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THE EFFECTS OF TIME PRESSURE ON SOCIAL COGNITIVE PROBLEM-SOLVING BY AGGRESSIVE AND NONAGGRESSIVE BOYS

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This study evaluated the effects of one potential source of arousal, namely time pressure, on the attributions made and the solutions generated in hypothetical social problem situations by aggressive and nonaggressive boys. It was predicted that time pressure would be more disruptive to the social information-processing of aggressive boys as compared to their nonaggressive peers. Thirty aggressive and 32 nonaggressive third- and fourth-grade boys were administered attribution and solution generation tasks under both untimed and time pressured conditions. Level of arousal in both conditions was assessed by experimenter observation and subject self-report. The time pressure condition resulted in greater arousal than the untimed condition across all subjects. The predicted interaction between group and condition did not reach statistical significance; however, there was a trend suggesting that the aggressive group made more hostile attributions in the time pressured as compared to the untimed condition, whereas the nonaggressive group did not differ between the two

conditions. On the solution generation measure, the time pressure condition resulted in all subjects producing a greater number of solutions overall, more types of solutions, and proportionally more aggressive solutions. Results are discussed in terms of the influence of arousal on social information-processing.

Aggressive children have been shown to possess deficits and biases in various social cognitive problem solving (SCPS) skills. Research by Dodge and his colleagues, for example, has shown that aggressive children are more likely than their nonaggressive peers to perceive another's intentions as hostile in ambiguously-motivated negative outcome situations (e.g., Dodge, 1980; Dodge & Coie, 1987; Dodge & Tomlin, 1987; Milich & Dodge, 1984; Quiggle, Garber, Panak, & Dodge, 1992). In addition, aggressive children may encode relatively little pertinent information prior to making judgments about others' behaviors, and they may be biased toward attending to and encoding hostile information (Dodge & Frame, 1982; Dodge & Newman, 1981; Milich & Dodge, 1984). Aggressive children have also been found to produce fewer assertive or effective solutions and/or more aggressive solutions in hypothetical problem situations than do nonaggressive children (e.g., Deluty, 1981; Joffe, Dobson, Fine, Marriage, & Haley, 1990; Lochman & Lampron, 1986; Richard & Dodge, 1982). Relative to their nonaggressive peers, aggressive children have also been shown to have deficits and biases in their evaluation of aggressive responses, including thinking of fewer consequences for hypothetical aggressive acts (Guerra & Slaby, 1989), expecting aggression to lead to positive outcomes (Slaby & Guerra, 1988; Perry, Perry, & Rasmussen, 1986), and feeling more confident in their ability to use aggressive responses (Perry et al., 1986; Quiggle et al., 1992).

In the vast majority of SCPS research, the variance in behavior accounted for by problem-solving measures is small, though statistically significant (Evans & Short, 1991; cf. Dodge, Pettit, McClaskey, & Brown, 1986). One reason for the generally weak relationship between SCPS skill and behavior may be the emphasis in the experimental situation on emotion-free, rational cognitive processes. Research concerning children's social information-processing has typically ignored the role of arousal, including such factors as time pressure, competition, anxiety, and emotion in cognition and behavior (Vitaro & Pelletier, 1991). Indeed, the relevance to behavior in actual situations of performance on hypothetical reflective problem-solving measures has been questioned (e.g., Evans & Short, 1991). In a recent study, for example, Vitaro and Pelletier (1991) examined the solutions provided by well adjusted and maladjusted children to actual social problem situations initiated by peer-confederates as well as to hypothetical problem situations. During the actual social problem situations, maladjusted children showed several deficiencies relative to their well adjusted peers. Responses to the hypothetical problem situations, in contrast, revealed no such differences. Citing "prohibitive emotional arousal" as one possible cause, the investigators suggested that some children may provide appropriate solutions to hypothetical social dilemmas, but may be unable to enact such solutions when confronted with actual problem situations.

Arousal may be thought of as a general state of activation reflected in behavioral and physiological systems (Pribram & McGuinness, 1975), ranging from extreme drowsiness or sleep to extreme excitement or agitation (Revelle, 1986). Sources of arousal are diverse and may include such factors as emotional reactions, drugs, time pressure, noise, and competition. Although the influence of arousal on SCPS has not been systematically investigated, researchers in the area of nonsocial cognition have explored the effects on different aspects of information processing of various sources of arousal, such as emotional

states (e.g., Masters, Barden, & Ford, 1979; Versace, Monteil, & Mailhot, 1993), time stress (e.g., Coury & Boulette, 1992), and failure experiences (e.g., Mogg, Mathews, Bird, & Macgregor-Morris, 1990).

Research suggests that most sources of arousal reduce the range of cues to which one can attend (e.g., Easterbrook, 1959). If arousal reduces the range of cues to which children can attend during social conflict situations, children may rely more on their personal histories and salient schemata in interpreting peers' intentions. Because aggressive children are more often the targets of aggression than nonaggressive children (Dodge & Frame, 1982), greater reliance on personal experience may cause aggressive children, but not nonaggressive children, to make more attributions of hostility when aroused. In addition, Zajonc (1965) has argued that arousal increases the tendency to perform behaviors that are most dominant. Research suggests that conflict-escalating solutions to social problems are highly salient for aggressive children (e.g., Rabiner, Lenhart, & Lochman, 1990). Thus, under conditions of arousal, aggressive children should be more likely to produce aggressive solutions. Nonaggressive children, whose dominant behavioral responses are not aggressive, should not be more likely to respond aggressively under arousal.

As noted previously, few studies have addressed the effects of arousal on SCPS. Though not specifically concerned with arousal, a study by Dodge and Somberg (1987) is relevant to the present discussion. Dodge and Somberg assessed attributions for hypothetical peers' behaviors in aggressive and nonaggressive boys under both normal laboratory and "threat" conditions. In the threat condition, subjects were led to believe that they would soon interact with a hostile peer. Dodge and Somberg predicted that the differences in social information-processing between the two groups would be greater during the threat condition than during the normal condition.

Although the predicted interaction between group and condition did not reach significance, simple main effects analyses indicated that aggressive boys were less accurate in intention cue interpretation and more likely to attribute hostility to a peer under the threat relative to the normal condition. Nonaggressive subjects, in contrast, did not show differences between the two conditions. Dodge and Somberg (1987) proposed several possible mechanisms by which threat influences the attributions of aggressive children, including impairment in attention due to physiological arousal. In Dodge and Somberg's study, all children received the normal condition prior to the threat condition. Thus, the effect of threat was confounded with the potential effects of practice and/or fatigue. In addition, an issue of theoretical and practical interest not addressed was the effect of threat on alternative solution generation.

The present research was conducted to determine how a potential source of arousal, time pressure, influences attribution and solution generation by aggressive and nonaggressive elementary school boys. It was predicted that, under conditions of time pressure relative to normal testing conditions, aggressive boys would show a greater increase in hostile attributions and greater decrements in solution generation as compared to their nonaggressive peers. In the present study, the situational contexts for investigation of attribution and solution generation were two of the most problematic types of social situations for elementary-aged children: peer provocation and peer group entry situations (e.g., Dodge, 1983; Dodge, McClaskey, & Feldman, 1985).

Method

Subjects

All third- and fourth-grade teachers in six public elementary schools of a suburban Midwestern school district were asked to identify those boys in their classes who were aggressive. They were also asked to identify an equal number of nonaggressive, but nonwithdrawn boys. Teachers were provided with descriptions of aggressive and nonaggressive boys, including a list of aggressive behaviors (e.g., pushing, hitting, teasing, threatening, destroying property, and so on), and instructions to select as aggressive only those students who frequently engaged in one or more aggressive behaviors. Fifty-eight percent of parents of aggressive children and 63% of parents of nonaggressive children consented to their child's participation. All students for whom parental consent was obtained agreed to participate. The final group consisted of 30 aggressive and 32 nonaggressive children.

The aggressive group consisted of 14 third graders and 16 fourth graders. The group ranged in age from 8 years, 11 months to 11 years, 9 months, with a mean of 10 years, 0 months (SD = 9 months). The nonaggressive group consisted of 17 third graders and 15 fourth graders. The group ranged in age from 8 years, 8 months to 10 years, 11 months, with a mean of 9 years, 10 months (SD = 8 months). The groups did not differ significantly in age, $t(60) = 1.1$, *ns*.

Teachers completed the 38-item aggression subscale of the Child Behavior Checklist-Teacher's Report Form (Edelbrock & Achenbach, 1984) for all subjects. The mean score of the aggressive group (M = 36.5, SD = 20.6) was significantly higher than the mean of the nonaggressive group (M = 6.3, SD = 7.2), $t(60) = 7.8$, $p<.001$, two-tailed.[1]

Measures

Attributions. Attributions were assessed using a measure developed by Dodge (1980; Dodge & Frame, 12982; Brown, 1988a). Subjects were asked to imagine that they were taking part in various social interactions in which a male peer (or peers) was (were) responsible for a negative outcome for the subject. In each story the peer's (peers') actions could be interpreted either as accidental or as intentional. Children were asked two questions about the hypothetical interaction: (a) why did the other child (children) in the story behave as he (they) did, and (b) what would the subject himself do if the story events really happened. There were a total of eight stories, each accompanied by a cartoon illustration. Half of the stories involved ambiguous peer provocations (e.g., a peer bumps into the subject causing soda to spill on the subject), and half of the stories involved unsuccessful bids to join peers at play (e.g., the subject says "Hi" to a group of peers at the first meeting of a club, but no one answers him).

Responses to questions concerning peers' intentions were scored either as hostile attributions or as nonhostile attributions. Following Brown (1988b), any indication that the peer(s) was (were) being mean or was (were) behaving intentionally was coded as a hostile attribution. Any other response was coded as nonhostile. Children's stated behavioral responses were scored as either aggressive or nonaggressive, using the same criteria for aggression as in the solution generation measure.

Interrater agreements of 95% (Dodge, 1980) and 94% (Dodge & Frame, 1982) for coding attributions as hostile versus nonhostile have been reported for earlier versions of this measure. In addition, earlier versions have been found to differentiate between aggressive and nonaggressive boys (e.g., Dodge, 1980; Dodge & Frame, 1982; Milich & Dodge, 1984).

Solution generation. Solution generation was assessed with four items from Dodge's Social Problem Solving Measure (Brown, 1988a). For each item, children were presented with a hypothetical interpersonal problem, along with a cartoon illustration. Children were asked to report all the things they could do or say to solve the problem. After each response, the experimenter said, "Tell me another thing you could do or say..." When children indicated that they could not think of any more responses, they were asked, "Can you think of anything else that you could do or say...?" If, at this point, subjects generated another solution, the first prompt was used again. When subjects stated that they could not think of any more responses two consecutive times in response to prompts, the experimenter went to the next item. In addition, if subjects gave ten responses to a given item, the experimenter went to the next item. Each of the four items involves a peer provocation situation. Two items contain "strong" provocations (a peer pushes the subject out of line and takes his place; a peer teases the subject), and two contain "moderate" provocations (a peer will not share a swing with the subject; a peer takes the subject's turn while playing a game).

The scoring system used to code responses was developed by Weissberg and his colleagues for the Middle School Alternative Solutions Test (Caplan, Weissberg, Bersoff, Ezekowitz, & Wells, 1986) and adapted for use in the present study. Following Caplan et al., each solution was classified into one of 23 mutually exclusive subcategories. The 23 subcategories comprised six main classifications: aggressive, passive, help-seeking, nonconfrontational, assertive, and cooperative.

Effectiveness scores were assigned to each response using the 4-point effectiveness scale from the Middle School Alternative Solutions Test. Effectiveness scores reflect the plausibility of the solution, the degree of social skillfulness, and the extent to which the solution maximizes positive consequences and minimizes negative

consequences for the subject and for others (Caplan et al., 1986). The scale was derived from ratings of six adult judges who independently rated the effectiveness of prototypical responses in each of the 23 subcategories for three different problem situations. Effectiveness scores are assigned based on the subcategory and the problem situation. Kappa coefficients for interrater agreement have ranged from .88 to .94 for subcategory and effectiveness of solutions across several groups of raters and different sets of protocols (Caplan et al., 1986).

Several outcome measures were derived from subjects' responses: (a) the total number of solutions judged to be relevant to the problem (not including verbatim repetitions of earlier responses to the same problem); (b) the number of solution types (i.e., number of different subcategories); (c) the proportion of solutions that were aggressive; and (d) the mean effectiveness of solutions.

Procedure

Students were tested in a private room on the school grounds during school hours. All students were tested in both untimed and time pressure conditions. During the untimed condition, the administration procedures described in the test manual were followed (Brown, 1988a), as previously outlined, with one exception. Prior to the untimed condition and again at two designated points during this condition, experimenters reminded subjects that they had as much time as they needed to respond.

During the time pressure condition, there were several modifications to these procedures. First, children were told that they would be timed because the experimenter wanted to see how quickly they could answer the questions. Second, children were told that they would have only a short amount of time to answer and that they should answer as quickly as they could. Third, each test

question began with the phrase, "As quickly as you can, tell me..." followed by the relevant prompt. Fourth, immediately after asking each question, the experimenter said, "Go!" and started a stopwatch in clear view of the subject. Fifth, if subjects did not respond within 6 seconds, the experimenter said, "Time's up. Let's try it again," and then repeated the question. Sixth, at two designated points during the testing, experimenters reminded subjects that it was "very important to answer quickly, so please answer as fast as you can."

The order of conditions was counterbalanced within aggressive and nonaggressive groups. Between conditions, the experimenter spent approximately five minutes interacting with the child in a relaxed manner. This time was intended, in part, to reduce the arousal generated by the timing procedure when the time pressure condition was presented first.

During each condition, subjects were administered four attribution items and two solution generation items. Items were randomly selected from the pool of eight attribution items and four solution generation items, with the following constraints. Of the four attribution items, two were peer provocation and two were peer group entry situations. Of the two solution generation items, one was a strong provocation and one was a moderate provocation. Any given item appeared in only one condition. Thus, all subjects responded to all items across the two conditions.

All subjects were yoked to a member of their respective groups (i.e., aggressive or nonaggressive) such that they were given the same sets of items, but with the reverse order of conditions. Consequently, each item was administered the same number of times in the untimed and time pressure conditions within both groups.

Subjects' level of arousal during each condition was assessed in three ways. First, after each condition subjects were asked to indicate how they felt during the task on a "nervousness thermometer" ranging from 1 (*not nervous at all*) to 10 (*very nervous*). This procedure is a modification

of the "fear thermometer" frequently used in pediatric psychology studies (e.g., Peterson & Mori, 1987). Second, for each item, experimenters rated the presence or absence of four behavioral signs of arousal: extraneous arm or hand movements, extraneous foot or leg movements, tension of facial muscles, and shifting/swaying in the chair. This method was based on a technique used by Fox and Houston (1981) to assess anxiety, adapted from work by Paul (1966). Fox and Houston (1981) used a time sampling procedure to rate the presence or absence of 12 behavioral signs of anxiety in fourth-grade children who were reciting a poem while standing in front of a video camera. They found that the following five items were significantly related to one another: extraneous arm movement, extraneous leg movement, foot movement, tense face muscles, and swaying. Interjudge reliability for the sum of the five items was high. Furthermore, behavioral rating scores based on these five items were positively correlated with state anxiety scores on the State-Trait Anxiety Inventory for Children (Spielberger, 1973). In the present study, foot movement was combined with extraneous leg movement, and shifting or swaying in the chair was substituted for swaying while standing. The total arousal score for a given condition was the sum of the four behavioral signs across the six items. Thus, scores ranged from 0 to 24. To assess interrater reliability for the behavioral signs of arousal, each of the three experimenters was videotaped administering the entire protocol to one child (who was not used as a subject in the study). Each videotape was rated for behavioral signs of arousal by the principal investigator as well as the other two experimenters. The third method to assess arousal was experimenter ratings of overall level of arousal during each condition on a 1 (*not aroused at all*) to 5 (*highly aroused*) scale.

The experimenters were three female upper-level graduate students in clinical psychology who were unaware of subject status. Each experimenter tested 10 boys identified as aggressive and 9, 10, and 13 boys identified as nonaggressive, respectively. Interviews were audio taped and later transcribed. Transcriptions were coded by the principal investigator who had no identifying information about subjects at the time of coding. Ten protocols (approximately one-third) from each group were randomly selected for coding by a second judge, also unaware of subject status, in order to assess interrater reliability.

Results

Interrater Agreement

Kappa coefficients for the proportion of judgments in which there was agreement between the two raters, after correcting for chance (Cohen, 1960), were .95 for both attribution type (hostile vs. non-hostile) and attribution response (aggressive vs. nonaggressive). Kappa coefficients for main category and subcategory for the solution generation measure were .90 and .85, respectively. The level of interrater agreement for both the attribution and solution generation measures is consistent with previous studies (Caplan et al., 1986; Dodge, 1980; Dodge & Frame, 1982; Pettit, Dodge, & Brown, 1988).

For the behavioral signs of arousal, Kappa coefficients measuring agreement between the principal investigator and the three experimenters were .63, .58, and .46, respectively. Pairwise Kappa's for agreement among the experimenters ranged from .39 to .63. All Kappas were statistically significant at or below the $p<.01$ level.

Analytic Model

The results were initially analyzed using a 2 (group: aggressive vs. nonaggressive) x 2 (order of conditions: untimed-time pressure vs. time pressure-untimed) x 2 (condition: untimed vs. time pressure) x 2 (story type) mixed model analysis of variance (ANOVA) design. Group and order were between subjects factors. Condition and story type were within subjects factors. For the attribution measure, story type refers to provocation versus peer group entry situations. For the solution generation measure, story type refers to strong versus moderate provocation situations.

There were Order x Condition interaction effects for five of the six dependent measures as well as the three measures of arousal. This indicates that the order in which conditions were presented mediated the effects of condition. While the interaction of condition and presentation order raises some methodological and theoretical questions (see footnote 3), the effects of presentation order *per se* were not of primary interest in designing the research. Thus, to evaluate the effects of condition independent of presentation order, analyses were conducted in which only the first condition presented to subjects was considered. Thus, for subjects in the untimed-time pressure presentation order, only the untimed condition was examined. For subjects in the time pressure-untimed presentation order, only the time pressure condition was examined. This changed condition from a within-subjects to a between-subjects factor and eliminated presentation order as a factor. These analyses are presented subsequently.

To protect against the potentially high experimentwise error rate and to take into account the intercorrelations among the dependent variables, multivariate analyses of variance (MANOVA's) were used for the measures pertaining to arousal and solution generation, respec-

tively. Exact F tests corresponding to Hotelling's T^2 are reported. Significant multivariate effects were followed up with univariate analyses.

Arousal

To assess the effects of time pressure on arousal, a 2 (group: aggressive vs. nonaggressive) x 2 (condition: time pressure vs. untimed) MANOVA was conducted on the three arousal scores: nervousness thermometer ratings, behavioral signs of arousal, and ratings of overall arousal. The multivariate condition effect was significant, $F(3,56) = 5.57$, $p<.01$. In univariate follow-up analyses, the condition effect was significant for behavioral signs of arousal, $F(1,58) = 4.87$, $p<.05$, and ratings of overall arousal, $F(1,58) = 16.79$, $p<.001$, but not nervousness thermometer ratings, $F(1,58) = 1.47$, *ns*. The arousal means and standard deviations by condition are shown in Table 1.

TABLE 1

Arousal Means and Standard Deviations by Condition

	Measure		
Condition	Nervousness Thermometer	Behavioral Signs	Overall Arousal
Untimed	3.5 (3.0)	5.4 (3.1)	2.2 (0.9)
Time pressure	4.4 (3.0)	7.2 (3.5)	3.3 (1.1)

Note. Standard deviations are in parentheses.

Attributions

Attribution type. A 2 (group) x 2 (condition) x 2 (story type: provocation vs. peer group entry) mixed model ANOVA was performed on attribution type (i.e., hostile vs. non-hostile). Group and condition were between subjects factors. Story type was a within subjects factor. The main effects for group and condition were not significant, $F(1,58) = .13$, *ns*, and $F(1,58) = 1.47$, *ns*, respectively; however, the Group x Condition interaction approached statistical significance, $F(1,58) = 3.76$, $p = .057$. Although the Group x Condition interaction only approached statistical significance, simple main effects analyses in which the condition effect was analyzed within each group were conducted because of the relevance of the trend to the study's main hypothesis. The condition effect was statistically significant within the aggressive group, $F(1,58) = 4.82$, $p<.05$, but not within the nonaggressive group, $F(1,58) = .27$, *ns*. The attribution means and standard deviations by group and condition are shown in Table 2.

TABLE 2

Attribution Type Means and Standard Deviations by Group and Condition

Condition	Nonaggressive	Aggressive
Untimed	.52 (.26)	.42 (.28)
Time pressure	.47 (.23)	.62 (.23)

Note. Standard deviations are in parentheses. Attribution items were scored 1 (*hostile*) or 0 (*non-hostile*). The four attribution item scores for each subject were averaged before computing group means.

The story type main effect was significant, $F(1,58) = 13.48$, $p<.01$. The mean attribution score for the provocation situations, collapsed across group and condition, was $M = .63$ ($SD = .35$). The mean score for the peer group entry situations was $M = .38$ ($SD = .38$).[2]

Attribution response. Subjects' proposed behavioral responses for the attribution stores were examined with a 2 (group) x 2 (condition) x 2 (story type) mixed model ANOVA. Group and condition were between subjects factors. Only the story type main effect was significant, $F(1,58) = 17.14$, $p<.001$. The mean attribution response score for the provocation situations was $M = .16$ ($SD = .31$). The mean attribution response score for the peer group entry situations was $M = .02$ ($SD = .09$).

Solution Generation

A 2 (group) x 2 (condition) x 2 (story type: strong provocation vs. moderate provocation) mixed model MANOVA was conducted using the following solution generation outcome measures: total number of solutions, number of different solution types, percent of aggressive solutions, and mean effectiveness of solutions. Group and condition were between subjects factors. Story type was a within subjects factor. There were significant main effects for condition, $F(4,55) = 2.82$, $p<.05$, and story type, $F(4,55) = 4.44$, $p<.01$.

In univariate follow-up analyses, the condition effect was significant for total number of solutions, $F(1,58) = 10.29$, $p<.01$, and number of different solution types, $F(1,58) = 6.57$, $p<.05$, and approached significance for percent of aggressive solutions, $F(1,58) = 3.09$, $p = .08$. The solution generation means by condition are presented in Table 3. It reveals that the time pressure condition resulted in a greater number of solutions, a greater number of solution types, and a greater percentage of aggressive solutions as compared to the untimed condition.

TABLE 3

Solution Generation Means and Standard Deviations by Condition

	Measure			
Condition	Total No.	Different Types	Percent Aggressive	Effectiveness
Untimed	5.0 (2.4)	3.8 (1.4)	7.9 (12.2)	3.0 (0.4)
Time pressure	6.8 (2.0)	4.6 (1.2)	15.3 (19.1)	2.8 (0.5)

Note. Standard deviations are in parentheses.

Univariate follow-up of mean effectiveness of solutions revealed a significant Condition x Story type interaction, $F(1,58) = 5.28$, $p<.05$, such that the condition effect was significant for the moderate provocation items, $F(1,58) = 5.62$, $p<.05$, but not for the strong provocation items, $F(1,58) = .12$, *ns*. Among the moderate provocation items, the mean effectiveness score was $M = 3.2$ ($SD = .52$) for the untimed condition and $M = 2.8$ ($SD = .59$) for the time pressure condition.

Univariate follow-up of the multivariate story type main effect revealed that story type was statistically significant for number of different solution types, $F(1,58) = 6.68$, $p<.05$, percent of aggressive solutions, $F(1,58) = 5.61$, $p<.05$, and mean effectiveness of solutions, $F(1,58) = 11.13$, $p<.05$. Story type was not significant for total number of solutions, $F(1,58) = 2.48$, *ns*. The mean scores on the solution generation variables by story type are presented in Table 4.

TABLE 4

Solution Generation Means and Standard Deviations by Story Type

Measure	Strong Provocation	Moderate Provocation
Total number	6.2 (2.5)	5.7 (2.7)
Different types	4.5 (1.5)	4.0 (1.6)
% aggressive	14.1 (18.6)	9.3 (17.9)
Mean effectiveness	2.8 (.49)	3.0 (.58)

Note. Standard deviations are in parentheses.

Discussion

Research concerning SCPS in aggressive children has generally failed to consider the effects of arousal on the problem-solving process and its outcome. This investigation was conducted to evaluate how one potential source of arousal, time pressure, influences attributions and solution generation in aggressive and nonaggressive elementary school boys. In the discussion that follows, the effects of time pressure on arousal are considered first. The influence of time pressure on attribution and solution generation are considered next, followed by discussion of story type and group effects. Finally, conclusions and recommendations for further study are presented.

Effects of Time Pressure on Arousal

The time pressure manipulation was designed to increase levels of arousal above those produced by standard (untimed) testing procedures. Three measures were employed as assess level of arousal: the subject-rated nervousness thermometer, the experimenter-rated behavioral signs of arousal, and the experimenter-rated overall

level of arousal. The time pressure condition resulted in significantly greater arousal than the untimed condition as measured by behavioral signs of arousal and overall arousal ratings. The nervousness thermometer did not produce a significant difference. The significant results for both experimenter-rated variables in connection with the lack of significance for the subject-rated variable raises the possibility that experimenter ratings were biased. Alternatively, the nervousness thermometer rating may have lacked sensitivity.

It should be noted that behavioral and self-report measures of arousal do not necessarily correlate with electroencephalogram (EEG) recordings or with peripheral physiological measures, such as heart rate and skin conductance (Evans, 1989). In addition, measures of peripheral physiological activity are often unrelated to EEG recordings and often fail to correlate among themselves (Evans, 1989). Thus, even with the aid of physiological measures, arousal has proved troublesome for investigators to operationalize.

Attributions

It was predicted that under conditions of time pressure relative to normal testing conditions, aggressive boys would show greater increases in hostile attributions compared to nonaggressive boys. The predicted interaction between group and condition approached statistical significance ($p = .057$). Simple main effects analyses revealed that the aggressive group made a greater number of hostile attributions in the time pressure condition than in the untimed condition, whereas there was no difference between the conditions for the nonaggressive group. These findings, however, must be regarded as tentative.

Research involving primarily nonsocial tasks has shown that arousal may reduce the range of cues to which one can attend (Easterbrook, 1959). It may be that time

pressure reduced the range of intention cues to which subjects attended, leading them to rely more on their personal histories in interpreting the hypothetical peer's intentions. Because aggressive boys are more often the targets of aggression than nonaggressive boys (Dodge & Frame, 1982), greater reliance on personal experience may have caused the aggressive group, but not the nonaggressive group, to make more attributions of hostility in the time pressure condition.

If replicated, the findings would suggest that aggressive boys are more likely to make attributions of hostility when they are aroused. SCPS training programs for aggressive boys, therefore, may need to assess and teach problem identification and attribution skills in more lifelike and arousing situations. The emphasis on emotion-free, rational cognitive processes may be partly responsible for the limited success of many SCPS training programs for aggressive children (e.g., Guevremont & Foster, 1993; Kettlewell & Kausch, 1983; Lochman, Burch, Curry, & Lampron, 1984).

Solution Generation

It was predicted that under conditions of time pressure relative to normal testing conditions, aggressive boys would show greater decrements in solution generation as compared to nonaggressive boys. The results failed to support the hypothesis. Rather, the findings indicated that across both groups, time pressure resulted in more solutions, more types of solutions, a greater percentage of aggressive solutions ($p = .08$), and, for moderate provocation items, less effective solutions.

In terms of optimal level of arousal theories that posit an inverted U-shaped relationship between arousal and performance on a given task (e.g., Evans, 1989; Hebb, 1955; Yerkes & Dodson, 1908), subjects in the time pressure condition may have been aroused beyond the optimal level for the solution generation task. Thus, while they

were highly motivated to perform well and consequently produced a relatively large number of responses, their ability to produce effective responses suffered.[3] Time pressure may have caused both groups to encode fewer cues and to give less consideration to the possible consequences of their solutions, thereby leading to more aggressive and, for moderate provocation items, less effective solutions. Despite the failure to find greater decrements in solution generation within the aggressive group, the present findings leave open the question of whether time pressure differentially influences the evaluation of solutions and/or the selection of solutions to execute among aggressive and nonaggressive boys.

Story Type Effects

Several researchers have pointed out that SCPS ability may be influenced by situational factors such as the nature of the problem situation and the characteristics of the other participants in the problem (e.g., Krasnor & Rubin, 1981; Lochman & Lampron, 1986). In the present study, attributions were examined in two different types of situations: peer provocation situations and unsuccessful peer group entry situations. Solution generation was also analyzed in two different types of situations: strong provocation situations and moderate provocation situations. The results indicated that the type of problem situation had an impact on both attribution and solution generation.

On the attribution measure, the provocation situations resulted in a greater number of hostile attributions and a greater number of aggressive responses than the peer group entry situations. The results suggest that subjects tended to match attributions with story outcomes. That is, subjects were more likely to attribute hostility to a peer when the outcome was more clearly negative and dramatic, such as being hit hard in the back with a baseball, compared to when the outcome was less dramatic,

such as peers' not responding to the subject's salutation. This pattern of responses may be indicative of cognitive immaturity (e.g., Piaget, 1965).

With regard to solution generation, the strong provocation situations resulted in more types of solutions, more aggressive solutions, and less effective solutions, as compared to the moderate provocation situations. Although it is not surprising that subjects responded more aggressively to strong provocations such as being pushed out of line or teased, it is notable that subjects responded with more types of solutions. The pattern of results for the strong provocation items relative to the moderate provocation items resembles that of the time pressure condition relative to the untimed condition. One possibility is that, like the time pressure condition relative to the untimed condition, strong provocation items may have been more arousing to subjects than the moderate provocation items.

Group Effects

Previous research suggests that, compared to nonaggressive boys, aggressive boys are more likely to make hostile attributions and less likely to generate multiple effective solutions to interpersonal problems. In the present study, however, the group main effect (i.e., aggressive vs. nonaggressive) was not significant in analyses involving either attribution or solution generation. In addition, the effect of time pressure on solution generation did not differ between the two groups. The failure to find group differences raises the question of whether the research groups were in fact comprised of aggressive and nonaggressive children, respectively. However, the difference between the groups on the Aggression subscale of the Child Behavior Checklist - Teacher's Report Form was statistically significant. In addition, the scores reveal that the groups constituted highly aggressive versus nonaggressive boys. In fact, the mean for the aggressive group was higher than that for the clinic referred boys used by Edelbrock and

Achenbach (1984) in the development of the Child Behavior Checklist - Teacher's Report Form.

One reason for the apparent discrepancy between the present findings and those of other studies may be differences in sample selection procedures. In the studies reported by Dodge and his colleagues (e.g., Dodge, 1980; Dodge & Frame, 1982; Dodge & Newman, 1981; Richard & Dodge, 1982), aggressive subjects are typically selected on the joint basis of teacher ratings and peer sociometric nominations that assess not only aggressive behavior, but also peer relations. Consequently, these subjects not only display aggressive behavior, but also have generally poor social relations and are rejected by peers. In one such study, Dodge et al. (1986) reported a mean score on the Aggression scale of the Child Behavior Checklist - Teacher's Report Form (Edelbrock & Achenbach, 1984) that was virtually identical to the mean score of the present aggressive group. Thus, it seems plausible that, whereas their sample was not more aggressive than the present sample, it was a more socially rejected group.

The present research design provided adequate statistical power to identify moderate differences between aggressive and nonaggressive boys in SCPS. Thus, the results raise the question of whether aggressive boys necessarily have deficits in SCPS relative to their nonaggressive peers. Indeed, preliminary research suggests that subtypes of aggressive children exist (e.g., reactive vs. proactive) and that only certain subtypes may have deficits in SCPS skills (e.g., Dodge & Coie, 1987).

Conclusions and Recommendations for Further Research

The present findings provide tentative support for the notion that time pressure increases the likelihood of hostile interpretations in ambiguously-motivated negative-outcome situations for aggressive but not nonaggressive boys. In addition, time pressure may lead to more

solutions, a broader range of solutions, and a greater percentage of aggressive solutions in hypothetical conflict situations for both aggressive and nonaggressive boys. The present findings concerning time pressure, however, cannot conclusively be attributed to arousal. An alternative explanation for the findings is that children simply had less time to sufficiently evaluate potential responses. Although such an interpretation has important implications with respect to the mechanisms by which time pressure influences SCPS, it does not necessarily detract from the clinical significance of the results. Time pressure represents an ecologically valid condition under which children frequently must solve social problems. As such, its effects on performance are important, even if the mechanisms by which time pressure operates are as yet unclear.

Possible mechanisms by which time pressure influenced solution generation include reduction in the range of cues to which subjects were able to attend (e.g., Easterbrook, 1959) and limitation of the consideration given to response alternatives (e.g., Keinan, 1987). Future research should attempt a more detailed analysis of the effects of time pressure on the problem-solving process. Dodge's five step social information-processing model may provide a useful framework for such work. Dodge's five steps are (a) encoding of social cues, (b) mental representation and interpretation of cues, (c) accessing of possible behavioral responses, (d) evaluation and selection of a response, and (e) execution of the response (Dodge et al., 1986). The effects of time pressure on the encoding of social cues and the evaluation of possible responses are potentially fruitful areas for further investigation. Future research should also consider different sources of arousal. In this regard, it is possible that stronger stressors generating more arousal would reveal greater differences between aggressive and nonaggressive groups.

The present study attempts to introduce the notion of arousal into an area of research that has emphasized rational, emotion-free cognitive processes. It is notable that in a domain of investigation concerned largely with interpersonal conflict among children, little attention has been paid to arousal. Social cognitive problem-solving research is predicated on the assumption that responses to hypothetical social conflict situations in the laboratory are related to thoughts and behavior in actual interpersonal problem situations. By altering laboratory conditions to approximate the environments in which children cope with actual social problems, investigators may enrich their understanding of social cognitive problem-solving and ultimately develop more effective interventions for a variety of maladaptive behaviors.

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Footnotes

[1]Because the two sample variances were not homogeneous, $F(29,31) = 8.3$, $p<.001$, separate estimates of the population variance were used to find the estimated standard error of the difference between the means.

[2]Attribution items were scored 1 (hostile) or 0 (nonhostile). For each subject the two provocation situation item scores and the two peer group entry situation item scores were averaged, respectively, before computing overall story type means.

[3]Results from the preliminary analyses, which included presentation order as a factor, revealed that when the time pressure condition followed the untimed condition, the time pressure condition resulted in more solutions and more types of solutions ($p = .08$), consistent with the notion that subjects were more motivated during the time pressure condition. The fact that solutions were not significantly more aggressive during the time pressure condition may be due to the availability of nonaggressive solutions produced in the previous (untimed) condition (i.e., carryover effects). When the untimed condition followed the time pressure condition, the untimed condition resulted in a greater percentage of aggressive solutions and less effective solutions. This may be due to subjects' having produced aggressive solutions in the time pressure condition, and thereby having these solutions available to them in the untimed condition (i.e., carryover effects). Moreover, the arousal-induced motivation to perform well most likely decreased in the untimed condition. Thus, solutions in the untimed condition when it followed the time pressure condition were even more aggressive and less effective than in the time pressure condition itself. Of course, the present formulation is *post hoc* and its validity can only be evaluated through additional research. It should be noted that the existence of presentation order effects highlights the importance of counterbalancing in a repeated measures approach (cf. Dodge and Somberg, 1987).

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