Profiles of anger control in second-grade children: Examination of self-report, observational, and physiological components

Marissa Smith, Julie A. Hubbard *, Jean-Philippe Laurenceau

Department of Psychology, University of Delaware, Newark, DE 19716, USA

A R T I C L E   I N F O

Article history:
Available online 11 March 2011

Keywords:
Aggression
Anger control
Emotion regulation
Latent profile analysis
Peer relations
Social preference

A B S T R A C T

The current study used latent profile analysis (LPA) to examine anger control in 257 second-grade children (~8 years of age). Anger was induced through losing a game and prize to a confederate who cheated. Three components of anger control were assessed: self-report of awareness of anger, observed intensity of angry facial expressions, and skin conductance reactivity. These components served as indicators in an LPA conducted to determine whether distinct groups of children who differed in anger control profiles would emerge. Five groups were found: (a) Physiology-and-Expression Controllers (high self-report, low expression, low physiological arousal), (b) Expression-Only Controllers (high self-report, low expression, high physiological arousal), (c) Non-controllers (high self-report, high expression, medium physiological arousal), (d) Non-reactive (low self-report, low expression, low physiological arousal), and (e) Non-reporters (low self-report, medium expression, medium physiological arousal). These findings are discussed in terms of implications for the assessment of children’s anger control skills and intervention programs for children’s anger management.

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Introduction

Controlling anger is an important developmental task of middle childhood, and children who struggle to regulate anger are at risk for externalizing disorders (e.g., Cole, Teti, & Zahn-Waxler, 2003). As early as infancy, babies learn that expressions of anger are not well received by others (Malatesta &...
Haviland, 1982). As they develop, children’s understanding that the expression of anger is frowned upon becomes increasingly sophisticated (Scheff, 1984), particularly in the peer context (Shipman, Zeman, Nesin, & Fitzgerald, 2003). Children in middle childhood report that, among peers, they are much less likely to express anger than any other emotion, because they believe angry expressions will produce adverse interpersonal consequences (e.g., Underwood, Hurley, Johanson, & Mosley, 1999). In fact, children who express anger toward peers are likely to be rejected (e.g., Eisenberg, Fabes, Guthrie, & Reiser, 2000). Children in middle childhood may be especially motivated to control angry feelings when with peers in an effort to appear cool and avoid embarrassment (e.g., Lemerise & Dodge, 2008). Thus, in middle childhood, a premium is placed on maintaining emotional composure and controlling anger.

The current study sampled second-grade children, who are in the early stages of this middle childhood period. Previous observational studies of anger expression in middle childhood have shown that second graders express more anger and control their anger less expertly than fourth and sixth graders (Underwood et al., 1999). Thus, we chose to study second graders to learn more about the emergence of anger control in the early years of middle childhood.

Furthermore, the current study used a procedure designed both to induce angry feelings in children and to motivate them to control their anger. Anger was induced by having children lose a competitive board game and a desired prize to a confederate peer who cheated. The procedure aimed to promote anger control by placing children with a same-age peer. This peer was an unfamiliar child, and children may be even more likely to conceal anger when with unfamiliar peers than with close friends (Underwood, Coie, & Herbsman, 1992). Thus, this procedure was well-suited to both evoke anger and motivate children to control anger.

In the past, researchers have typically assessed anger control in middle childhood using paper-and-pencil measures completed by children, parents, or teachers (e.g., the Children’s Anger Management Scale by Zeman and colleagues; Zeman, Shipman, & Penza-Clyve, 2001; Zeman, Shipman, & Suveg, 2002). Questionnaire measures of children’s anger control allow for efficient assessment, and they are clearly important for this reason. However, for the current project, our goal was to develop a laboratory-based assessment of anger control suitable for the middle childhood period. Researchers have not used laboratory-based assessments in the past, and we hoped to fill this gap in a number of ways. In particular, we aimed to design a procedure that was ecologically valid, standardized anger-inducing stimuli across children, and allowed for the assessment of multiple components of children’s anger control (e.g., observational, physiological).

Anger control is one part of the broader and more complex construct of emotion regulation. One of the most commonly-cited definitions in the child development literature states that emotion regulation includes “the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions ... to accomplish one's goals” (Thompson, 1994, pp. 27–28). This definition implies that regulation may involve either increasing or decreasing the experience or expression of an emotion. In the current study, however, we focused more narrowly on the control, or reduction, of the particular emotion of anger.

Theorists conceptualize three components of emotion and its regulation: an experiential component, an expressive component, and a physiological component (e.g., Cole, Martin, & Dennis, 2004; Thompson, Lewis, & Calkins, 2008). The experiential component is most often assessed through self-report, the expressive component through observation, and the physiological component through measures such as heart rate and skin conductance. In the current study, we included self-report, observational, and physiological measures of children’s anger in the context of the anger-inducing game with the peer confederate.

Traditionally, theorists have assumed that these components cohere and vary together as a unitary construct (Ekman, 1992; Izard, 1977). However, empirical support for this coherence is mixed and weak (see Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005, for a succinct review and for their own findings). Moreover, in four separate studies of middle-childhood participants playing anger-inducing games with peer confederates (Casey, 1993; Hessler & Katz, 2007; Hubbard et al., 2004; Underwood & Bjornstad, 2001), weak correlations emerged across the self-report, observational, and physiological components of anger.

Thus, although some children may show high or low levels of all three components of anger, other children may display high levels of some components but low levels of others, explaining the weak
relations among components. This idea suggests that each of these components is useful in understanding how children control anger. However, the components may be better conceptualized as anger control profiles, in which children could display high or low levels of each component independent of the others.

The goal of the current study was to examine whether distinct profiles of the three components emerged when second-grade children were placed in an anger-inducing situation. Many different profiles are possible if children potentially could display low, medium, or high levels of self-reported anger, observed anger, and physiological arousal. Because this study is the first to examine anger control profiles in children, we considered our work to be exploratory. Thus, with the exception of a group predicted to struggle with all aspects of anger control, we did not hypothesize that particular profile types would emerge. Instead, we empirically investigated whether distinct groups would emerge. Latent profile analysis (LPA) was used to investigate whether children clustered into groups based on the levels of self-reported, observed, and physiological anger that they displayed. These analyses represented a reexamination of data from a previous study by Hubbard and colleagues (2002, 2004).

The examination of profiles across the three components may have implications for the assessment of children's anger control. If children fall into distinct groups with different anger control profiles, this finding will suggest that assessment of all three components is essential to understanding each child's approach to anger control. These profiles will contain important information not available from any single measure of anger, and they will indicate that we should avoid assessing children's anger control using only one of the components.

Our primary goal was to examine whether distinct profiles of anger control emerged when children were placed in an anger-eliciting situation. A secondary goal was to investigate whether the groups that emerged differed in classroom-based social preference and aggression. Studies suggest that children who struggle with anger control are more aggressive and rejected than other children (e.g., Denham, McKinley, Couchoud, & Holt, 1990; Fabes & Eisenberg, 1992). For this reason, we hypothesized that a group of children who particularly struggle with anger control would emerge and that this group would be significantly lower on social preference and higher on aggression than the other groups. We predicted that this group would display the highest levels of self-reported anger, observed anger, and physiological arousal of all groups.

Thus, in contrast to our general hypothesis about a lack of coherence among the anger control components across all children, we predicted that this most dysregulated group of children would display coherence, in the form of elevated responses across all three components. This prediction is counter to two previous studies suggesting that children with externalizing problems show even weaker coherence across emotion components than their peers (Hastings et al., 2009; Marsh, Beauchaine, & Bailey, 2008). However, in these studies, other emotions besides anger were induced. We hypothesized that children who are peer-rejected and aggressive would show greater coherence than their peers when the emotion evoked was anger in particular. Furthermore, coherence across emotion components may be greater as emotional intensity increases (Davidson, 1992; Tassinary & Cacioppo, 1992). We expected that the externalizing group of children would experience more intense anger than their peers in response to losing the game to the confederate peer who cheated, resulting in their high levels of all three components.

Our final goal was to explore whether the groups that emerged differed on sex or race/ethnicity. In previous work, boys have been shown to struggle more than girls with both aggression and emotion regulation (e.g., Moffitt & Caspi, 2001; Saarni, 1984). Thus, we predicted that the group of children who had the most difficulties with anger control would contain more boys than girls. In all other respects, however, our analyses regarding sex and racial/ethnic differences across the groups were exploratory.

Method

Overview

All children in 134 second-grade classrooms with parental permission completed peer nominations to assess social preference and overt aggression. A subsample of 257 of these children subsequently
participated in a laboratory visit. During the visit, participants played an anger-inducing competitive board game with a peer confederate. During the game, an observational measure of participants’ anger (intensity of angry facial expressions) and a measure of physiological arousal (skin conductance reactivity) were collected. Following the game, participants self-reported on the level of anger they experienced during the game.

Participants

Participants for classroom data collection included all children with parental permission in 134 second-grade classrooms in public (N = 1695) and parochial (N = 357) school districts in the mid-Atlantic area of the United States (total N = 2052). These children were roughly 8 years old. Approximately 35% of these children were classified as low-income and qualified for free or reduced price lunch. The average classroom participation rate was 69% (range = 40%–93%). The average number of participants per class was 15 (range = 6–33). These data were collected during three consecutive spring semesters.

During the three subsequent summers, a subsample of 257 of these children participated in laboratory data collection. This subsample was selected to represent both boys and girls and to sample across sociometric status categories (40 popular boys, 44 average boys, 43 rejected boys, 49 popular girls, 49 average girls, and 32 rejected girls). The racial/ethnic breakdown of the sample reflected that of the school districts (179 European Americans, 55 African Americans, 20 Latino Americans, and 3 Asian Americans). However, sociometric status categories did not differ in their racial/ethnic composition (European American, African American, Latino American, or Asian American), χ²(6) = 12.09, ns.

Of note, in previous articles using this data set, the number of laboratory participants has been reported as slightly higher (e.g., N = 272 in Hubbard et al., 2002). For the analyses reported here, only those participants with complete data across self-report, observational, and physiological measures were included, because our primary purpose was to examine anger control profiles using these three indicators. Thus, the lower N is the result of the exclusion of those few participants who were missing data across one of the three indices of anger control. For this reason, the analyzed data set did not include any missing data.

To recruit laboratory participants, letters were sent to parents describing the purpose and procedures of the study. Later, parents were called to request their children’s participation. In total, 33% of the parents called agreed to allow their children to participate in the laboratory procedure and brought their children to the laboratory to do so. These percentages ranged from 30% to 38% across the six Sex × Sociometric Status groups and did not vary by Sex or Sociometric Status. In addition, participants did not differ from children whose families were contacted but who refused participation on Social Preference, F(1, 1589) = 1.49, ns. However, participants (M = 0.11, SD = 1.03) were slightly higher on Overt Aggression than those who refused participation (M = −0.06, SD = 0.92), F(1, 1589) = 6.54, p < .05, Cohen’s d = 0.17. Participants were compensated with $5 and a small toy.

Classroom data collection procedures

Peer nominations of liking and disliking

Peer nominations of liking and disliking were collected during individual interviews with each child. Children were first asked to name an unlimited number of children in their classroom (both same- and other-sex) 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” (children generated names spontaneously, without the aid of pictures or rosters). On average, each child nominated 7.52 peers as liked (SD = 4.39) and 3.50 peers as disliked (SD = 2.64). Numbers of liking and disliking nominations received by each child were tallied and standardized within classroom.

Social Preference (SP) scores were calculated as the standardized difference between liking and disliking scores, and Social Impact (SI) scores were calculated as the standardized sum of liking and disliking scores. Popular children were those who received SP scores greater than 1.00, “liked most” scores greater than 0, and “liked least” scores less than 0. Rejected children were those who received SP scores less than −1.00, “liked most” scores less than 0, and “liked least” scores greater than 0.
Average children were those whose SP and SI scores were between –1.00 and 1.00. Of note, continuous SP scores were used in analyses for the purposes of external validation of the anger control profile groups, whereas sociometric status categories (popular, average, and rejected) were used to sample children for laboratory visits.

**Peer nominations of overt aggression**

During the same individual interviews, three unlimited peer nominations of overt aggression were collected (Who are the kids in your class who start fights? Who yells and calls other kids mean names? Who hits and pushes other kids?). The number of nominations that each child received on each item was summed and standardized within classroom, and these three scores were then averaged. These calculations resulted in a continuous score for Overt Aggression for each child.

**Laboratory data collection procedures**

The following sections describe the anger-inducing game that participants played and the measures of self-reported anger, observed anger, and physiological arousal collected during the game. Of note, previous articles using this data set (Hubbard et al., 2002, 2004) used turn-by-turn indices of these measures. For the purpose of the LPA conducted here, aggregated measures that summarized children’s scores across the game were necessary.

**Anger-evoking, confederate-based, standardized competitive game procedure**

Prior to playing the game, participants spent 4 min working alone on an arts-and-crafts project. Following this baseline period, each participant and a confederate played a competitive board game for approximately 8.5 min. This procedure was designed to arouse a moderate degree of anger in two ways. First, the game was “rigged” to ensure that the participants lost. Second, the confederates engaged in blatant unfair play in a standardized manner. A prize was offered to the winner of the game. The experimenter asked participants to select the prize they would like to win from five possible prizes. Following participants’ choice, confederates always chose the same prize.

In the game, participants and confederates pretended to be astronauts who brought back stars from space. As they moved around the game board, the children collected and lost star tokens that were placed on a scorecard; the first child to collect 25 tokens was the winner. The game was rigged by controlling which space the children landed on for each turn. Thus, movement around the board was determined by a slide projector that projected numbers and arrows through the one-way mirror onto a wall. The arrow indicated to the children whose turn it was, and the number indicated how many spaces to move.

Each confederate was a same-age, same-sex child unfamiliar to the participant. Child confederates were recruited from a school that did not participate in data collection. They were trained in two skills. The first skill involved playing unfairly. At three points during the game, confederates landed on the “best” space of the game board—the only space that indicated the player should take three tokens. At each point, they were trained to take five star tokens, rather than three, in an obvious manner. The second skill involved learning to behave in a neutral fashion at all times when not cheating. For example, confederates were taught not to express obvious emotion, either positive or negative, and to respond briefly when spoken to.

A number of steps were taken to protect the welfare of participants and confederates. These steps were detailed thoroughly in Hubbard and colleagues (2002) and Hubbard (2005).

**Self-report of anger**

Following the game, each participant viewed a videotape of the game with an experimenter. The end of the video depicted the participant losing both the game and prize to the confederate. The experimenter asked the participant to rate how angry he or she felt at the end of the game using a 4-point Likert scale ranging from 1 (not at all) to 4 (a lot). This rating represented the participant’s score for Self-Report of Anger.
Observed anger

In total, 21 observers were trained in the use of a simple observational coding scheme designed to assess the intensity of facial anger. Observers were blind to the hypotheses of the study and to the sociometric status of the participants.

When using this coding scheme, observers first viewed each participant’s game in its entirety. Then they answered the question, “During the game, how much did the participant’s face look angry?” using a 9-point rating (1 = not at all, 9 = a whole lot). Each participant received a rating for Angry Facial Expressions using this coding scheme.

Observers were trained by the second author. Reliability for the training trials was calculated by comparing observers’ data with coding completed by this author. Observers were considered to be sufficiently trained when they reached a criterion of .80 (Pearson’s r) on three consecutive training trials.

For reliability purposes, 25% of the videotapes were coded by two observers. Observers knew that reliability checks would occur throughout coding, but were blind to which videotapes were reliability trials. The correlation between the anger intensity ratings of the two observers across all reliability trials was r(63) = .86, p < .0001.

Physiological arousal

Participants’ skin conductance was measured continuously throughout the baseline period and game with a Biolog Model 3992/4 ambulatory monitoring device carried by each participant in a small backpack. Skin conductance was recorded with two UFI 1081FC Ag–AgCl electrodes filled with an isotonic NaCl electrolyte gel and attached with small Velcro bands to the volar surfaces of the first and third medial phalanges on the nondominant hand. The Biolog recorded the participant’s skin conductance level 10 times per second at a resolution of .012 μSiemens (μS).

In addition to the skin conductance measure, each participant’s activity level was monitored on a second-by-second basis throughout the baseline period and game. Activity level was measured by the movement of a piezoelectric device, capable of detecting motion along all three axes, incorporated in the body of the Biolog unit. Activity level was of interest as a potential covariate because active children may have experienced increased levels of skin conductance simply due to motor activity.

Skin conductance and activity level data were stored in digital form on a memory card within the Biolog. After the game, these data were transferred from the memory card to a desktop computer. Offline, the skin conductance recording was checked for artifacts, edited when necessary, and quantified for each second of the game.

Skin conductance artifacts were defined as any value that exceeded either the upper limit (50 μS) or lower limit (.12 μS) of the Biolog detected during an automated scan or as large abrupt discontinuities in the skin conductance recording identified by an experimenter blind to the participant’s sociometric status. Points identified as containing artifacts were excluded from subsequent data reduction and averaging.

Scores for Skin Conductance Reactivity and Activity Level Reactivity were calculated for each participant. First, an average skin conductance level score and an average activity level score for both the baseline arts-and-crafts period and the game were calculated for each participant. Skin Conductance Reactivity was calculated as the difference between skin conductance during the game versus the baseline period, and Activity Level Reactivity was calculated in the same manner.

Several steps were taken to ensure participants’ comfort with the Biolog. First, the experimenter related wearing the device to the “astronaut” theme of the game, explaining that astronauts often wear these sorts of devices when they are in outer space. Second, the confederates wore an identical backpack and electrodes. However, the confederates’ backpack did not contain an actual Biolog device; rather, it contained a simple weight designed to give the backpack the same appearance as participants’ backpack.

Summary of data collected

In summary, in the spring, peer-report measures of children’s Social Preference and Overt Aggression in the classroom were collected. During the subsequent summer, children played an anger-inducing board game with an unfamiliar peer confederate. During this game, aggregated measures
of three anger control components (Self-Report of Anger, Observed Angry Facial Expressions, and Skin Conductance Reactivity) were collected, along with the covariate Activity Level Reactivity.

Results

Descriptive statistics and preliminary analyses

Table 1 provides descriptive statistics for and correlations between each of the six final variables listed above. Of the three correlations among the anger control components, only the correlation between Angry Facial Expressions and Skin Conductance Reactivity was significant, and that correlation was modest. Activity Level Reactivity was significantly but modestly correlated with Skin Conductance Reactivity. Two significant correlations emerged between the anger control components and Social Preference and Overt Aggression: Angry Facial Expressions was modestly negatively correlated with Social Preference, and Overt Aggression was modestly positively correlated with Self-Report of Anger. Finally, Social Preference and Overt Aggression were highly negatively correlated.

Latent profile analysis

LPA was used to examine whether distinct Anger Control Groups could be identified. The three components of Self-Report of Anger, Angry Facial Expressions, and Skin Conductance Reactivity were used as indicators of these latent groups. Activity Level Reactivity was also included as a covariate because of its significant positive relation with Skin Conductance Reactivity.

LPA was conducted using the Mplus software package (Muthén & Muthén, 1998–2007). LPA is a type of latent class analysis (LCA) in which all indicators are continuous. LPA is used to identify the smallest number of latent groups required to account for the distribution of individuals across indicators (Mccutcheon, 1987; Walrath et al., 2004).

LCA and LPA are considered to be improvements over cluster analysis because the number of groups that best fits the data is determined statistically rather than subjectively (Pastor, Barron, Miller, & Davis, 2007). Furthermore, this approach provides data on the probability that each individual is a member of each group, allowing for the evaluation of how well the model classifies individuals (McLachlan & Peel, 2000; Whiteman & Loken, 2006). Finally, LPA allows for the inclusion of covariates, whereas cluster analysis does not.

Several fit statistics were used to determine how many Anger Control Groups provided the best fit for the data. The Bayesian Information Criterion (BIC) and the Sample-Size-Adjusted BIC were used to estimate model fit; lower numbers represent better-fitting models (Kline, 2005). The Vuong–Lo–Mendell–Rubin likelihood ratio test, the adjusted Lo–Mendell–Rubin likelihood ratio test, and the parametric bootstrapped likelihood ratio test were used to compare models. For all three tests, significant p-values suggest that the estimated model fits the data better than a model with one fewer group (Nylund, Asparouhov, & Muthén, 2007; Walrath et al., 2004). Finally, the Entropy measure was used to indicate how well the model classified individuals into groups; values of Entropy range from 0 to 1.

Table 1
Means, standard deviations, and bivariate correlations of final variables.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Correlation</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Self-Report of Anger</td>
<td>2.70</td>
<td>1.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Angry Facial Expressions</td>
<td>2.24</td>
<td>1.48</td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Skin Conductance Reactivity</td>
<td>447.09</td>
<td>321.88</td>
<td>.09</td>
<td>.17**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Activity Level Reactivity</td>
<td>0.43</td>
<td>2.99</td>
<td>.12</td>
<td>.05</td>
<td>.12*</td>
<td></td>
</tr>
<tr>
<td>5. Social Preference</td>
<td>-0.02</td>
<td>1.31</td>
<td>-.12</td>
<td>-.15*</td>
<td>-.01</td>
<td>-.01</td>
</tr>
<tr>
<td>6. Overt Aggression</td>
<td>0.11</td>
<td>1.02</td>
<td>.16*</td>
<td>.11</td>
<td>.08</td>
<td>.09</td>
</tr>
</tbody>
</table>

*p < .05.

**p < .01.
LPA models with increasing numbers of groups were fitted to the data. An a priori decision was made to stop testing models with additional groups once none of the fit statistics suggested further improvement. Using this rule, models with one to six groups were fitted to the data. Fit statistics for these six models are displayed in Table 2.

These fit statistics suggested that a five-group model provided the best fit to the data. First, the five-group model had the lowest BIC and Sample-Size-Adjusted BIC of all six models. Second, the three likelihood ratio tests converged to support the five-group model. The parametric bootstrapped likelihood ratio test suggested that model fit improved as additional groups were added from the one-group model to the five-group model; however, the six-group model did not fit the data as well as the five-group model. In addition, both the Vuong–Lo–Mendell–Rubin and Adjusted Lo–Mendell–Rubin likelihood ratio tests suggested that a five-group model was superior to a four-group model, but that a six-group model was not superior to a five-group model. Finally, the Entropy score for the five-group model was higher than the score for any other model except the much-simpler two-group model.

Within Mplus, the five latent Anger Control Groups were compared on the three indicators (Self-Report of Anger, Angry Facial Expressions, and Skin Conductance Reactivity) (see Table 3). Significant differences across groups emerged for all three indicators.

### Table 2
Fit statistics for LPA models representing one to six Anger Control Groups.

<table>
<thead>
<tr>
<th>Number of groups</th>
<th>BIC</th>
<th>SSA BIC</th>
<th>VLMR p-value</th>
<th>Adj. LMR p-value</th>
<th>Para. Boot. p-value</th>
<th>Entropy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5460.79</td>
<td>5438.60</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>2</td>
<td>5395.80</td>
<td>5357.76</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.94</td>
</tr>
<tr>
<td>3</td>
<td>5384.78</td>
<td>5330.89</td>
<td>.100</td>
<td>.106</td>
<td>.000</td>
<td>.90</td>
</tr>
<tr>
<td>4</td>
<td>5360.90</td>
<td>5291.16</td>
<td>.639</td>
<td>.651</td>
<td>.000</td>
<td>.90</td>
</tr>
<tr>
<td>5</td>
<td>5342.94</td>
<td>5257.34</td>
<td>.012</td>
<td>.013</td>
<td>.000</td>
<td>.92</td>
</tr>
<tr>
<td>6</td>
<td>5362.61</td>
<td>5261.16</td>
<td>.921</td>
<td>.924</td>
<td>.500</td>
<td>.88</td>
</tr>
</tbody>
</table>

Note. BIC, Bayesian Information Criterion; SSA BIC, Sample-Size-Adjusted BIC; VLMR, Vuong–Lo–Mendell–Rubin Likelihood Ratio Test; Adj. LMR, Adjusted Lo–Mendell–Rubin Likelihood Ratio Test; Para. Boot., Parametric Bootstrapped Likelihood Ratio Test; n/a, not applicable.

### Table 3
Means and standard deviations of latent class indicators for the five Anger Control Groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>Self-Report of Anger</th>
<th>Angry Facial Expressions</th>
<th>Skin Conductance Reactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (N = 128)</td>
<td>3.53 (0.50)</td>
<td>1.85 (0.89)</td>
<td>370.78 (238.04)</td>
</tr>
<tr>
<td>2 (N = 85)</td>
<td>1.41 (0.50)</td>
<td>1.70 (0.76)</td>
<td>371.12 (234.77)</td>
</tr>
<tr>
<td>3 (N = 15)</td>
<td>3.57 (0.52)</td>
<td>6.52 (1.25)</td>
<td>566.10 (308.04)</td>
</tr>
<tr>
<td>4 (N = 13)</td>
<td>3.36 (0.75)</td>
<td>2.07 (0.91)</td>
<td>1213.34 (210.72)</td>
</tr>
<tr>
<td>5 (N = 16)</td>
<td>1.54 (0.52)</td>
<td>4.58 (0.95)</td>
<td>614.17 (386.00)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level</th>
<th>Self-Report of Anger</th>
<th>Angry Facial Expressions</th>
<th>Skin Conductance Reactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (N = 128)</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>2 (N = 85)</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>3 (N = 15)</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>4 (N = 13)</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>5 (N = 16)</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
</tr>
</tbody>
</table>

Note. Standard deviations are in parentheses. Different subscripts indicate significant differences between means at p < .05. Cohen’s d ranged from 2.87 to 4.24 for Self-Report of Anger, from 1.76 to 4.80 for Angry Facial Expressions, and from 0.72 to 3.78 for Skin Conductance Reactivity. Group 1: Physiology-and-Expression Controllers; Group 2: Non-reactive; Group 3: Non-controllers; Group 4: Expression-Only Controllers; Group 5: Non-reporters.
The largest group, Group 1 (N = 128, 50% of children), self-reported a high level of anger, but only displayed a low level of physiological arousal and expressed a low level of anger. We labeled this group the Physiology-and-Expression Controllers. The next-largest group, Group 2 (N = 85, 33% of children), displayed low levels of self-reported anger, anger expression, and physiological arousal. We termed this group the Non-reactive Group. The three remaining groups were much smaller. Group 3 (N = 15, 6% of children) had high levels of self-reported anger and expressed anger and a medium level of physiological arousal. These children were labeled the Non-controllers. Group 4 (N = 13, 5% of children) showed high levels of self-reported anger and physiological arousal, but displayed a low level of anger expression. This group was termed the Expression-Only Controllers. Finally, Group 5 (N = 16, 6% of children) displayed medium levels of anger expression and physiological arousal, but only a low level of self-reported anger. Because they reported less anger than their expression or physiology would suggest they felt, we labeled this group the Non-reporters.

The Mplus output includes scores for the conditional probability that each child is a member of each of the five Anger Control Groups. For the purposes of group comparison and external validation, children were assigned to the group for which they had the highest conditional probability. These scores were quite high, with an average highest conditional probability score of .96. In total, 112 children had a highest conditional probability score of 1.00, 96 children had a score of .95 to .99, 22 children had a score of .90 to .94, 13 children had a score of .80 to .89, 10 children had a score of .70 to .79, and only 4 children had a score below .70.

**Variations in sex and ethnicity across the five Anger Control Groups**

Analyses were run to examine whether the five Anger Control Groups varied in terms of sex or racial/ethnic composition. The groups varied by sex, χ²(1) = 9.24, p < .05, but not by race/ethnicity (European American, African American, Latino American, or Asian American), χ²(12) = 13.42, ns. Follow-up analyses revealed that the Non-controllers included more boys (N = 12) than girls (N = 3), χ²(1) = 5.40, p < .05. The Physiology-and-Expression Controllers (54.7% female), the Non-reactive group (54.1% female), the Expression-Only Controllers (30.8% female), and the Non-reporters (43.8% female) did not vary by sex.

**Differences in Social Preference and Overt Aggression among the five Anger Control Groups**

Finally, the five Anger Control Groups were compared on Social Preference and Overt Aggression in two separate analyses of variance (ANOVAs). The practice of externally validating groups identified through LPA using exogenous variables is common, especially when exogenous variables are collected at a different time and in a different context than the indicators of the latent groups (e.g., Martel, Goth-Owens, Martinez-Torteya, & Nigg, 2010; Walrath et al., 2004; Zinn, 2010). In this data set, measures of Social Preference and Overt Aggression were collected in the classroom during the spring, and the three components of anger control were assessed in the laboratory during the subsequent summer. Furthermore, the fact that children could be assigned to one of the five Anger Control Groups with such high conditional probability scores gave us further confidence in these group assignments. Even so, it is important to remember that group membership is a latent construct that is best considered-probabilistic and not absolute.

A significant main effect of Anger Control Group was found for Social Preference, F(4, 252) = 3.71, p < .01. Post-hoc paired comparisons among the five Anger Control Groups using a Bonferroni correction revealed that the Non-controllers were significantly lower in Social Preference than the other four groups (see Table 4).

A significant main effect of Anger Control Group was also found for Overt Aggression, F(4, 252) = 4.15, p < .01. Analogous post-hoc comparisons showed that the Non-controllers were higher in Overt Aggression than the Physiology-and-Expression Controllers, the Non-reactive group, and the Non-reporters. The Expression-Only Controllers did not differ from any of the other four groups on Overt Aggression (see Table 4).
The goal of the current study was to investigate whether distinct profiles of anger control would emerge when second-grade children were placed in an anger-provoking peer interaction. Three components of anger control (self-report of awareness of anger, observations of anger expression, and physiological arousal) were examined using LPA.

To reach this goal, we developed a laboratory-based assessment of anger control in middle childhood. We found that using an anger-eliciting interaction with a peer confederate had a number of advantages. The use of child confederates increased ecological validity beyond what would be possible using adult experimenters, "virtual peers," and the like. The procedure also allowed for more efficient assessment of children's anger control than naturalistic observations, along with greater standardization of anger-inducing stimuli. Finally, the procedure enabled assessment of multiple components of children's anger, including observational and physiological measures. Moreover, the emergence of distinct profiles of anger control across empirically-derived groups of children resulted in additional assessment implications. Specifically, these findings suggest that it will be important to assess all three components of anger (self-reported experience, observed expression, and physiological arousal) to gain a complete picture of how each child manages angry feelings. If these components do not vary together, then researchers should avoid measuring a single component as an index of children's anger control more broadly.

Two groups of children displayed profiles indicative of active anger control: the Physiology-and-Expression Controllers and the Expression-Only Controllers. We were surprised by the disparity in size of the two groups. The Physiology-and-Expression Controllers accounted for 50% of the children, whereas the Expression-Only Controllers accounted for only 5%. These findings suggest that, at least for second graders in this anger-provoking peer context, children are likely to control both their physiological arousal and their anger expression. Furthermore, the size of the Physiology-and-Expression Controllers group suggests that many children displayed quite sophisticated anger control capabilities, even in a particularly challenging situation involving losing a board game and a desirable prize to a cheating peer.

In contrast, the Expression-Only Controllers group was not only quite small, but also characterized by a profile of anger control that may actually be worrisome. Specifically, this group displayed a level of physiological arousal that was markedly greater than that of all other groups, including the Non-controllers. Although it is not surprising that a group of children who managed their outward anger expression but not their internal physiology emerged, we did not expect that this group would be distinguished by especially high physiological arousal. Such elevated physiological arousal suggests that these children were quite internally distressed. Experiencing, and masking, such strong internal emotion may have maladaptive developmental consequences for children (e.g., Richards & Gross, 1999; Roberts, Levenson, & Gross, 2008). One possible indicator of these consequences is the finding that this group of children did not differ from the Non-controllers in peer-rated aggression, whereas the other three groups did. Of course, we hesitate to interpret null results, and much more work is needed to replicate these findings and fully understand the functioning of this group of children. However, at this point, our LPA analysis does suggest that an expression-only

<table>
<thead>
<tr>
<th>Group membership</th>
<th>Social Preference mean</th>
<th>Overt Aggression mean</th>
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</thead>
<tbody>
<tr>
<td>Physiology-and-Expression Controllers (N = 128)</td>
<td>−0.08 (1.25)</td>
<td>0.14 (1.01)</td>
</tr>
<tr>
<td>Non-reactive (N = 85)</td>
<td>0.18 (1.30)</td>
<td>−0.07 (0.92)</td>
</tr>
<tr>
<td>Non-controllers (N = 15)</td>
<td>−1.13 (1.47)</td>
<td>0.95 (1.58)</td>
</tr>
<tr>
<td>Expression-Only Controllers (N = 13)</td>
<td>0.29 (1.29)</td>
<td>0.42 (1.03)</td>
</tr>
<tr>
<td>Non-reporters (N = 16)</td>
<td>0.19 (1.22)</td>
<td>−0.24 (0.42)</td>
</tr>
</tbody>
</table>

Note. Standard deviations are in parentheses. Different subscripts indicate significant differences between means at p < .05 using a Bonferroni correction. Cohen's d ranged from 0.77 to 1.03 for Social Preference and from 0.62 to 1.19 for Overt Aggression. Means with the subscript “ab” do not differ from means with the subscript “a” or means with the subscript “b.”

Discussion

The goal of the current study was to investigate whether distinct profiles of anger control would emerge when second-grade children were placed in an anger-provoking peer interaction. Three components of anger control (self-report of awareness of anger, observations of anger expression, and physiological arousal) were examined using LPA.

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pattern of anger control may be less common, and more concerning, than previous theorizing would have predicted.

As hypothesized, a group of children who especially struggled to control their anger emerged. The Non-controller group was distinguished by relatively high levels of self-reported anger, observed anger, and physiological arousal (although, as noted above, the Expression-Only Controllers actually displayed even higher physiological arousal). This coherence across the anger components stands in contrast to other work suggesting that children with externalizing behavior problems display less coherent emotional responses than other children (Hastings et al., 2009; Marsh et al., 2008). Possible reasons for these discrepant findings include the current study’s specific focus on anger and the likelihood that the Non-controllers were more intensely angry than the other groups. As described above, coherence across emotion components may be greater as emotional intensity increases (Davidson, 1992; Tassinary & Cacioppo, 1992). Although emotion regulation may typically be characterized by coherence among the components, it is possible that, for the specific case of high-intensity anger, a coherent pattern of responding may be more indicative of dysregulation than of regulation.

The Non-controller group represented 6% of children and included significantly more boys than girls. Previous research has consistently documented sex differences in both aggressive behavior problems (e.g., Moffitt & Caspi, 2001) and emotion regulation (e.g., Saarni, 1984), with more boys than girls struggling in these areas. Moreover, these children were significantly more disliked by their peers, and considered to be more aggressive by their peers, than all other groups (see one exception noted in paragraph above). These findings emphasize what an important role anger control deficits play in children’s aggressive behavior problems. When these children were faced with an anger-inducing situation that many of their peers handled with considerable skill and finesse, they responded with outward expressions of anger and significant internal arousal, in addition to reporting to feel quite angry. This difficulty controlling any component of anger likely is instrumental in explaining these children’s aggressive behavior, as well as their peer rejection. Although advances have been made in understanding the emotional functioning of aggressive children, much work with this population is still driven by social–cognitive models (e.g., Crick & Dodge, 1994). Clearly, social–cognitive processes are critical to understanding aggressive children, and findings such as these suggest that anger control processes may be just as important.

In addition, a group of children (6%) who both expressed considerable anger and experienced substantial physiological arousal emerged, despite the fact that they only self-reported-low levels of anger. We labeled this group Non-reporters. One possibility is that these children were unaware of their physiology and behavior and were unable to accurately interpret these cues as signals that they were feeling angry. However, it is also possible that they were aware of their angry feelings but chose not to report them to the experimenter, perhaps because they thought that to do so would be inappropriate. Future researchers should work to untangle these two possibilities, perhaps by allowing children to self-report privately. It is only through greater attention to these important nuances of assessment techniques that we will gain a better understanding of the factors that influence our measurement of children’s anger control.

The final group to emerge was the Non-reactive group, characterized by low levels of self-reported, observed, and physiological anger. This group was quite large, representing 33% of children. Two explanations for this group’s profile are possible. First, the anger-eliciting procedure used in the current study may not have effectively induced anger in this significant percentage of children. These children may not have been as motivated to win the game and prize, or as disturbed by the peer confederate’s cheating behavior, as other children. If this is the case, then future investigators will need to carefully ensure that they are in fact inducing anger in child participants when that is their aim, while at the same time remaining well within the bounds of ethical protections. Second, these children may have experienced some degree of anger, but controlled it so effectively that, by the end of the game, they did not even report feeling angry. This explanation suggests that the group of children who regulate both physiology and expression well may actually be even larger than described above.

On a related note, the Non-reactive group and the Physiology-and-Expression Controllers differed only in the amount of anger they self-reported, with the first group reporting low levels of anger and the second group reporting high levels. It is possible that this difference represents inaccurate reporting on the part of one group or the other and that these groups actually do not differ in any meaningful
way. More specifically, the Non-reactive group may have experienced significant anger, but these children may have been uncomfortable self-reporting this anger to the experimenter due to the socialization that many children receive about the taboos of anger expression. Conversely, the Physiology-and-Expression Controllers may not have actually been angered by the peer provocation procedure, but reported that they were because they believed the situation dictated such a response. However, in the absence of further data in support of either of these alternatives, the more likely scenario is that the two groups did differ as reported, suggesting that a substantial group of children actively regulated both the physiological and expressive components of the anger they experienced, whereas another large group of children either did not experience the anger we intended to elicit, or regulated this anger so effectively that they did not report feeling it by the end of the procedure.

Taken together, these findings have important implications for intervention and prevention programs for children's anger control. First, our results suggest that anger control should be an important target of programs designed for peer-rejected and aggressive children, alongside behavioral and social–cognitive skills. Several such programs already emphasize anger control (e.g., The Coping Power Program [Lochman, Wells, & Murray, 2007]), and the current study supports the necessity of this approach. Second, the findings reinforce the focus on both external and internal control processes in intervention programs. In these programs, children are actively taught to monitor both their internal physiology and their external behavior for cues that they are feeling angry, and they are then coached on strategies to manage both external displays of anger and internal feelings of anger. Approximately half of the second-grade children displayed control of both anger expression and physiological arousal naturally when faced with an anger-inducing situation, suggesting that this approach is a competent one. Furthermore, those children who evidenced the most difficulties with peer rejection and aggression struggled with both internal and external anger control.

Several limitations of the current study should be noted. First, the groups into which children were placed through the LPA index a latent construct. Thus, group membership is based on conditional probability and is not definitive. Although the conditional probabilities with which children were assigned to groups were quite high, it will be important to replicate these group formations in the future. Second, the current study was limited by a focus on the emotion of anger and the context of the provoking game with a peer. Future work should expand the use of LPA analyses of children's emotion regulation to other emotions and other contexts. Third, children's anger control was assessed when interacting with unfamiliar peers, and this particular context may be considered a limitation of the study. It is likely that children work harder to control angry feelings in the presence of unfamiliar peers compared with friends (Underwood et al., 1992). Future researchers should investigate whether the same anger control profiles emerge when children interact with friends and, in particular, whether the Physiology-and-Expression Controllers group remains as large in the context of friendship interactions. Fourth, only second-grade children were included in this study. In future investigations, other age groups of children should be examined. Moreover, it will be essential to determine the stability of groups differing in anger control profiles across developmental periods. If consistency is found across time, then a thorough study of the precursors (e.g., temperament, parental socialization of anger control) and outcomes (including internalizing and externalizing forms of developmental psychopathology) associated with different anger control profiles will be warranted and essential. Fifth, the sample was somewhat unrepresentative, in that children who participated in the study were slightly more aggressive than those who refused participation. However, given the study's focus on anger control, this oversampling of aggressive children does not seem to be very problematic. Sixth, future investigations should include other measures of physiological arousal (e.g., respiratory sinus arrhythmia). It is possible that our measure of skin conductance reactivity was not sensitive enough to detect subtle but important changes in children's physiological arousal. Finally, our study failed to consider cognitive aspects of children's anger, such as appraisal processes. Future work on profiles of children's anger control should incorporate a focus on the cognitive bases of children's anger.

References


Merrill–Palmer Quarterly, 49–122.


