Children’s Self-Reports About Anger Regulation: Direct and Indirect Links to Social Preference and Aggression

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We assessed the direct relations between three aspects of self-reported anger regulation and peer-rated social preference and aggression as well as the indirect relations between these constructs as mediated by observed anger expression. The three aspects of anger regulation were the generation of strategies for de-escalating external anger expression, the generation of strategies for regulating the internal experience of anger, and use of display rules for anger. Participants were 274 2nd grade children, approximately 8 years old (135 girls and 139 boys). Children participated in two anger-arousing games. They were interviewed about the three aspects of anger regulation in these situations, and their anger expressions were coded. Although anger regulation was not directly related to social preference or aggression, it was indirectly related to both social preference and aggression through the mediating mechanism of nonverbal anger expression.

Both peer rejection and aggression in childhood predict negative adolescent outcomes, including externalizing disorders, early school withdrawal, and delinquency (Coie, Terry, Lenox, Lochman, & Hyman, 1995; Kupersmidt & Coie, 1990; Parker & Asher, 1987). Thus, a large body of research has focused on better understanding the functioning of aggressive and rejected children.

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The concept of emotion regulation may be critical to this understanding. However, the relations between peer rejection and aggression on the one hand and emotion regulation on the other have not been thoroughly investigated, perhaps because emotion regulation is a complex process that is challenging to measure. A widely cited definition of emotion regulation has been put forth by Thompson (1994, pp. 27–28), who defined the construct as consisting of “the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one’s goals.” Subsequently, Eisenberg and Fabes (1999) expanded this conceptualization by making a distinction between the regulation of the internal experience of emotion (in their terms, emotion regulation) and the regulation of external emotion expression (in their terms, emotion-related behavioral regulation). In this study, we sought to measure emotion regulation in both of these domains and to relate emotion regulation to peer rejection and aggression.

Researchers have found that peer-rejected and aggressive children express more negative emotion than their peers (Cole, Zahn-Waxler, Fox, Usher, & Welsh, 1996; Denham, McKinley, Couchoud, & Holt, 1990; Eisenberg et al., 1996; Fabes & Eisenberg, 1992; Hubbard, 2001; Underwood, 1997), and these findings imply that these children have difficulty regulating the external expression of emotion. Similarly, researchers have found that peer-rejected and aggressive children experience more negative emotion than their peers (Eisenberg & Fabes, 1995; Underwood, Coie, & Herbsman, 1992), and these findings suggest that these children have difficulty regulating the internal experience of emotion. However, these findings only peripherally address whether rejected and aggressive children actually experience more difficulties regulating the external expression and internal experience of emotion, compared to other children.

We chose to investigate the relations between emotion regulation and social preference and aggression in a sample of 2nd-grade children with regard to one emotion, namely anger. We focused on anger because it is theoretically linked to aggression and because it is the emotion whose expression is most likely to have implications for peer rejection.

Within the external and internal domains of anger regulation, we examined three aspects of anger regulation. The first two aspects were the generation of strategies for dissembling external anger expression and the generation of strategies for regulating the internal experience of anger. Children's ability to generate strategies for regulating emotion from a developing knowledge base of such strategies is an important skill in the overall process of emotion regulation (Garber, Braafladt,
& Zeman, 1991). Saarni (1999) theorized about strategies that children may adopt in regulating emotion, although little empirical work has addressed children’s knowledge of these strategies, especially in relation to peer rejection and aggression. However, peer-rejected and aggressive children may have a less well-developed repertoire of strategies for regulating both the external expression and internal experience of anger, given that they both experience (Denham et al., 1990; Fabes & Eisenberg, 1992; Hubbard, 2001; Underwood, 1997) and express (Eisenberg & Fabes, 1995; Underwood et al., 1992) more anger than their peers. Therefore, we hypothesized that children’s generation of strategies for dissembling external anger expression and their generation of strategies for regulating the internal experience of anger would both be positively related to social preference and negatively related to aggression.

Two lines of research support this hypothesis. First, peer-rejected and aggressive children have deficits in their ability to generate strategies for solving social problems (see Crick & Dodge, 1994, for a review), and this deficiency may generalize to strategies for regulating anger. Second, research by Eisenberg and colleagues on children’s ability to cope with emotional or stressful situations suggests that peer-rejected and aggressive children generally use less adaptive strategies than their peers. Using both observational and adult-report techniques to assess children’s coping, they found that sociometric peer ratings and teacher-rated social competence were positively related to constructive coping and negatively related to destructive coping (Eisenberg et al., 1993; Eisenberg et al., 1995; Eisenberg, Fabes, Nyman, Bernzweig, & Pinuelas, 1994; Fabes & Eisenberg, 1992). Similarly, parent-rated problem behaviors were negatively related to constructive coping and positively related to destructive coping (Eisenberg et al., 1995; Eisenberg et al., 1997).

The third aspect of anger regulation of interest in this study was children’s use of display rules for anger. Display rules are integral to anger regulation in that they guide children’s decisions about whether or not to regulate the external expression of anger, and if so, to what extent. Thus, children’s use of display rules applies only to the domain of regulating external anger expression. Limited research has linked the use of display rules and aggression, while no research yet exists linking display rules to social preference. Specifically, across two studies, researchers found that aggressive children used display rules less than nonaggressive children (Cole, Zahn-Waxler, & Smith, 1994; Underwood et al., 1992). Based on these findings, we hypothesized that
children's display rule use would be positively related to social preference and negatively related to aggression.

We made two decisions about how to assess children's anger regulation. First, we measured anger regulation through self-report, rather than through adult ratings. By using children's self-report, we were able to assess children's knowledge of those strategies for regulating anger that may not be easily observed by adult raters (e.g., cognitive strategies). Our second decision was to question children about their anger-regulation processes following a live interaction in the laboratory, rather than in response to hypothetical vignettes. Anger may be more salient following a live interaction, and, consequently, children's self-reports about anger regulation may differ in these two situations. In fact, in other research from our laboratory, children's self-reports about display rule use differed when assessed via hypothetical vignettes versus when assessed following a live interaction (Parker et al., 2001).

We considered two possible approaches to examining the relations between self-reported anger regulation and peer-rated social preference and aggression. Our first approach was to assess the direct relations between these constructs. However, there remained a distinct possibility that direct relations between these constructs would be weak at best, because the strategies and display rules that are part of the anger-regulation process cannot directly affect how much peers like a child or how aggressive they view him/her to be. Therefore, we considered that the actual expression of anger may be one mechanism through which self-reported anger regulation relates to peers' ratings of social preference and aggression. Inner anger-regulation processes may impact peer opinion through their impact on the expression of anger, a behavior that can be observed by peers. By using a laboratory procedure to collect data on children's self-reported anger regulation, we were able to observe their actual anger expression as well. Therefore, our second approach was to assess the indirect relations between self-reported anger regulation and peer-rated social preference and aggression through the mediating mechanism of observed anger expression.

In our conceptualization, anger expression and anger regulation are distinct constructs. However, given that researchers often infer about the capacity to regulate anger from children's anger expression, the distinction between the two constructs has become fuzzy. We consider anger expression to be an outcome of the ongoing anger-regulation process, not equivalent to that process. In order to methodologically separate these two constructs, we assessed anger regulation and anger
expression via distinct methodologies (i.e., self-report and observations, respectively).

Similarly, we conceptualized anger expression and aggression as separate constructs. Confusion arises between these two constructs because the expression of anger and aggressive behavior often occur together, and in fact, they can even be represented by a single behavior (i.e., reactive aggression). However, a behavior can be aggressive without being motivated by anger or accompanied by anger expression (i.e., proactive aggression), and a behavior can be an expression of anger without being aggressive (i.e., without involving the intention to harm someone else).

In summary, we predicted that the relations between self-reported anger regulation and peer-rated social preference and aggression would be mediated by observed anger expression. We predicted that: (1) the generation of strategies for dissembling external anger expression, the generation of strategies for regulating the internal experience of anger, and the use of display rules for anger would all be negatively related to anger expression; and (2) that anger expression would be negatively related to social preference and positively related to aggression.

Method

Overview

Peer nominations for liking and disliking and peer nominations for overt aggression were collected from children in 2nd-grade classrooms. A subsample of these children participated in laboratory data collection. The laboratory protocol lasted approximately 60 minutes per participant and consisted of three parts: (a) participants interacting with a confederate in two anger-arousing, standardized, competitive games; (b) an interview-based assessment of the generation of strategies for dissembling external anger expression, the generation of strategies for regulating the internal experience of anger, and use of display rules for anger; and (c) videotaping of the games for later observational coding of anger expression. These data were collected as part of a larger project on anger-regulation processes in children’s peer interaction.

Participants

Participants for classroom data collection were 2,052 children (1,029 girls and 1,023 boys) in 135 2nd-grade classrooms in public and parochial schools in the northeastern United States. These children were approximately 8 years old. Ethnicity in the sample was as follows:
22% African American, 1% Asian American, 70% Caucasian, 6% Hispanic American, and 1% other. The average classroom participation rate was 69%, with a range from 40% to 93%.

A subset of 827 of these children who were classified sociometrically as popular, average, or rejected were recruited for laboratory data collection. Of these children, 48% agreed to participate, and 33% actually completed data collection. Thus, our recruitment resulted in a final sample of 274 children (135 girls and 139 boys) from the 135 classrooms. Ethnicity in this sample was as follows: 21% African American, 1% Asian American, 70% Caucasian, and 8% Hispanic American.

For the purposes of the larger project, only children who were classified sociometrically as popular, average, or rejected were recruited for laboratory data collection (see Coie, Dodge, & Coppotelli, 1982, for details about calculating sociometric status categories). We selected laboratory participants based on sociometric status categories because we wanted to preserve the flexibility to conduct both more traditional categorical analyses that have dominated the field of children’s peer relations, as well as newer statistical techniques that require continuous variables. We included rejected children but not neglected or controversial children largely because rejected children are at higher risk for later negative outcomes. Moreover, we included popular children to allow for an examination of those children viewed as most socially competent by their peers. Finally, we included average children, but not children classified as other, in order to use the most conservative control group.

The 274 children who participated in laboratory data collection did not differ from the popular, average, and rejected children who were eligible but did not participate in terms of either social preference, \( t(825) = -.67, ns \), or aggression, \( t(825) = .22, ns \). However, these 274 children were lower in social preference, \( t(1497) = -2.70, p < .01 \), and higher in aggression, \( t(1497) = 4.37, p < .001 \), than the ineligible 1,225 neglected, controversial, and other children.

**Procedures for Classroom Data Collection**

**Peer nominations for social preference**

Participants were first asked to name an unlimited number of children in their classroom whom they “like a lot.” Next, participants were asked to name an unlimited number of children in their classroom whom “you don’t like very much.” Numbers of positive and negative nominations received by each child were tallied and standardized within classroom. Social preference scores were calculated as the standard difference between liking and disliking scores.
This procedure for collecting sociometric nominations and calculating social preference scores is similar to the one outlined and validated by Coie et al. (1982). Terry and Coie (1991) found that this approach had greater temporal stability and discriminant validity than two other sociometric methods (i.e., Asher & Dodge, 1986; Newcomb & Bukowski, 1983). Our procedure deviated from the original procedure only in that children nominated an unlimited number of classmates as liked and disliked, rather than being limited to three nominations. There are two advantages to the use of unlimited nominations. First, Terry stated that the unlimited procedure is superior to the limited procedure because a greater range of values is obtained, because there is less skewness and kurtosis in the distribution of nominations and because measurement error is reduced. Thus, the unlimited procedure results in more reliable measurement of children's social preference (Terry, 2000). Second, Terry (1999) stated that reliable and valid sociometric data can be collected using unlimited nominations when as few as 40% of the children in a classroom participate. This figure stands in contrast to the 70% participation rate needed when using limited nominations (Crick & Ladd, 1989).

We chose not to limit nominations to same-sex peers, and not to standardize nominations within gender as well as within classroom. Terry and Coie (1991) examined whether such practices affect the social preference scores children receive. They found that social preference scores calculated taking gender into account were correlated .90 with those calculated without considering gender.

**Peer Nominations for Aggression**

Interviewers asked participants to name an unlimited number of classmates who fit three nomination items designed to assess overtly aggressive behavior: (a) “kids in your class who start fights”; (b) “kids in your class who yell and call other kids mean names”; and (c) “kids in your class who hit and push other kids.” The number of nominations that each child received for each of the three items was standardized within classroom. These three standardized scores were summed, and the total score was restandardized within classroom. This calculation resulted in a standardized continuous score for aggression for each participant.

**Procedures for Laboratory Data Collection**

**Anger-arousing, Confederate-based, Standardized, Competitive Games**

Children played two anger-arousing, competitive games with a confederate, a method similar to that used by Underwood in recent work.
Anger Regulation

(Underwood, Hurley, Johanson, & Mosley, 1999; Underwood, Schockner, & Hurley, 2001). Each of the games lasted approximately 8 minutes. A prize was offered to the winner of each game, and both games were “rigged” to insure that the participant lost. In the first game, the confederate appeared to play fairly, but in the second game, the confederate engaged in blatant unfair play in a standardized manner.

The games involved children pretending to be astronauts who bring back stars from space. As they moved around the game board, they collected and lost star tokens; the first child to collect 25 tokens was the winner. Rigging the game involved controlling which space the confederate and participant landed on for each turn. Thus, instead of movement around the board being determined by dice or spinners, a slide projector projected numbers and arrows through the one-way mirror onto a wall. The arrow told the children whose turn it was, and the number told how many spaces to move. We only informally assessed children’s suspicions that the game was rigged. However, we believe that only one child suspected rigging (this child was not included in the total N of 274).

The confederate was a same-age, same-sex child unfamiliar to the participant. We chose to use unfamiliar peers because it would not be possible to create standardized situations with familiar peers. Thirty-three children (18 Caucasian boys and 15 Caucasian girls) served as confederates. These children were recruited from an elementary school that did not participate in data collection. Those children whose parents granted permission were trained during after-school training sessions.

Confederates were trained in two skills. The first skill involved playing unfairly during the second game. At three points during this game, the confederate landed on the “best” space of the game board, the only space that indicated the player should take three tokens. Each time the confederate landed on this space, he/she was trained to take five star tokens, rather than three. Confederates were trained to cheat blatantly to insure that this behavior was not missed by the participants. The second skill involved behaving in a neutral fashion when not cheating. For example, confederates were taught not to initiate conversation with the participants and not to express obvious emotion, either positive or negative. Although most participants did not initiate much conversation, if they did, confederates were taught to respond briefly and pleasantly, but not to prolong the verbal exchange. Although this approach was somewhat unnatural, it resulted in increased standardization.

We took a number of steps to protect participants and confederates. For example, before the debriefing, the participant and confederate played a third game rigged to insure that the participant won and
received a prize. In addition, at the conclusion of their participation, children were thoroughly debriefed. They were told that we had rigged the first two games so that they could not win and that the fact that they lost those games was not because they were not a good player. Furthermore, they were told that the children with whom they played were actors whom we trained to cheat, so that we could learn how children reacted when someone they were playing with cheated.

**INTERVIEW TO ASSESS ANGER REGULATION**

A 5-minute interview followed each game. Participants were first reminded of the situation in which they had just interacted, and the questions that followed pertained to this specific interaction.

**Assessment of use of display rules for anger**

Children were asked two questions to assess their use of display rules for anger, and two preliminary variables were created from their responses. First, for the variable *level of anger experienced*, children were asked, “How angry did you feel? Did you feel a little angry, or some angry, or a lot angry?” (1 = a little angry, to 3 = a lot angry). Second, for the variable *level of anger expressed*, children were asked about the extent to which they displayed versus dissemble their angry feelings facially. Children were told, “Sometimes kids’ faces look the same as how they feel, and sometimes their faces look different than how they feel. I’m going to show you some faces, and I want you to point to how you looked. Now remember, the last question was about how you felt, this question is about how you looked. Did you look happy, or not at all angry, or a little angry, or some angry, or a lot angry?” This question was accompanied by drawings of faces with happy, neutral, and three increasingly angry expressions (−1 = happy; 0 = not at all angry, 1 = a little angry, 2 = some angry, and 3 = a lot angry).

An overall variable, *use of display rules for anger*, was created to represent the discrepancy between how angry children reported feeling versus how angry of a facial expression they reported making. This variable was calculated by subtracting *level of anger expressed* from *level of anger experienced* (range of −2 to 4). The resulting scores should be interpreted as follows: (a) positive numbers mean that children reported expressing less anger than they reported feeling, (b) negative numbers mean that children reported expressing more anger than they reported feeling, and (c) zeros mean that children reported expressing the same amount of anger that they reported feeling.

Two points should be noted with regard to this variable. First, it was possible for children to receive the same score in multiple ways. For example, a child who reported experiencing and expressing a little
anger would receive a score of 0, as would a child who reported experiencing and expressing a lot of anger. Second, although children could report that they expressed more anger than they experienced, this pattern only occurred five times out of the 274 children. These scores are difficult to interpret, but could be explained either by measurement error or by children purposefully expressing more anger than they experienced, perhaps for the purpose of intimidation.

**Assessment of strategies for dissembling external anger expression**

Children were asked a series of questions to assess generation of strategies for dissembling the external expression of anger: “What is something that you did so that the other boy/girl playing the game did not find out that you were angry? What is something else you did? What is something else you could have done? (repeat for up to five strategies).” Children were encouraged to generate as many as five strategies; however, when they stated that they did not know any more strategies, they were allowed to stop. This procedure resulted in children generating different numbers of strategies.

Children’s responses to this question were coded as behavioral, cognitive, or nonsense. Coders were blind to the social preference and aggression scores of the children. Reliability was estimated by having 20% of the interviews coded by two assistants who were blind to which interviews were reliability trials. Examples of strategies coded as behavioral were leaving the room and covering the face (kappa = .97). Examples of strategies coded as cognitive included pretending that the peer was not winning the game and thinking about a happier topic (kappa = .94). Strategies coded as nonsense were considered illogical responses to the question, such as “wet my hair” (kappa = .98).

Two preliminary variables were calculated. Number of behavioral strategies-external and number of cognitive strategies-external represent the number of strategies each child generated that were coded as behavioral and cognitive, respectively. An overall variable representing generation of strategies for dissembling external anger expression, number of plausible strategies-external, was created by summing the two preliminary variables (range of 0 to 5).

**Assessment of strategies for regulating the internal experience of anger**

Children were asked a series of questions to assess generation of strategies for regulating the internal experience of anger. Children were asked, “What is something that you did to make yourself feel less angry? What is something else you did? What is something else you could have done? (repeat for up to five strategies).” Children were encouraged to generate up to five strategies; however, when they stated
that they did not know any more strategies, they were allowed to stop. This procedure resulted in children generating different numbers of strategies.

Again, children’s responses were coded into three categories, behavioral, cognitive, or nonsense. Examples of strategies coded as behavioral were starting the game over and asking the other child to stop cheating (kappa = .97). Examples of strategies coded as cognitive included thinking about something else and ignoring the cheating (kappa = .93). Finally, strategies coded as nonsense were considered illogical responses to the question, such as “I made myself more angry” (kappa = .94).

Two preliminary variables were calculated. Number of behavioral strategies-internal and number of cognitive strategies-internal represent the number of strategies each child generated that were coded as behavioral and cognitive, respectively. An overall variable representing generation of strategies for regulating the internal experience of anger, number of plausible strategies-internal, was created by summing the two preliminary variables (range of 0 to 5).

In order to validate the distinction between strategies for dissembling the external expression of anger and strategies for regulating the internal experience of anger, we conducted a factor analysis on the four variables number of behavioral strategies-external, number of cognitive strategies-external, number of behavioral strategies-internal, and number of cognitive strategies-internal. Principal axis factoring with Promax rotation revealed a clean solution consistent with the distinction between internal and external strategies. Number of behavioral strategies-external and number of cognitive strategies-external loaded on the first factor, with factor loadings of .95 and -.47, respectively. Similarly, number of behavioral strategies-internal and number of cognitive strategies-internal loaded on the second factor, with factor loadings of -.56 and .80, respectively. There were no notable cross-loadings.

Observational Coding of Anger Expression

Using the videotapes recorded during the games, anger expression was measured using two coding systems previously shown to be reliable and valid in this context (Hubbard, 2001). First, observers coded facial expressions of anger. Second, observers coded the display of two angry nonverbal behaviors, using game materials roughly and displaying frustration. Although we had originally intended to code children’s verbal expressions of anger as well, participants did not talk frequently enough to allow for reliable coding of these verbalizations.
Procedures used in the training of observers

Twenty-one observers (2 Caucasian female graduate students, 17 Caucasian female undergraduate students, and 2 Asian American female undergraduate students) were trained in the use of the facial coding system. Thirteen observers (two Caucasian female graduate students, eight Caucasian female undergraduate students, two Caucasian male undergraduate students, and one Asian American female undergraduate student) were trained in the use of the nonverbal coding system. Each observer used only one of the two coding systems. Observers were blind to the hypotheses of the study and to the social preference and aggression scores of the participants. Reliability for the training trials was calculated by comparing observers’ data to coding completed by the second author. Observers were considered sufficiently trained when they reached a criterion of .80 (Cohen’s kappa) on three consecutive training trials.

Facial expression coding system

Observers coded on a second-by-second basis whether the participant displayed an angry, sad, happy, or neutral facial expression. Observers were taught to recognize angry facial expressions via global indicators such as when the participant furrowed his/her eyebrows inward or “set” his/her mouth in a hard line. In addition, after observing each game, coders rated the intensity of the participant’s angry facial expressions over the course of the entire game on a 3-point scale (ranging from a little to some to a lot). When viewing the videotapes, coders turned off the sound, so that facial coding was not influenced by auditory content.

For reliability purposes, 20% of the videotapes were coded by two observers, who were blind to which tapes were reliability trials. The reliability index across all second-by-second facial coding was .81, and the reliability index for angry facial expressions was .73 (both Cohen’s kappa). In addition, the reliability index for the intensity of angry facial expressions was .66 (Pearson’s r).

This coding system resulted in three variables assessing angry facial expressions. First, frequency of angry facial expressions reflects the number of angry facial expressions that the participant displayed during the game. Second, mean duration of angry facial expressions represents the average number of seconds that the participant maintained an angry facial expression during the game. Third, intensity of angry facial expressions reflects the observer’s rating of the intensity of the participants’ angry facial expressions throughout the game. Because the duration of the games varied considerably ($M_{game} = 414.24$,}
\[ SD_{game1} = 72.44, \ M_{game2} = 507.04, \ SD_{game2} = 76.99, \]

The frequency variables were adjusted by multiplying these scores by the mean duration for that game across all participants and dividing the resulting score by the actual duration of that game for that participant.

**Nonverbal behavior coding system**

On an event basis, observers recorded all instances in which participants engaged in two nonverbal behaviors indicative of anger. These were:

1. Using Game Materials Roughly: Examples included throwing game pieces or slamming the "man" down on the board with force. This code was not used if the behavior was aggressive (i.e., if the participant intended to harm the confederate, for example by throwing game pieces at him/her).
2. Displaying Frustration: Examples included punching the fist into the hand, hitting one's own head with the palm of the hand, and pretending to cry.

This coding system resulted in two variables, frequency of rough nonverbal behaviors and frequency of frustrated nonverbal behaviors, which represent the frequency with which the participant displayed each of these two behaviors during the game. These variables were adjusted to account for differences across participants in the duration of the games in the same manner as is described above for facial expressions. Again, reliability analyses were conducted by having 20% of the videotapes coded by two observers. The reliability indices for using game materials roughly and for displaying frustration were .85 and .78, respectively (both Cohen's kappa).

**Results**

**Preliminary Analyses**

We initially examined the effects of gender and game (the fair game versus the cheating game) on the analyses reported below. Although there were mean differences between boys and girls and between games on several variables, none of the correlations between any of the variables differed as a function of gender or between the two games. Therefore, because our main analyses were correlational in

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1 Although all observers were trained to code aggressive behavior (e.g., hitting, name calling) in addition to using game materials roughly and displaying frustration, this behavior never occurred during either of the two games played by the 274 children.
nature, all findings reported below are for boys and girls combined and are averaged across the two games.

**Descriptive Statistics**

Means, standard deviations, ranges, and skewness statistics are provided in Table 1 for the three self-reported anger-regulation variables and the five observed anger-expression variables. According to Glass and Hopkins (1996), a cutoff of +/− 0.5 on the skewness statistic should be used to determine if variables are significantly skewed. Using this cutoff, seven of the eight variables were skewed. Therefore, we performed log transformations on these variables to correct for skewness, and we used the transformed variables in all subsequent analyses.

**Data Reduction for Observed Anger-Expression Variables**

To examine the possibility of aggregating the observational variables to form composites representing angry facial expressions and angry nonverbal behaviors, we correlated the five observational variables with one another (see Table 2). Although all of these correlations were significant, the magnitude of the correlations among the facial variables was much larger than that between the nonverbal variables. Moreover, the correlation between the two nonverbal variables was of approximately the same magnitude as the correlations across the facial and nonverbal variables. These results supported the legitimacy of forming an aggregated variable representing angry facial expressions, but suggested that aggregation of the two nonverbal variables may not be appropriate.

To further examine whether the nonverbal variables should be aggregated, we conducted correlations between the five observational variables and children’s self-reports of how much anger they experienced (level of anger experienced) and expressed (level of anger expressed). The only significant relation was between level of anger expressed and frequency of rough nonverbal behaviors (see Table 2). Thus, children’s perceptions of their own anger expression were differentially related to observations of their frustrated versus rough nonverbal behaviors. These findings further supported the idea that frequency of frustrated nonverbal behaviors and frequency of rough nonverbal behaviors should not be aggregated, but instead should be analyzed independently.

Therefore, we created an aggregate called angry facial expressions. This variable was calculated by standardizing frequency of angry facial expressions, mean duration of angry facial expressions, and intensity of angry facial expressions across the 274 participants and averaging the
Table 1. Means, Standard Deviations, and Skewness Statistics for Self-Reported Anger-Regulation Variables and Observed Anger-Expression Variables

| Construct                       | Variable                                        | Mean | Standard deviation | Range   | Skewness |
|---------------------------------|                                                |      |                    |         |          |
| Self-reported anger regulation  | Number of plausible strategies-external        | 2.01 | 1.46               | 0 - 5   | .53      |
|                                 | Number of plausible strategies-internal        | 1.61 | 1.44               | 0 - 5   | .80      |
|                                 | Use of display rules for anger                 | 1.08 | .64                | -.50 - 2.50 | -.05    |
| Observed anger expression       | Frequency of angry facial expressions          | 2.49 | 5.23               | 0 - 7.53 | 10.36   |
|                                 | Mean duration of angry facial expressions      | 2.91 | 7.53               | 0 - 111.00 | 11.31  |
|                                 | Intensity of angry facial expressions          | 2.11 | 1.27               | 1 - 3   | 1.65     |
|                                 | Frequency of frustrated nonverbal behaviors    | .38  | .93                | 0 - 7.08 | 4.33     |
|                                 | Frequency of rough nonverbal behaviors         | .41  | 1.13               | 0 - 11.89 | 5.84    |
Table 2. Correlations Among Observed Anger-Expression Variables, Level of Anger Experienced, and Level of Anger Expressed

<table>
<thead>
<tr>
<th>Construct</th>
<th>Variable</th>
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<tr>
<td>Observed angry facial expressions</td>
<td>1. Frequency of angry facial expressions</td>
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<td>2. Mean duration of angry facial expressions</td>
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<td>3. Intensity of angry facial expressions</td>
<td>.81*** .71***</td>
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<td>Observed angry nonverbal behaviors</td>
<td>4. Frequency of frustrated nonverbal behaviors</td>
<td>.36*** .17*** .37***</td>
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<td>5. Frequency of rough nonverbal behaviors</td>
<td>.26*** .17*** .30*** .30***</td>
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<tr>
<td>Self report</td>
<td>6. Level of anger experienced</td>
<td>-.07</td>
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<td>-.02</td>
<td>.03</td>
<td>.09</td>
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<tr>
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<td>7. Level of anger expressed</td>
<td>-.01</td>
<td>.03</td>
<td>.05</td>
<td>-.02</td>
<td>.20*** .51***</td>
<td></td>
</tr>
</tbody>
</table>

*p < .05. ** p < .01. *** p < .001.
three standardized scores. Higher numbers on this variable reflected an increased tendency to display facial anger. In contrast, we did not create an aggregate representing angry nonverbal behaviors.

EVIDENCE FOR THE VALIDITY AND STANDARDIZATION OF THE ANGER-AROUSING GAMES

We made two assumptions about the games. First, we assumed that the games elicited some anger in participants. According to children’s self-reports, they experienced between a little anger and some anger (M_{Level of Anger Experienced} = 1.54), and they expressed between no anger and a little anger (M_{Level of Anger Expressed} = .46). These statistics provided some support for the contention that the games elicited anger in participants.

Second, we assumed that different confederates elicited similar responses from participants. In order to test this assumption, we conducted two multivariate analyses of variance (MANOVAs), one for each game, with confederate serving as the independent variable. Children’s self-report of anger experienced (level of anger experienced), their self-report of anger expressed (level of anger expressed), and observations of their anger expression (angry facial expressions, frequency of frustrated nonverbal behaviors, and frequency of rough nonverbal behaviors) served as the dependent variables. There was no confederate effect for either game 1, F(29, 240) = .91, ns, or game 2, F(29, 240) = 1.09, ns.

Correlations

Next, we correlated the anger-regulation variables, the anger-expression variables, and the outcomes of social preference and aggression (see Table 3). Given that we assessed three conceptually distinct aspects of anger regulation, we were first interested in the extent to which the anger-regulation variables were related to one another. All three variables were significantly related in the expected directions. Number of plausible strategies-external and number of plausible strategies-internal were more highly related than were the other two pairs of anger-regulation variables. Although this correlation is strong, it is not so robust as to suggest that these variables are in fact assessing a single construct. Thus, this correlation, in combination with the previously reported factor analysis, lends support to the validity of the distinction between strategies for dissembling external anger expression and strategies for regulating the internal experience of anger.

Next, for each of the three self-reported anger-regulation variables, we examined the direct correlations with social preference and with
Table 3. Correlations Among Self-Reported Anger Regulation Variables, Observed Anger Expression Variables, Social Preference, and Aggression

<table>
<thead>
<tr>
<th>Construct</th>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-reported anger regulation</td>
<td>1. Number of plausible strategies-external</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Number of plausible strategies-internal</td>
<td>.48***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Use of display rules for anger</td>
<td>.12*</td>
<td>.17**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observed anger expression</td>
<td>4. Angry facial expressions</td>
<td>-.04</td>
<td>-.03</td>
<td>-.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Frequency of frustrated nonverbal behaviors</td>
<td>.02</td>
<td>-.08</td>
<td>.04</td>
<td>.34***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Frequency of rough nonverbal behaviors</td>
<td>-.04</td>
<td>-.14*</td>
<td>-.16**</td>
<td>.19**</td>
<td>.30***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcomes</td>
<td>7. Social preference</td>
<td>.12</td>
<td>.07</td>
<td>.02</td>
<td>-.13*</td>
<td>-.19**</td>
<td>-.18**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Aggression</td>
<td>-.01</td>
<td>-.05</td>
<td>-.01</td>
<td>.04</td>
<td>.19**</td>
<td>.20***</td>
<td>-.62***</td>
</tr>
</tbody>
</table>

*p < .05. **p < .01. ***p < .001.
aggression. As can be seen in Table 3, none of the anger-regulation variables were related to social preference or to aggression.

Path Analyses

Our next step was to assess whether observed anger expression mediated the relation between each of the three aspects of self-reported anger regulation and the peer-rated outcomes of social preference and aggression. Following the mediational approach put forth by Kenny, Kashy, and Bolger (1998), we tested only those models that included significant relations between the initial (anger regulation) and mediating (anger expression) variables as well as between the mediating and outcome (social preference or aggression) variables. This approach stands in contrast to traditional mediation, which calls for a significant relation between the initial and outcome variables as well (Baron & Kenny, 1986). However, in their recent discussion of mediational analyses, Kenny et al. argued that a relation between the initial and outcome variables is implied if relations between the initial and mediating variables as well as between the mediating and outcome variables are significant. Thus, a significant relation between the initial and outcome variables is not required. Testing a mediational model via path analysis, then, takes the place of the final step in mediation, namely estimating the effects of both the initial and mediating variables on the outcome variable in a single regression equation.

Preliminary Correlational Analyses

Using the correlations in Table 3, we constructed path models that met the criteria of a significant correlation between the anger-regulation variable and the anger-expression variable as well as between the anger-expression variable and social preference or aggression. Our gatekeeping procedure began with selecting those combinations of anger-regulation variables and anger-expression variables that were significantly correlated. The only anger-expression variable that correlated with any anger-regulation variable was frequency of rough nonverbal behaviors, which was significantly correlated with both number of plausible strategies-internal and use of display rules for anger. Given that only frequency of rough nonverbal behaviors could operate as the mediating variable, the final step was to establish whether this variable was significantly correlated with either outcome variable. Frequency of rough nonverbal behaviors was significantly correlated with both social preference and aggression (see Table 3). Because the two
initial variables and the two outcome variables were correlated with each other (see Table 3), we included both initial variables and both outcomes together in one model. The final model to be tested is displayed in Figure 1.

**Path Model**
The fit of the model was assessed using two statistics, chi-square ($\chi^2$) and root mean square error of approximation (RMSEA). The $\chi^2$ statistic indexes exact fit of a model. Nonsignificant values represent no difference between the model-reproduced covariance matrix and the sample-covariance matrix, indicating that the model fits the data exactly. The RMSEA statistic measures approximate fit of a model. Nonsignificant values represent minimal differences between the two covariance matrices, indicating that the model fits the data approximately. When using path analysis, mediation is indicated when the path model fits the data exactly.

The values of the path coefficients and the two model fit statistics are presented in Figure 1. The model yielded nonsignificant model fit statistics, indicating mediation. Both number of plausible strategies-internal and use of display rules for anger were significantly negatively related to frequency of rough nonverbal behavior, and frequency of rough nonverbal behavior was significantly negatively related to social preference and positively related to aggression.

Figure 1. Path model in which two self-reported anger-regulation variables predict frequency of rough nonverbal behaviors, which, in turn, predicts peer-rated social preference and aggression.

$$\chi^2 = .92, p > .05$$
$$RMSEA = .00, p > .05$$

* $p < .05$, ** $p < .01$, *** $p < .001$. 
Finally, we tested an alternative model in which the paths from the anger-regulation variables to frequency of rough nonverbal behaviors were set to zero. The purpose of this test was to determine whether our mediational model fit the data better than a model in which social preference and aggression were predicted from frequency of rough nonverbal behaviors alone, without the indirect contribution of the anger-regulation variables. By comparing this alternative model to our original model, we were able to assess whether the inclusion of the self-reported anger-regulation variables contributed to the process in which anger expression predicted social preference and aggression.

In terms of model fit statistics, the alternative model provided a somewhat worse fit for the data than the mediational model. For the alternative model, \( \chi^2(6) = 11.84, ns \) and \( \text{RMSEA} = .06, ns \). In addition, when altering models, it is important to attend to the Expected Cross-Validation Index (ECVI) that measures how well a model will cross-validate with similar models based on samples of the same size drawn in the same manner. Thus, the ECVI is a better index of change in model fit than simple comparison of model fit statistics. For the original model, the ECVI equaled .08. In comparison, for the alternative model, the ECVI equaled .11. Given that lower ECVI values indicate better model fit, these statistics indicated that the alternative model fit the data worse than the original model. These findings suggested that the indirect relations between the two anger-regulation variables and the outcomes of social preference and aggression were at least partially mediated by frequency of rough nonverbal behaviors. Stated another way, inclusion of these aspects of children’s self-reported anger regulation contributed to the process in which anger expression predicted social preference and aggression.

**Discussion**

The goal of this study was to examine the relations between self-reported anger regulation and peer-rated social preference and aggression. The three aspects of anger regulation that we assessed were the generation of strategies for dissembling the external expression of anger, the generation of strategies for regulating the internal experience of anger, and use of display rules for anger.

Our first approach was to examine the direct relations between each aspect of anger regulation and the outcomes of social preference and aggression. None of the aspects of anger regulation were related to either of these outcomes. If we had only examined these direct correlations, we would have thought that anger regulation had no relation to social preference or to aggression.
However, peer rejection and aggression are related to children's tendency to express more anger in social interaction (Denham et al., 1990; Fabes & Eisenberg, 1992; Hubbard, 2001; Underwood, 1997). These findings suggest problems with anger regulation, problems that may function through the mechanism of anger expression, affect the outcomes of social preference and aggression. The strategies and display rules that are part of the anger-regulation process cannot directly affect how much others like an individual or how aggressive others view him/her to be. The actual expression of anger may be the mechanism through which anger regulation relates to peers' ratings of social preference and aggression. Therefore, our second approach involved examining the indirect relations between anger regulation and social preference and aggression through the mediating mechanism of anger expression.

The path model that we constructed yielded moderate support for indirect relations between two of the three aspects of anger regulation and the outcomes of social preference and aggression through the mediating mechanism of nonverbal anger expression. The disparity in findings between the direct correlational approach and the indirect mediational approach suggests that, although anger regulation was not directly related to the outcomes of social preference and aggression, it was indirectly related to these outcomes through the mechanism of nonverbal anger expression. Perhaps these inner aspects of anger regulation were too distal to relate to peer-rated social preference and aggression directly. However, the importance of anger regulation for the outcomes of social preference and aggression became apparent when nonverbal anger expression was included as the mechanism through which anger regulation related to these outcomes. These findings appear more robust when one considers that each of the three constructs included in the models was evaluated using unique sources of data, which makes the possibility that method variance accounted for these relations unlikely.

Specifically, the generation of strategies for regulating the internal experience of anger was not directly related to either social preference or aggression. However, when we assessed the indirect relations between the generation of these strategies and these outcomes through the mediating mechanism of nonverbal anger expression, moderate support for mediation emerged. We considered the possibility that the ability to generate strategies for regulating the internal experience of anger is merely reflective of the ability to generate strategies for solving social problems. However, we believe that the generation of the two types of strategies is distinct, for two reasons. First, a direct relation has consistently been found between children's ability to generate strategies for
solving social problems and social preference and aggression (Crick & Dodge, 1994); in contrast, in the current study, only an indirect relation was found between the generation of strategies for regulating the internal experience of anger and the outcomes of social preference and aggression. Second, the finding that nonverbal anger expression mediated these relations suggests that individual differences in knowledge of these strategies is not solely accounted for by individual differences related to social information processing.

Similar to the generation of strategies for regulating the internal experience of anger, the generation of strategies for dissembling external anger expression was also not directly related to either social preference or aggression. However, the generation of strategies for dissembling external anger expression was also not indirectly related to these outcomes through nonverbal anger expression. Thus, there was no evidence of any relation between the generation of strategies for dissembling external anger expression and the outcomes of social preference or aggression.

This discrepancy highlights the importance of separating anger-regulation strategies into the two domains of internal versus external regulation. Perhaps an explanation for these differential relations lies in the development of children's knowledge bases for these two types of strategies. Although we know of no developmental literature that compares children's ability to generate the two types of strategies, children's knowledge of strategies for regulating the internal experience of anger may develop more slowly than their knowledge of strategies for dissembling the external expression of anger. By 2nd grade, most children may have a well-developed repertoire of strategies for dissembling external anger expression regardless of their social preference or aggression. In contrast, if children in 2nd grade are in the midst of acquiring a knowledge base of strategies for regulating the internal experience of anger, then more socially competent children may be ahead of less competent children in their acquisition of these strategies. In fact, in other areas of children's cognitive development, knowledge of internal processes has been found to develop more slowly than knowledge of external processes (e.g., Flavell, 2000; Welch-Ross & Miller, 2000).

We assessed children's use of display rules for anger as the third aspect of anger regulation. As with both types of strategies, children's use of display rules for anger was not directly related to either social preference or aggression. However, when we assessed the indirect relations between use of display rules for anger and these outcomes through the mediating mechanism of nonverbal anger expression, moderate support for mediation emerged. Generally, in previous
research, either self-report or observational methodologies have been used to measure children's display rule use (Cole et al., 1994; Underwood et al., 1992), but the two approaches have not been used in combination. Thus, although others have inferred that children's self-reports about display rule use relate to emotional expressions, which is in turn affect the outcomes of social preference or aggression, previous research has not directly addressed this possibility. Our study was the first to provide empirical support for the links between self-reported display rule use, emotion expression, and the outcomes of social preference and aggression.

By including both the generation of strategies for regulating the internal experience of anger and use of display rules for anger in one model, we were able to evaluate the unique contributions of these variables. In fact, each of these anger-regulation variables contributed to the prediction of nonverbal anger expression and the outcomes of social preference and aggression, even after the contribution of the other variable was taken into account.

However, the possibility remained that the strong relation between nonverbal anger expression and the outcomes of social preference and aggression fully accounted for the fit of the mediational path model. Therefore, in order to determine whether including the self-reported anger-regulation variables in the model contributed to the prediction of these outcomes, we tested an alternative model in which the relations between the anger-regulation variables and nonverbal anger expression were constrained. The purpose of this test was to determine whether our mediational model fit the data better than a model in which social preference and aggression were predicted from nonverbal anger expression alone, without the indirect contribution of the anger-regulation variables. Results indicated that the alternative model fit the data less well than the original model, suggesting that self-reported anger regulation contributed to the process in which nonverbal anger expression predicted social preference and aggression.

Through the process of investigating the indirect relations between anger regulation and social preference and aggression, several noteworthy additional findings emerged. First, of the three types of anger expression, only the frequency with which a child displayed excessively rough handling of the game materials was related to any self-reported anger-regulation variable. We were surprised to find that the other two types of anger expression (angry facial expressions, frustrated nonverbal behaviors) did not correlate with anger regulation. However, rough nonverbal behavior was the only type of anger expression that correlated significantly with children's self-report of how much anger they
expressed during the games. Other investigators have found similar weak relations between children's self-reports of emotion expression and observations of that expression (Casey, 1993; Underwood & Bjornstad, 2001). Perhaps when children self-reported on their own expressions of anger, they were focusing on their displays of rough behaviors, rather than on their displays of frustrated behaviors or angry facial expressions. If children conceived of their own displays of anger in terms of rough behavior, they likely focused on regulating those rough behaviors when they self-reported on their anger-regulation processes. This could account for why rough nonverbal behaviors was related to self-reported anger regulation, while the other observed anger-expression variables were not.

However, because rough nonverbal behaviors was the only anger-expression variable to relate to the anger-regulation variables, we were concerned that this variable may not have actually indexed anger expression per se. However, in addition to correlating with children's self-reported expression of anger, rough nonverbal behaviors correlated with every other observed anger-expression variable as well, supporting the idea that rough nonverbal behaviors were actual displays of anger.

Furthermore, although the constraints of constructing a mediational model limited our focus on the relations between observed anger expression and the outcomes of social preference and aggression to rough nonverbal behaviors, it is important to note that other significant relations did emerge. Specifically, both social preference and aggression were significantly related to the display of frustrated nonverbal behaviors. In addition, social preference was related to angry facial expressions, although aggression was not. These findings suggest that the relation between anger expression and these outcomes is not limited to the display of rough nonverbal behavior. Rather, social preference and aggression are related to anger expression more broadly, a finding that has been supported in several other investigations as well (Cole et al., 1996; Denham et al., 1990; Eisenberg et al., 1996; Fabes & Eisenberg, 1992; Hubbard, 2001; Underwood, 1997).

Several limitations of the present research should be addressed. First, the interview to assess anger regulation, while drawing heavily on previous literature (e.g., Ekman & Friesen, 1975; Saarni, 1979, 1988; Underwood, 1997), was utilized for the first time in the present research. Second, the possibility remains that the games may not have elicited anger in all participants, but rather, that they elicited either another negative emotion or no negative emotion at all. If some participants did not experience anger, they may have had more difficulty reporting on their anger-regulation processes, thus dampening the rela-
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tions reported here. Third, our findings may be specific to situations involving an unfamiliar peer, rather than a friend or acquaintance. Children may think differently about regulating anger, and children may differ in the extent of their anger expression, when interacting with a friend rather than an unfamiliar child. Fourth, these results may be specific to 2nd-grade children. Children's ability to self-report validly on anger regulation, as well as the relation between anger regulation and social preference and aggression, may change with age. Fifth, because only children of popular, average, or rejected sociometric status were included in our sample, our findings cannot be generalized to neglected and controversial children. Finally, our findings cannot be generalized beyond the context of competitive game playing. A promising avenue for future research would be to examine children's anger regulation and anger expression in other provoking peer situations.

References


