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Hostile attributional bias and aggressive behavior in global context

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We tested a model that children's tendency to attribute hostile intent to others in response to provocation is a key psychological process that statistically accounts for individual differences in reactive aggressive behavior and that this mechanism contributes to global group differences in children's chronic aggressive behavior problems. Participants were 1,299 children (mean age at year 1 = 8.3 y; 51% girls) from 12 diverse ecological-context groups in nine countries worldwide, followed across 4 y. In year 3, each child was presented with each of 10 hypothetical vignettes depicting an ambiguous provocation toward the child and was asked to attribute the likely intent of the provocateur (coded as benign or hostile) and to predict his or her own behavioral response (coded as nonaggression or reactive aggression). Mothers and children independently rated the child's chronic aggressive behavior problems in years 2, 3, and 4. In every ecological group, in those situations in which a child attributed hostile intent to a peer, that child was more likely to report that he or she would respond with reactive aggression than in situations when that same child attributed benign intent. Across children, hostile attributional bias scores predicted higher mother- and child-rated chronic aggressive behavior problems, even controlling for prior aggression. Ecological group differences in the tendency for children to attribute hostile intent statistically accounted for a significant portion of group differences in chronic aggressive behavior problems. The findings suggest a psychological mechanism for group differences in aggressive behavior and point to potential interventions to reduce aggressive behavior.

aggressive behavior | cultural differences | hostile attribution | interpersonal conflict | social cognition

Why do children in some ecological contexts and cultural groups across the world exhibit more chronic aggressive behavior problems than children in other contexts? We assert that groups differentially socialize a key psychological process of attribution of hostile intent, which mediates the display of aggression in response to threat (i.e., it statistically accounts for differences in reactive aggressive behavior), which, when repeated in interpersonal interactions over time, grows into chronic aggressive behavior problems.

Some evolutionary theorists posit the adaptive function of deescalating aggressive conflict in response to ambiguous provocation or threat. Axelrod's computer simulations and empirical tests of ambiguous conflicts in political science suggest (but do not prove) that the response strategy responsible for the containment of violence and the evolution of cooperation is a "tit for tat" tactic characterized by a benign interpretation of another's ambiguous intentions (1). He asserts that an alternate two-step strategy of attributing hostile intent to another and retaliating with aggression leads to escalation of conflict and eventual mutual destruction.

Despite Axelrod's assertions that the long-term adaptiveness of reactive aggression is poor, certain ecological contexts have been found to encourage hostile attributions and reactive aggression in response to ambiguous provocations. For example, rhesus macaque mothers who hold high dominance ranks socialize their 9-mo-old infants to display a pattern of high vigilance to threatening faces, probably as a short-term adaptive strategy to enable the offspring to maintain high rank (2). In the US South, a unique "culture of honor" promotes vigilance toward provocateurs, perceptual readiness to attribute hostile intent to others, and retaliatory aggression in response to being dishonored (3). Qualitative accounts of urban violence among minority males also point toward the importance of retaliating against being "dissed," as in disrespected (4). Recent "Stand Your Ground" laws in the United States excuse retaliation against a perceived provocateur.

A pattern of hypervigilance to threat, hostile attribution of intent, and reactive aggression in response to provocation often comes at a cost to an individual within a society and to that society's long-term health and well-being. A large body of psychological research in the United States indicates that, when an individual attributes hostile intent to a peer provocateur, the individual is likely to become anxious and escalate reactive aggression, leading in turn to chronic aggressive behavior problems (5). Children who consistently make hostile attributions about others have been shown to escalate aggression in response to provocation, to become

Significance

Interpersonal conflict and violence occur within and between groups around the world. Although not proving causation, this study is significant because it suggests a key psychological mechanism in children's chronic aggression that might be targeted for intervention: one's attribution that a peer is acting with hostile intent. When children attribute hostile intent to peers, they are more likely to predict they would react aggressively than when they attribute benign intent. Differences in this tendency statistically account for differences in future chronic aggressive behavior problems across children, as well as differences in chronic aggressive behavior problem rates across ecological-context groups. Identifying this mechanism could lead to novel interventions, education, and policies that reduce or prevent aggressive behavior.

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chronically anxious, and to increase their aggressive behavior problems over time and grow into violent adults (6).

How do we reconcile the universality of Axelrod's tit for tat pattern of benign attributions and cooperation with known ecological group differences in chronic aggressive behavior rates? A social ecological model that embeds behavior in a widening circle of ecological contexts (e.g., family, community, culture) posits that a child's cultural-ecological context of local norms, values, and affordances will influence that child's attention and attribution processes, which, in turn, will account for that child's aggressive behavior (ecological context → child hostile attribution bias → child aggression) (7). We assert that some environments socialize a pattern that consists of high vigilance to threat, hostile attributions of another's intent, and reactive aggression. The reasons for group differences in socialization patterns are beyond the scope of this study but likely grow in response to local environmental challenges such as genuine threat from outside groups, political conflict, and relative economic disadvantage, and are perpetuated through transmission across generations.

We propose a model of hostile attributional bias, depicted in Fig. 1, which builds on these ideas. We posit that Axelrod's universal axiom that the psychological act of making a benign attribution about another's provocation leads to the deescalation of conflict (and, reciprocally, that a hostile attribution leads to reactive aggression). We hypothesize that variation in a child's reactive aggressive behaviors across the situations that a child experiences will co-occur within that child with the attribution of hostile intent toward a provocateur. We further hypothesize that individual differences across children in reactive aggression in response to provocation will be accounted for partially by individual differences across children in the tendency to make hostile attributions and that both hostile attributional biases and reactive aggressive responses to provocation will predict present and future individual differences in chronic aggressive behavior problems even controlling for prior individual differences in chronic aggression.

Finally, and most importantly, we assert that ecological group differences in rates of chronic aggressive behavior problems are due in part to culturally socialized differences in how children are reared to become vigilant toward threat and to make hostile attributions about others under conditions of ambiguous provocation. If this model is supported, it suggests interventions to reduce a group's rate of chronic aggressive problems, and it has implications for understanding some cross-group conflicts (e.g., Arab-Israeli conflict and racial conflict within the United States), which could be understood as a function of group differences in how attributions of outgroup intentions are socialized and used to justify cross-group violence. Study of antecedents of cross-group conflict is beyond the present scope and is not pursued further here.

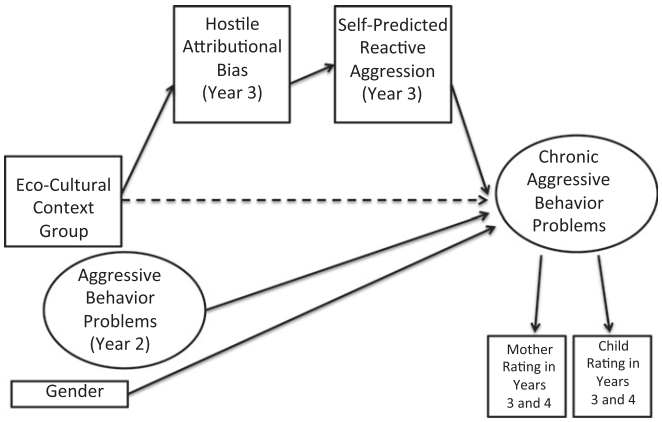

Fig. 1. Hypothesized model of how ecological context affects chronic aggressive behavior by influencing hostile attributional biases.

To test the tenets of this model, we used identical methods with large samples of children followed prospectively across diverse ecological socializing contexts around the world. The goal of the current study was to test three sets of hypotheses in a sample of 8-y-old boys and girls from 12 different groups around the world followed annually over 4 y.

The first hypothesis (the within-child hypothesis) is that variation in reactive aggressive behavior in response to provocation situations within a child will be statistically accounted for by variation in the attributions that child makes across peer provocation situations. We hypothesize that this relation will hold universally in each ecological context and in each sex.

The second hypothesis (the between-children hypothesis) asserts that measurements of a child's attributions about peers' intentions will yield internally consistent individual differences across children, called hostile attributional bias, which acts like an acquired personality trait to correlate with and predict chronic aggressive behavior. We hypothesize that variation across children in hostile attributional bias will be correlated with children's chronic tendencies to assert that they would react aggressively in response to a provocation; furthermore, we hypothesize that children's hostile attributional biases will predict their current and future chronic aggressive behavior problems as measured by themselves and their mothers even controlling for prior aggressive behavior problems, and these relations will hold in each ecological context and each sex.

The third hypothesis (the between-context hypothesis) asserts that ecological-cultural group differences in children's rates of mother-rated and self-rated chronic aggressive behavior problems will be partially statistically accounted for by group differences in children's hostile attributional biases and self-predicted tendencies to react aggressively in response to ambiguous threat.

Methods

Participants. Community samples of families were recruited through letters sent from schools and included 1,299 children (mean age at year 1 = 8.30 y, SD = 0.65; 51% girls; 82% with married parents) and their mothers (n = 1,276) and fathers (n = 1,032) from 12 groups in nine countries across the world that were selected because they varied in the ecological context in which children are raised: Jinan, China (n = 120); Medellín, Colombia (n = 108); Naples, Italy (n = 100); Rome, Italy (n = 103); Zarqa, Jordan (n = 114); the Luo tribe in Kisumu, Kenya (n = 100); Manila, Philippines (n = 120); Trollhättan/Vänersborg, Sweden (n = 103); Chiang Mai, Thailand (n = 120); Durham, NC, USA, European American (n = 111); Durham, NC, USA, African American (n = 103); and Durham, NC, USA, Hispanic (n = 97). Families were recruited from schools that served socioeconomically diverse populations within each participating group. Groups were not selected to represent the world's contexts but rather because they represented distinct contexts; thus, African Americans, European Americans, and Hispanics within the United States were selected as separate groups because of their distinct histories of dominance and discrimination, and Italians in Rome and Italians in Naples were distinct groups because of the historical presence of organized crime in the latter but not former context.

At time 1, mothers averaged 38.30 y of age (SD = 6.68) and had completed 12.59 y of education (SD = 4.29). Interviews were conducted annually thereafter, with 94%, 91%, and 67% of the original sample providing data in years 2, 3, and 4, respectively. Participants who attrited did not differ from the original sample with respect to child sex or parents' marital status or education.

Procedures and Measures. Measures were administered in the predominant language at each site, following forward- and back-translation and meetings to resolve any item-by-item ambiguities in linguistic or semantic content and cultural insensitivities (8, 9). Each 90- to 120-min interview was conducted in participants' homes, schools, or other locations chosen by the participants. Procedures were approved by local institutional review boards (IRBs) at universities in each participating country; parents and children provided consent and assent, respectively, and were interviewed separately to ensure privacy. Mothers and fathers were given the option of having the questionnaires administered orally (with rating scales provided as visual aids) or completing written questionnaires. All children completed the questionnaires orally, with questions read and responses recorded by trained

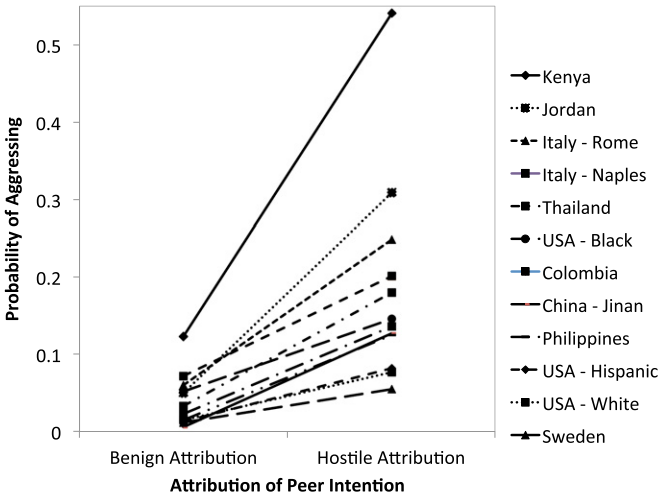

Fig. 2. The relation between attribution of intention and probability of aggressing, by ecological context group.

interviewers. Children were given small gifts, and parents were given modest financial compensation for their participation.

Child hostile attributions and self-predicted reactive aggression. In year 3, children were presented with each of 10 hypothetical vignettes in which the child was asked to imagine being in a situation in which a peer ambiguously provokes the child (e.g., walking to school wearing new shoes and being bumped into a puddle from behind by another child). Following each vignette, the child was asked whether the peer provocateur in the story had caused the negative outcome for the child by accident or on purpose (scored as follows: accident = 0; on purpose = 1). Next, the child was asked to select one of three possible responses indicating what she or he would do if the event had happened to the child. Responses were coded 0 if the child selected the response "avoid confrontation" (e.g., ignore it, scored as 0) or "act competently" (e.g., clean up a mess), and 1 if the child selected the response to react aggressively (e.g., push the provocateur to the ground following a slight bump). Ninety-one percent of the original sample provided data for this measure.

Child chronic aggressive behavior problems. In years 2, 3, and 4, mothers completed the 20-item Aggression Scale of the Child Behavior Checklist (CBCL) (10) (e.g., "My child gets in many fights") by indicating whether each behavior was "not true" (coded as 0), "somewhat or sometimes true" (coded as 1), or "very true or often true" (coded as 2), and children completed a compatible Youth Self-Report version of the same instrument. Item responses were summed within reporter to yield Chronic Aggressive Behavior Problem Scores. This measure has been translated into at least 69 languages, and more than 9,000 published studies have used this measure in at least 800 countries (11). Aside from its widespread use (12), researchers have specifically demonstrated cross-ethnic and cross-language equivalence of this measure across cultural groups (13–16). Year 4 scores were used for assessing hypothesis 2 to best maintain temporal ordering. Because not all groups of children were administered the CBCL in year 4, however, the full information maximum likelihood (FIML) missing-data solution would not be available for those groups with completely missing data when testing hypothesis 3, which used a multiple group strategy. For hypothesis 3, therefore, within-rater year 3 and year 4 scores were combined in each of two latent factors with equated loadings. This procedure allowed the use of data from all children and ecological groups, as the group-dependent missingness is clearly at random. Ninety-three percent of the original sample provided at least one mother or child report score in year 3 or 4.

Results

Hypothesis 1 (Within-Child Process). Children's attributions of hostile intent and self-predicted reactive aggression responses for each of 10 hypothetical vignettes were subjected to a multilevel logistic regression model, with three levels: hypothetical story vignette (n = 11,851) within a child at level 1, having two variables: attribution (0 = nonhostile, 1 = hostile) and self-predicted behavioral response (0 = nonaggression, 1 = reactive aggression); child (n = 1,093) at level 2, with sex (0 = female, 1 = male); and ecological context (12 groups coded nominally) at level 3. Children attributed hostile intent to the peer provocateur for 38.5% of all episodes and self-predicted reactive aggression for 9.8% of all episodes.

Controlling sex, the within-child relation between making a hostile attribution about a peer's intent and self-predicting reactive aggression with that peer was highly statistically significant overall (OR = 1.46; 95% CI: 1.09, 1.96) and within each of the 12 ecological contexts, as depicted in Fig. 2. When a child attributed hostile intent to a peer provocateur, that child self-predicted engaging in reactive aggressive behavior 19.6% of the time, in contrast with just 3.7% of the time when that same child attributed benign intent, a fivefold increase in the likelihood of self-predicted reactive aggression.

Hypothesis 2 (Between-Child Processes). Hostile attributional bias was computed as the mean of responses to all 10 vignettes and found to be internally consistent overall (Bentler's $\rho = 0.82$; 95% CI: 0.80, 0.84) and within each ecological context group (ρs ranged from 0.61 to 0.94, each $P < 0.001$), indicating strong internal consistency of individual differences in hostile attributional bias. Likewise, internal consistency of individual differences in self-predicted reactive aggression was high overall ($\rho = 0.95$; 95% CI: 0.94, 0.96) and in each group.

Hostile attributional biases predict chronic aggression. Bivariate correlations among variables, controlling for sex and clustering by group, are listed in Table 1. Group was a 12-level nominal variable that was captured by 11 dof using dummy variables. As expected, mother-rated and child-rated chronic aggressive behavior problem scores were significantly correlated with each other and with similar scores across years. Hostile attributional bias scores in year 3 were significantly correlated with both mother-rated and child-rated chronic aggressive behavior problem scores in each of years 2, 3, and 4.

To test hypothesis 2, we estimated a saturated structural model, shown in Fig. 3, accounting for complex sampling by cultural group. The hypothesis was supported that a child's year 3 hostile attributional bias score could predict that child's chronic aggressive behavior problems, as measured by a latent construct of mother-rated and child-rated chronic scores in years 3 and 4, controlling for sex and mother-rated and child-rated chronic aggressive behavior problems in year 2 [Wald $\chi^2(2) = 25.96$, $P < 0.001$; under the null hypothesis, the Wald test is asymptotically equivalent to the likelihood ratio test] (17). The path from year 3 hostile attribution scores to child-rated chronic aggressive behavior problems, controlling year 2 child-rated and mother-rated chronic aggressive behavior problems, was statistically significant ($b = 0.95$, SE = 0.24, $z = 3.94$, $P < 0.001$, standardized $b = 0.18$); the path from year 3 hostile attribution scores to year 4 mother-rated chronic aggressive behavior problems, controlling year-2 child-rated and mother-rated

Table 1. Partial correlations among variables across time

Variable	HAB3	SRA3	M2AGG	C2AGG	M3AGG	C3AGG	M4AGG
SRA3	0.42						
M2AGG	0.12	0.18					
C2AGG	0.16	0.25	0.30				
M3AGG	0.13	0.20	0.74	0.30			
C3AGG	0.24	0.36	0.29	0.55	0.33		
M4AGG	0.12	0.21	0.62	0.28	0.68	0.28	
C4AGG	0.21	0.29	0.24	0.48	0.27	0.59	0.35

Values are partial correlations, controlling sex and clustered by group, tested by full information maximum likelihood based on n = 1,244. Every value is $P < 0.05$. HAB3, hostile attributional bias score in year 3; SRA3, self-predicted reactive aggression score in year 3; M2AGG, mother-reported aggression in year 2; C2AGG, child-reported aggression in year 2; M3AGG, mother-reported aggression in year 3; C3AGG, child-reported aggression in year 3; M4AGG, mother-reported aggression in year 4; C4AGG, child-reported aggression in year 4.

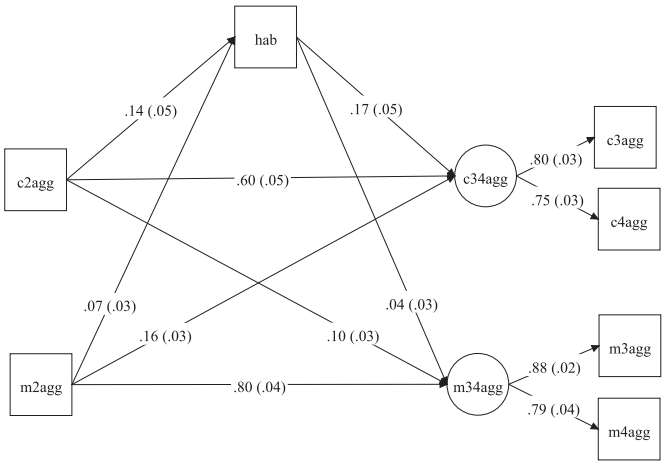

Fig. 3. Saturated structural equation model findings predicting chronic aggressive behavior problems as rated by child (c34agg) and mothers (m34agg) from hostile attributional biases (hab), controlling for prior aggressive behavior (c2agg and m2agg) and sex. Figures are standardized coefficients (SEs). Residual and disturbance variances and covariance and all paths for sex are omitted for clarity.

chronic aggressive behavior problems, was not statistically significant ($b = 0.25$, SE = 0.19, $z = 1.26$, $P = 0.20$, standardized $b = 0.04$).

Self-predicted reactive aggression predicts chronic aggression. Children's self-predicted reactive aggression was significantly correlated with their hostile attributional biases. Self-predicted reactive aggression scores were also significantly correlated with both mother-rated and child-rated chronic aggressive behavior problems in years 2, 3, and 4.

In a separate model, the hypothesis was supported that a child's year 3 self-predicted reactive aggression score could predict that child's chronic aggressive behavior problems as rated by mothers and children in years 3 and 4, modeled as above [Wald $\chi^2(2) = 41.23$, $P < 0.001$]. The path from year 3 self-predicted reactive aggression scores to child-rated chronic aggressive behavior problems in years 3 and 4, controlling year 2 child-rated and mother-rated chronic aggressive behavior problems, was statistically significant ($b = 1.91$, SE = 0.31, $z = 6.08$, $P < 0.001$, standardized $b = 0.27$), as was the path from year 3 self-predicted reactive aggression scores to mother-rated chronic aggressive behavior problems in years 3 and 4, controlling year 2 child-rated and mother-rated chronic aggressive behavior problems ($b = 0.67$, SE = 0.33, $z = 2.01$, $P = 0.045$, standardized $b = 0.08$).

The model also provides information about the prediction of hostile attributional bias from prior aggressive behavior. A construct of child-rated and mother-rated aggressive behavior problems in year 2 significantly predicted hostile attributional bias in year 3 [Wald $\chi^2(2) = 12.10$, $P = 0.002$]. The individual paths from child-rated and mother-rated aggressive behavior problems were each uniquely significant: child ($b = 0.020$, SE = 0.007, $z = 2.73$, $P = 0.006$, standardized $b = 0.14$) and mother ($b = 0.009$, SE = 0.003, $z = 2.76$, $P = 0.006$, standardized $b = 0.07$).

Hypothesis 3 (Between-Group Processes). We estimated the overall model from Fig. 1 that a child's ecological group designation could predict that child's hostile attributional bias scores, which could predict that child's self-predicted reactive aggression scores, and both hostile attributional bias scores and self-predicted reactive aggression scores could predict the child's chronic aggressive behavior problems scores as rated by mothers and children in years 3 and 4 and mediate part of the effect of site on chronic aggression. The nominal factor site was captured by an 11-dof variable using dummy variables. Sex was included as a covariate. The model was structurally saturated by including paths from each upstream predictor to each downstream variable. Because of the completely missing year 4 aggression measures in several cultural groups, the model could only be estimated as a mixture model with known class membership, and therefore overall fit statistics are not available. Ecological group mean scores for hostile attributional bias, self-predicted reactive aggression, mother-rated chronic aggressive behavior problems, and child-rated chronic aggressive behavior problems are listed in Table 2.

As expected from earlier analyses, ecological group membership predicted all three downstream variables, with ecological group as a 12-level nominal factor and sex as a covariate: total effects on hostile attributional bias scores [Wald $\chi^2(12) = 236.94$, $P < 0.001$]; self-predicted reactive aggression scores [Wald $\chi^2(12) = 182.25$, $P < 0.001$]; and chronic aggressive behavior problem rates {Wald $\chi^2(24) = 198.49$, $P < 0.001$: individually significant for both mother-rated scores [Wald $\chi^2(12) = 57.91$, $P < 0.001$] and child-rated scores [Wald $\chi^2(12) = 162.95$, $P < 0.001$]}.

Hostile attributional bias scores predicted self-predicted reactive aggression scores across groups [Wald $\chi^2(12) = 186.08$, $P < 0.001$] and chronic aggressive behavior problems in years 3 and 4 across groups [Wald $\chi^2(24) = 77.09$, $P < 0.001$]. Hostile attributional biases also predicted aggregated (weighted average across groups) point estimates for mother-rated and child-rated scores taken together [Wald $\chi^2(2) = 52.49$, $P < 0.001$]. The effects of hostile attributional bias on chronic aggressive behavior problems were positive and significant for both child-rated chronic aggressive behavior problems ($b = 1.40$, SE = 0.20, $z = 7.12$, $P < 0.001$) and mother-rated chronic aggressive behavior problems ($b = 0.82$, SE = 0.22, $z = 3.65$, $P < 0.001$).

Self-predicted reactive aggression scores also predicted chronic aggressive behavior problems [Wald $\chi^2(24) = 231.31$, $P < 0.001$], with significant across-group effects for mother-rated and child-rated scores taken together [Wald $\chi^2(2) = 102.42$, $P < 0.001$]. The effects of reactive aggression scores on chronic aggressive behavior problems scores were positive and significant for both child-rated chronic aggressive behavior problems ($b = 3.37$, SE = 0.35, $z = 9.58$, $P < 0.001$) and mother-rated chronic aggressive behavior problems ($b = 2.26$, SE = 0.36, $z = 6.27$, $P < 0.001$).

Five sets of analyses tested specific mediation hypotheses. First, the hypothesis was supported that children's self-predicted reactive aggression scores could statistically account for part of the impact of children's hostile attributional biases on chronic aggressive behavior problems [Wald $\chi^2(24) = 74.01$, $P < 0.001$]. Second, the hypothesis was supported that ecological group differences in children's self-reported reactive aggression scores could statistically account for part of the effect of ecological group membership on children's chronic aggressive behavior problems [Wald $\chi^2(24) = 61.18$, $P < 0.001$]. Third, the hypothesis was supported that ecological group differences in children's hostile attributional bias scores could statistically account for part of the effect of ecological group membership on chronic aggressive behavior problems [Wald $\chi^2(24) = 39.70$, $P < 0.001$]. Fourth, the hypothesis was supported that children's hostile attributional bias scores could account for part of the effect of ecological group membership on self-reported reactive aggression scores [Wald $\chi^2(12) = 189.10$, $P < 0.001$]. Finally, the full model was supported that ecological group membership could predict hostile attributional bias scores, which could predict and account for self-reported reactive aggression scores, which, in turn, could predict and account for chronic aggressive behavior problems [Wald $\chi^2(24) = 35.78$, $P = 0.058$].

Discussion

These findings provide compelling evidence that differences in rates of chronic aggressive behavior problems across groups of children around the world, defined by their ecological and cultural context, can be statistically accounted for, in part, by group

Table 2. Mean scores for hostile attributional bias, self-predicted reactive aggression, and mother- and child-reported chronic aggressive behavior problems by ecological context group

Ecological context	Hostile attributional bias	Self-predicted reactive aggression	Mother-reported chronic aggressive behavior problems	Child-reported chronic aggressive behavior problems
Zarqa, Jordan	0.544	0.188	9.12	9.87
Durham, NC, USA (black)	0.480	0.097	6.88	7.72
Naples, Italy	0.460	0.132	10.27	8.19
Rome, Italy	0.457	0.146	7.96	8.10
Durham, NC, USA (Hispanic)	0.427	0.043	8.46	7.66
Chiang Mai, Thailand	0.388	0.091	5.95	8.28
Durham, NC, USA (white)	0.383	0.039	6.86	6.61
Medellín, Colombia	0.381	0.066	9.86	6.67
Kisimu, Kenya	0.375	0.279	7.45	7.12
Trollhättan, Sweden	0.315	0.026	3.99	5.20
Manila, Philippines	0.288	0.047	9.74	9.72
Jinan, China	0.168	0.026	5.99	4.41

The hostile attributional bias score is the mean score across 10 stories; the self-predicted reactive aggression score is the mean score across 10 stories; the mother-rated chronic aggressive behavior problems scores is a latent factor score for years 3 and 4 with equated loadings. The child-rated chronic aggressive behavior problems score is a latent factor score for years 3 and 4 with equated loadings.

differences in children's tendencies to attribute hostile intent and to self-predict reactive aggression following ambiguous provocations. The findings encourage future attempts to find ways to interrupt the process of growing chronic aggressive behavior problems within and across groups by altering the way that children are socialized to process social cues during provocations, particularly a pattern characterized by hypervigilance to threat cues, attributions of hostile intent, and self-predicted escalation of reactive aggressive behavior.

A child's hostile attribution in response to threat was found to correlate with that child's report of reactive aggression across events. Children do not always respond to provocation with reactive aggression: a child's attribution that a provocateur is intentionally causing harm to that child was found to be a proximal and primary predictor of that child's stated intention to react aggressively or deescalate conflict. This finding held within each of 12 ecological groups from all over the world, representing diverse social cultures and contexts, and in boys and girls. Furthermore, a child's habitual patterns of hostile attributional biases and self-predicted reactive aggression in response to provocations were associated with individual differences in mother-rated and self-rated chronic aggressive behavior problems within every ecological context group, suggesting a universal psychological mechanism in the growth of chronic aggressive behavior problems: that is, when confronted with an ambiguous provocation, a tendency to attribute hostile intent to the other person and to state an intention to respond with reactive aggression and retaliation accounts for growth in current and future chronic aggressive behavior problems.

The findings indicate that some children are chronically more likely than others to demonstrate hostile attributional biases and to self-predict reactive aggression in response to ambiguous provocations. Social-cognitive response tendencies act like acquired personality traits to influence behavior (18), and hostile attributional bias is a prototype (19, 20). In the present study, this characteristic accounted for significant portions of the variation in children's chronic aggressive behavior problems as rated by mothers and selves.

Because these data are correlational, it remains plausible that unaccounted for third variables could affect both hostile attributional biases and chronic aggressive behavior problems. We controlled for possible third variables such as sex and ecological context and continued to find an association, but the possibility of third variable causation always holds with nonexperimental data.

It is also plausible that engaging in aggression and conflict toward others could lead others to act aggressively toward oneself, increasing a child's tendency to attribute hostile intent to others. We found evidence to support this pattern. However, it is unlikely that this pattern accounts fully for the pattern of a hostile attribution influencing chronic aggressive behavior problems because of the temporally distinct statistical controls in the current analysis that covaried prior levels of aggressive behavior problems and the cross-temporal prediction in growth of chronic aggressive behavior problems. Our tests are standard statistical tests that could reject our hypothesis but cannot prove conclusively that our hypothesized path is the only possible path. We conjecture that both paths operate in a reciprocally influential way. In dynamic transactional models (19), both paths often co-occur.

Although the patterns are robust, modest significance levels and curious anomalies in the findings suggest that chronic aggressive behavior problems might develop through more than one mechanism. For example, although both mothers and children in the Philippines report relatively high levels of chronic aggressive behavior problems, Filipino children's hostile attributional biases rank as the second lowest among all groups. Perhaps a different mechanism operates in that culture as a supplement to the attribution reactive aggression mechanism. Future studies should examine multiple psychological mechanisms and socialization patterns.

Previously unidentified is the finding that the psychological mechanism of hostile attributional bias could account for differences among groups around the world in rates of children's chronic aggressive behavior problems. We speculate that ecological group differences in children's attributional and behavior patterns are due to differential socialization by various agents such as parents, schools, and the local media. A plausible alternate interpretation is that group differences in rates of chronic aggressive behavior problems are due to differences in genes. Although there exists no empirical evidence or theory to support this notion, and we believe it is destructive to nurture such a hypothesis, our research design does not allow us to reject this hypothesis.

We caution the reader that no correlational findings can ever prove causation among variables. We use multiple time points to establish temporal relations among chronic aggressive behavior

problems at time 2, hostile attributional bias at time 3, and chronic aggressive behavior problems at time 4; we use rigorous tests that control for prior chronic aggressive behavior.

Causation can be tested best through experimentation such as a randomized controlled trial of an intervention. The current findings inspire future efforts to generate interventions to decrease population-level aggressive behavior problems by altering a group's tendency to acculturate hostile attributional biases and vigilance to threat. Research on hostile attributional bias has already inspired numerous interventions within Western society groups to teach and socialize individual children to become more leavened in attributing blame and malicious intent to others as a way to reduce chronic aggressive behavior problems. An intervention to reduce hostile attributional biases in African-American children successfully reduced their aggressive behavior (21). The Fast Track intervention reduced hostile attributional biases in high-risk early-starting conduct problem children, which mediated the intervention's long-term effect on reducing adolescent delinquent behavior (22), and the same intervention reduced testosterone reactivity to laboratory-induced provocations when these children became adults (23). The current findings suggest that interventions should be developed to reduce a population's level of hostile attributional bias, perhaps through media campaigns and classroom curricula, and then tested through a randomized controlled trial at the group level. Such a trial would test the causal status of the model more directly and could have broad impact on population outcomes.

However, another next step in scientific inquiry is to understand how ecological groups socialize hostile (or nonhostile) attributional biases. Community differences in poverty and adversity may lead parents to socialize children in particular ways that lead to different perceptions of the world (24). The early experience of physical maltreatment is known to lead children to develop hostile attributional biases, which then mediate the development of chronic aggressive behavior problems (25). In contrast, early parental use of nonharsh discipline methods is known to lead children to develop benign (rather than hostile) attributional biases, which mediate their low rates of interpersonally violent behavior in young adulthood (6). It is not fully known how ecological groups differ in parenting practices and whether these differences would account for differences in hostile attributions and aggressive behavior. Research on socialization differences would suggest ways that policy makers could attempt to alter group-wide patterns of socialization to lower population rates of chronic aggressive behavior problems.

Finally, although these findings do not address between-group violence, they could be applied to generate hypotheses about the source and resolution of between-group conflicts across ethnic, religious, political, and regional groups. Might between-group conflicts be accounted for by patterns of attributing hostile intent to other groups, and might interventions be developed to alter the way that groups attribute intent to each other in ambiguous provocation situations?

In summary, we find robust ecological group differences in the degree to which children follow Axelrod's tit for tat cognition-behavior strategy in response to provocation, and these group differences statistically account for a significant portion of group differences in rates of chronic aggressive behavior problems. We suggest that population-level aggressive behavior problem rates might be reduced by focusing on how groups socialize children to respond to provocations with attributions of hostile intent and self-stated intentions to react aggressively during interpersonal conflict.

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