regulation in young children. Developmental Psychobiology, 31, 125–135.
Calkins, S. D., & Dedmon, S. E. (2000). Physiological and behavioral regulation in two-year-old children with aggressive/destructive behavior problems. Journal of Abnormal Child Psychology, 28, 103–118.
Calkins, S. D., & Fox, N. A. (2002). Self-regulatory processes in early personality development: A multilevel approach to the study of childhood social withdrawal and aggression. Development and Psychopathology, 14, 477–498.
Calkins, S. D., Graziano, P. A., & Keane, S. P. (2007). Cardiac vagal regulation differentiates among children at risk for behavior problems. Biological Psychology, 74, 144–153.
Caprara, G. V., Scabini, E., Barbaranelli, C., Pastorelli, C., Regalia, C., & Bandura, A. (1999). Perceived emotional and interpersonal self-efficacy and good social functioning. Giornale Italiano di Psicologia, 26, 769–789.
Coplan, R. J., Gavinski-Molina, M. H., Lagace-Seguin, D. G., & Wichmann, C. (2001). When girls versus boys play alone: Nonsocial play and adjustment in kindergarten. Developmental Psychology, 37, 464–474.

Coplan, R. J., Rubin, K. H., Fox, N. A., Calkins, S. D., & Stewart, S. L. (1994). Being alone, playing alone, and acting alone: Distinguishing among reticence and passive and active solitude in young children. Child Development, 65, 129–137.
Downey, G., Lebolt, A., Rincon, C., & Freitas, A. L. (1998). Rejection sensitivity and children's interpersonal difficulties. Child Development, 69, 1074–1091.
Dweck, C. S., & Leggett, E. L. (1988). A social–cognitive approach to motivation and personality. Psychological Review, 95, 256–273.
Eisenberg, N., Fabes, R. A., Murphy, B., & Maszk, P. (1995). The role of emotionality and regulation in children's social functioning: A longitudinal study. Child Development, 66, 1360–1384.
Erdley, C. A., & Asher, S. R. (1996). Children's social goals and self-efficacy perceptions as influences on their responses to ambiguous provocation. Child Development, 67, 1329–1344.
Erdley, C. A., Loomis, C. C., Cain, K. M., Dumas-Hines, F., & Dweck, C. S. (1997). Relations among children's social goals, implicit personality theories, and responses to social failure. Developmental Psychology, 33, 263–272.
Foster, S. L., Bell-Dolan, D., & Berler, E. S. (1986). Methodological issues in the use of sociometrics for selecting children for social skills research and training. Advances in Behavioral Assessment of Children and Families, 2, 227–248.
Fox, N. A., & Field, T. M. (1989). Individual differences in preschool entry behavior. Journal of Applied Developmental Psychology, 10, 527–540.
Friedman, B. H. (2007). An autonomic flexibility–neurovisceral integration model of anxiety and cardiac vagal tone. Biological Psychology, 74, 185–199.
Gazelle, H. (2008). Behavioral profiles of anxious solitary children and heterogeneity in peer relations. Developmental Psychology, 44, 1604–1624.
Gazelle, H., & Ladd, G. W. (2003). Anxious solitude and peer exclusion: A diathesis–stress model of internalizing trajectories in childhood. Child Development, 74, 257–278.
Gazelle, H., Putallaz, M., Li, Y., Grimes, C., Kupersmidt, J. B., & Coie, J. D. (2005). Anxious solitude across contexts: Girls' interactions with familiar and unfamiliar peers. Child Development, 76, 227–246.
Gazelle, H., & Rudolph, K. D. (2004). Moving toward and away from the world: Social approach and avoidance trajectories in anxious solitary youth. Child Development, 75, 829–849.
Goetz, T. E., & Dweck, C. S. (1980). Learned helplessness in social situations. Journal of Personality and Social Psychology, 39, 246–255.
Kagan, J., Reznick, J. S., & Snidman, N. (1987). The physiology and psychology of behavioral inhibition in children. Child Development, 58, 1459–1473.
Kagan, J., Reznick, J. S., Snidman, N., Johnson, M. O., Gibbons, J. L., Gersten, M., et al. (1990). Origins of panic disorder. In J. C.Ballenger (Ed.), Neurobiology of panic disorder. Frontiers of clinical neuroscience (Vol. 8, pp. 71–87). New York: Wiley-Liss.
Kim, J., & Cicchetti, D. (2003). Social self-efficacy and behavior problems in maltreated children. Journal of Clinical Child and Adolescent Psychology, 32, 106–117.
London, B., Downey, G., Bonica, C., & Paltin, I. (2007). Social causes and consequences of rejection sensitivity. Journal of Research on Adolescence, 17, 481–506.
Maccoby, E. E., & Jacklin, C. N. (1987). Gender segregation in childhood. In H. W.Reese (Ed.), Advances in child development and behavior (Vol. 20, pp. 239–287). San Diego, CA: Academic Press.
Panella, D., & Henggeler, S. W. (1986). Peer interactions of conduct-disordered, anxious–withdrawn, and well-adjusted Black adolescents. Journal of Abnormal Child Psychology, 14, 1–11.
Pedersen, S., Vitaro, F., Barker, E. D., & Borge, A. I. H. (2007). The timing of middle-childhood peer rejection and friendship: Linking early behavior to early-adolescent adjustment. Child Development, 78, 1037–1051.
Peets, K., Hodges, E. V. E., Kikas, E., & Salmivalli, C. (2007). Hostile attributions and behavioral strategies in children: Does relationship type matter?Developmental Psychology, 43, 889–900.
Porges, S. W. (1985). Method and apparatus for evaluating rhythmic oscillations in aperiodic physiological response systems(U.S. Patent No. 4520944). Washington, DC: U.S. Patent Office.
Raudenbush, S. W., & Bryk, A. S. (2002). Hierarchical linear models: Applications and data analysis methods (2nd ed., Vol. 1). Thousand Oaks, CA: Sage.

Rubin, K. H., Coplan, R. J., & Bowker, J. C. (2009). Social withdrawal in childhood. Annual Review of Psychology, 60, 141–171.
Rubin, K. H., Hastings, P. D., Stewart, S. L., & Henderson, H. A. (1997). The consistency and concomitants of inhibition: Some of the children, all of the time. Child Development, 68, 467–483.
Rubin, K. H., Wojslawowicz, J. C., Rose-Krasnor, L., Booth-LaForce, C., & Burgess, K. B. (2006). The best friendships of shy/withdrawn children: Prevalence, stability, and relationship quality. Journal of Abnormal Child Psychology, 34, 143–157.
Schneider, B. H. (1999). A multimethod exploration of the friendships of children considered socially withdrawn by their school peers. Journal of Abnormal Child Psychology, 27, 115–123.
Stewart, S. L., & Rubin, K. H. (1995). The social problem-solving skills of anxious–withdrawn children. Development and Psychopathology, 7, 323–336.
Terry, R., & Coie, J. D. (1991). A comparison of methods for defining sociometric status among children. Developmental Psychology, 27, 867–880.
Wheeler, V. A., & Ladd, G. W. (1982). Assessment of children's self-efficacy for social interactions with peers. Developmental Psychology, 18, 795–805.
Wichmann, C., Coplan, R. J., & Daniels, T. (2004). The social cognitions of socially withdrawn children. Social Development, 13, 377–392.
Younger, A. J., Schwartzman, A. E., & Ledingham, J. E. (1985). Age-related changes in children's perceptions of aggression and withdrawal in their peers. Developmental Psychology, 21, 70–75.
Younger, A. J., Schwartzman, A. E., & Ledingham, J. E. (1986). Age-related differences in children's perceptions of social deviance: Changes in behavior or in perspective?Developmental Psychology, 22, 531–542.