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Examining Factors Associated With (In)Stability In Social Information Processing Among Urban School Children: A Latent Transition Analytic Approach

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Abstract

There is compelling evidence for the role of social information processing (SIP) in aggressive behavior. However, less is known about factors that influence stability vs. instability in patterns of SIP over time. Latent transition analysis (LTA) was used to identify SIP patterns over one year and examine how community violence exposure, aggressive behavior, and behavior regulation relate to (in)stability in SIP. Participants were 429 urban children (ages 7-13, *M* = 9.58; 86% African American). LTA indicated four SIP profiles: stable low, decreasing, increasing, and stable high. Children with consistently high aggressive SIP reported the greatest community violence exposure and aggressive behavior. Compared to children who remained high on aggressive SIP, children whose aggressive SIP declined reported greater behavior regulation, suggesting that individual differences in executive function may account for stability in aggressive SIP during mid to late childhood.

Keywords

social information processing; executive functioning; latent transition analysis; community violence; African American

Numerous studies have documented an association between aggressive behavior and the way that individuals interpret potentially conflicting social situations, or their social

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information processing (SIP) style (Crick & Dodge, 1994). Rooted in social cognitive theory (Bandura, 1973), a model of SIP was proposed by Crick and Dodge (1994) to describes a complex series of processing activities (e.g., perception of social interactions, response generation) that influence one's likelihood of responding aggressively in ambiguous social situations. As such, SIP is a common target for preventive interventions aiming to reduce youth violence (Sullivan, Farrell, Bettencourt, & Helms, 2008), which is the second leading cause of fatal injuries for youth (Centers for Disease Control and Prevention, 2010).

Research has identified numerous potential risk factors for aggressive information processing styles, such as community violence exposure (Bradshaw, Rodgers, Ghandour, & Garbarino, 2009) and aggressive behavior (Crick & Dodge, 1994). However, there has been less investigation into factors that influence the stability of those styles over time. The present study begins to fill this void by examining (in)stability in SIP and related factors in a sample of children aged 7-13. This developmental stage may be a particularly important one to examine these associations, as some research suggests that social cognition becomes increasingly related to actual behavior in late childhood and adolescence, relative to early childhood (Landsford et al., 2006). Our findings have the potential to enhance understanding of factors associated with stability versus instability in SIP styles and direct attention to targets for preventive interventions for urban children at risk for, and engaging in, aggressive behavior.

Association between Social-information Processing and Aggression

There is strong theoretical and empirical evidence linking SIP and aggressive behavior. Crick and Dodge (1994) outlined a model of SIP describing the way individuals perceive ambiguous social situations, make judgments about others' intents, and make decisions about how to respond. Several related studies have indicated that aggressive children tend to have aggressive cognitions, perceive aggression as an acceptable threat response, selectively attend to aggressive cues, and discount situational factors that may have influenced the other person's behavior (for reviews see Bradshaw & Garbarino, 2004; Sullivan, Farrell, Bettencourt, & Helms, 2008). These children have a well-developed hostile attribution bias, which influences their interpretation of a situation such that they infer greater hostility in others' ambiguous behavior. Aggressive children tend to have a large repertoire of aggressive responses that they believe to be more effective at obtaining goals than prosocial responses (Perry, Perry, & Rasmussen, 1986). Many interventions have been developed to modify different aspects of SIP, such as the interpretation of cues and response evaluation and decision (for a review, see Sullivan et al., 2008).

Potential Factors Associated with Change vs. Stability in SIP

Despite a considerable body of work investigating SIP, few studies have examined factors that influence the stability of SIP profiles and the relation of associative characteristics to these profiles. Some researchers have demonstrated through experimental manipulation that children's SIP profiles can become more prosocial and less hostile. One such study by Kirsh (1998) used a lab-based paradigm to induce a hostile attribution bias through exposure to

violent video games (also see Anderson & Dill, 2000). Other studies have altered SIP styles through school-based preventive interventions (e.g., Lochman & Wells, 2002, 2003).

Available longitudinal studies suggest a relatively high level of stability in SIP, yet there appears to be less stability among younger children relative to adolescents (Guerra et al., 2003). A transactional framework (e.g., Dodge & Pettit, 2003) may help explain this developmental trend. Aggressive children may seek out environments or elicit responses that reinforce their hostile SIP styles which are theorized to crystallize by mid- to late-childhood. Some children may experience an *increase* in their aggressive SIP style, whereas other children may become *less* aggressive in their SIP style. Some degree of heterogeneity in SIP styles may be accounted for by one's aggressive behavior. Contextual factors such as exposure to community violence, or constitutional factors such as executive functioning, may also account for heterogeneity in SIP. Evidence for each of these potential factors is considered in relation to stability vs. change in SIP during the transition to early adolescence among urban school children.

Aggression

Although the literature has emphasized the predictive utility of SIP for understanding the stability of aggression (Burks, Laird, Dodge, Pettit, & Bates, 1999), the transactional perspective suggests that aggressive behaviors are related in reciprocal ways to social-cognitive processes (e.g., Bradshaw & Garbarino, 2004; Fontaine, Yang, Dodge, Pettit, & Bates, 2009). Aggressive behaviors might simultaneously limit opportunities for prosocial information processing and facilitate hostile processing (Bradshaw & Garbarino, 2004). Aggressive behaviors may account for stability in SIP (Fontaine et al., 2009), although additional empirical work is needed.

Additionally, the literature on children's aggression and antisocial behavior highlights the importance of key transition periods (e.g., late childhood/early adolescence). During these developmental epochs changes in experiences can function as “cascading constraints,” serving as both consequences of previous processes and risk factors for subsequent processes (Granic & Patterson, 2006). There is a need for research examining predictors of aggressive SIP and elucidating how social cognition and behavior are related.

Exposure to violence

Research on the association between community violence exposure and aggression has stressed the important mediating role of SIP. Both victimization and witnessed violence appear to contribute to the formation of aggressive SIP styles (Bradshaw et al., 2009). Consistent with social learning theory (Bandura, 1973), children exposed to violence may learn that aggression is an acceptable response to threat and may imitate behaviors that they have witnessed. Violence exposure thus appears to contribute to a thought-action repertoire that supports aggressive responses to threat or the perception that aggression is justifiable (Huesmann, 1998). Numerous studies support the theory that social-cognitive processes account for the majority of the association between violence exposure and aggression (Bradshaw et al., 2009; Guerra et al., 2003), providing compelling evidence that violence

exposure contributes to changes in SIP. This research suggests that exposure to violence may contribute to the onset or reinforcement of aggressive SIP styles.

Executive functioning

Previous research stressed the link between aggressive behavior and SIP. Yet it may be important to examine the role of executive functioning in relation to SIP, particularly with regard to (in)stability in SIP profiles. Executive function is the set of cognitive processes responsible for inhibiting responses, regulating behaviors, planning ahead, weighing risks and rewards, and simultaneously considering multiple sources of information (Steinberg et al., 2008). Only in the past decade have researchers emphasized the role of executive functioning (e.g., impulsivity, behavior regulation) in SIP (Metropolitan Area Child Study Research Group [MACS], 2002) and suggested that impulsivity (i.e., a lack of self-control or deficiencies in response inhibition) may negatively influence the ability to process social information (Lemerise & Arsenio, 2000). During social conflict, individuals who tend to exhibit strong emotional reactions might not consider alternative reactions. Evidence for this aggression-supporting cognitive style is relatively robust (Furlong & Smith, 1994). Yet, the extent to which executive functioning may predict SIP profiles and aggressive/violent behavior remains unclear.

Initial research suggested a potential linkage between 2nd and 5th graders' impulsivity and their ability to encode and use social cues to solve ambiguous social problems (Gronau & Waas, 1997). However, more recent literature is inconclusive. Limited research purports that, for highly impulsive individuals, aggressive behavior might not be impacted by SIP. In one study of urban and suburban 4th-6th graders, the effects of impulsivity on aggression were direct and not mediated by SIP (Musher-Eizenman et al., 2004). Another study of 18-30 year-olds documented an indirect relation between impulsivity and aggressive behavior, and speculated that aggressive SIP might mediate this relation (Hoaken, Shaughnessy, & Pihl, 2003). Similarly, research on 11-17 year olds provided evidence of impulsivity as a possible moderator of the SIP-aggressive behavior link (Fite, Goodnight, Bates, Dodge, & Pettit, 2008). Despite inconsistencies in the literature regarding the precise role of executive functioning in SIP, a growing body of research suggests that poor executive functioning and regulation is associated with aggressive SIP.

Current Study

Thus, little empirical work has examined factors influencing heterogeneity in children's social-cognitive processes. Such work has implications for both basic and applied research, as it may identify potential targets for clinical and preventive interventions to reduce aggressive behavior. The present study intends to address these gaps using data from a sample of urban school children over a year. Specifically, we examined profiles of SIP over one year and explored the extent to which certain factors (i.e., aggressive behavior, exposure to community violence, and executive functioning) influence children's stability in SIP class at two consecutive time points. We examined whether certain factors were related to *stability* or *change* in patterns of SIP using a person-centered latent transition analytic approach. This novel approach advances prior research, which has typically used variable-

centered approaches (e.g., structural equation modeling) to examine stability in SIP over time. Employing a person-centered latent variable approach enabled us to group individuals with similar profiles of SIP. Although variable-based approaches have provided a sound knowledge base, they may not fully capture qualitatively different profiles of SIP over time. Researchers have increasingly called for the use of person-centered approaches in studying social cognitions, in part because they allow one to model heterogeneity.

A major strength of person-centered analyses is the ability to identify whether different populations exist, remain, or change. As suggested by Sturge-Apple, Davies, and Cummings (2010, p. 1320), person-based or pattern-based approaches may “reveal qualitatively different profiles of study variables that are not anchored on a linear or continuous scale.” Accordingly, person-based approaches may advance understanding of different SIP typologies. This analytic approach is also uniquely appropriate for addressing the current research question regarding patterns of change in SIP over time.

Latent profile analysis (LPA; Lazarsfeld & Henry, 1968; Muthén & Muthén, 1998-2010) was used in this study to address the first aim, which was to identify patterns of SIP at two time points. LPA derives a categorical latent factor (i.e., pattern of SIP) from continuous manifest indicators of specific facets of SIP (e.g., hostile attribution bias, response generation, beliefs about aggression). LPA models heterogeneity in the data and groups participants who share a common pattern of responses into discrete latent classes (McCutcheon, 1987). Through an iterative process, we sequentially fit a number of categorical latent classes. Fit indices, theory, and substantive interpretation were used to select a best-fitting “final model” (Nylund, Asparouhov, & Muthén, 2007) whose classes comprise participants sharing a common SIP pattern. The LPAs were conducted on SIP indicators at each time point separately.

After the appropriate number of latent classes was decided upon in each year, latent transition analysis (LTA; Collins & Lanza, 2010; Nylund, 2007) was used. LTA derives the likelihood that an individual would remain in the same latent class across time. Transitional probabilities indicate the extent to which there is continuity (same group membership at both time points) or change (a shift in group membership) in SIP. The second aim was addressed by investigating whether the following factors relate to one's SIP style over time: (a) exposure to community violence, (b) aggression, and (c) executive functioning. We hypothesized that being characterized by a stable aggressive SIP profile would be associated with greater exposure to community violence, more aggressive behavior, and poor behavior regulation.

The present study advances the available research in several important ways, such as using person-centered approaches rather than the traditional variable-centered approaches to examine patterns of heterogeneity in SIP. Whereas previous research has assumed relative stability in SIP, the current study examined transitions in SIP styles over time among a sample of urban, predominantly African American children at elevated risk for involvement in violence (Cooley-Strickland et al., 2009). Ultimately, these findings have the potential to shed light on the underlying profiles, processes, and motivations for urban children's aggressive behavior.

Method

Participants

Participants were recruited from six urban public elementary schools located in three Baltimore, Maryland communities with low, moderate, and high levels of neighborhood crime. Inclusion criteria for students included full-time enrollment in one of six urban public elementary schools, 7-12 years of age, English fluency and an English-speaking parent/guardian. Of the 490 families who provided active written parental consent and child assent, 429 (87.6%) child interviews were conducted.

Participants were 429 children (53% female) between the ages of 7 and 13 years (M = 9.58, SD = 1.09), enrolled in urban public schools in Baltimore, Maryland. Participants were interviewed over a one-year period (year 1 data were collected during 2007 and year 2 data were collected during 2008). The sample was primarily African American (86%), 3% Caucasian, and 11% other ethnic groups (i.e., 2% Native American, 8% mixed/bi-racial, less than 1% Asian, and less than 1% Hispanic). At year 1, 2.8% of the sample was in the second grade, 35.2% in the third grade, 33.2% in the fourth grade, and 28.8% in the fifth grade. At year 1, 86.5% were eligible for free or reduced-cost meals (an indicator of low socioeconomic status).

Procedure

Data were collected from the 1st cohort of children participating in a larger project, which is described in greater detail in Cooley-Strickland et al. (2009). Participating families received a small honorarium. Trained interviewers conducted individual student interviews at the schools during school hours using a combined paper-pencil and computerized battery. Data were collected over one year using collection procedures approved by the Institutional Review Board at the researchers' institution and by the school district. See Cooley-Strickland et al. (2009) for additional details on the methods.

Measures

Social information processing (SIP)—The measure of SIP was based on Crick and Dodge's (1994) information processing sequence, which includes the following components: hostile attribution bias, aggressive response generation, and justification of aggressive responses to threat. The SIP measure was a modified version of the instrument developed for use with younger children by Dodge and Frame (1982). Minor wording changes made the vignettes more developmentally appropriate and allowed participants to generate their own responses (for details see Bradshaw et al., 2009). Participants were read four vignettes involving ambiguous peer behaviors (i.e., the peer is observed holding the participant's bag, uses the participant's pencil without permission, spills a drink on the participant, and hits the participant with a ball). Participants provide a brief statement describing their interpretation of the peer's intent (hostile attribution bias) and how they would respond (response generation).

Hostile attribution bias—This construct was measured by the degree of hostility that participants inferred regarding the peer's intent in the four vignettes, and was rated on a 7-

point scale. Responses across the four vignettes were averaged, with higher scores indicating greater support for an aggressive interpretation of the peer's intent (Year 1 α = .78; Year 2 α = .70) (see information on the coding of the vignettes below). Similarly, *aggressive response generation* was assessed by the degree of hostility in what participants reported as their likely response in each of the vignettes on a 7-point scale. Responses were averaged, with higher scores indicating greater support for an aggressive response (Year 1 α = .78; Year 2 α = .75).

Intent and responses from the SIP vignettes were coded following procedures outlined by Bradshaw et al. (2009). Each statement was entered verbatim into separate electronic databases. Three research assistants, unaware of the study hypotheses, were trained to independently rate the lists of the participants' intents and responses using a seven-point rating scheme (Dodge & Frame, 1982). Raters completed an intensive training session with the second author that included 10 practice examples to ensure 80% reliability. Next, each rater assigned low scores to positive intents, moderate scores to ambiguous intents, and high scores to aggressive intents.

For year 1, the correlations among the intent ratings assigned by the three coders ranged from $r = .94$ to $r = .96$, $ps < .001$. An intraclass correlation coefficient (ICCs) of .95 indicated a high level of agreement. The three ratings (one by each coder) were averaged to yield one score per item. The same 1 (*positive*) to 7 (*aggressive*) rating scheme was used to rate the responses. For year 1, the correlations among the response ratings assigned by the three coders ranged from $r = .91$ to $r = .93$, $ps < .001$. An ICC of .91 also showed a high level of agreement. All three ratings were again averaged to yield one score per vignette. Intent and response scores across all four vignettes were averaged, yielding one score for hostile attribution bias and one for response generation, respectively. Identical coding procedures were used to code the year 2 data and resulted in a similarly high level of agreement among coders (i.e., intent correlations ranged from $r = .81$ to $r = .89$, $ps < .001$ with an ICC = .94, and response correlations ranged from .85 to .90, $ps < .001$, with an ICC = .95).

Justification of aggression—Justification of aggression is a critical element of Crick and Dodge's SIP model as it assesses the cognitions associated with normative beliefs about the use of violence. Justification of aggression is often characterized as the ‘database’ of prior experiences and perceived norms related to aggressive retaliation, which influences the on-line processing activities. It also plays a central role in Huesmann's (1998) information processing model. In both SIP models, beliefs influence the perception of situations and selection of responses to ambiguous and potentially aggressive situations. It was assessed in the current study using a five-item scale regarding the perceived legitimization or appropriateness of aggressive responses to threat (Huesmann, Guerra, Miller, & Zelli, 1992). Participants rated on a 4-point scale the degree to which they agreed with the statements (e.g., *It is okay for me to hit someone if they hit me first* and *If people do something to make me really mad, they deserve to be beaten up)*, with higher scores condoning aggressive behavior (Year 1 α = .85; Year 2 α = .85).

Aggressive behavior—The aggression subscale from the Youth Self-Report (YSR; Achenbach, 1991) was used to assess aggressive behavior. The YSR is a widely used self-rating measure of competencies, internalizing, and externalizing problems that parallel the Child Behavior Checklist (CBCL; Achenbach, 1991). The YSR was normed on a large sample of youth of various ethnicities and socioeconomic levels. Prior research by Achenbach (1991) indicates that the test-retest reliabilities range from .47 to .79, and internal consistencies ranged from .71 to .95. Participants responded to items from the YSR scale assessing physical aggression (e.g., I argue a lot, I am mean to others, I threaten to hurt people) using a 3-point scale from 'not true' to 'very true or often true' (Year 1 α = .83; Year 2 α = .80).

Exposure to chronic community violence—The Children's Report of Exposure to Violence (CREV; Cooley, Turner, & Beidel, 1995) was used to assess children's lifetime exposure to community violence. The CREV focuses on deliberate acts intended to cause physical harm to a person in the community (e.g., being chased or threatened, beaten up, robbed or mugged, shot, stabbed, or killed). The original CREV exhibited good test-retest reliability over a two-week period (r = .75), internal consistency (α = .78), and construct validity (Cooley et al., 1995). Lifetime exposure (i.e., a mean composite score based on the frequency of violent incidents one was ever exposed to) was assessed at year 1 (α = .88). Additionally, past year exposure to community violence was assessed at both year 1 (α = . 89) and year 2 (α = .90).

Executive functioning—Executive functioning was measured at year 2 using the self-report scale the Behavior Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000). The BRIEF, developed and normed on children (aged 5-8), was designed to assess behavioral manifestations of executive control functions. The BRIEF was added to the project assessment battery at year 2. Therefore, executive functioning data were not available at baseline. The composite behavioral regulation index (BRI), inhibit, shift, and emotion control subdomains of executive functioning are related to impulsivity and hyperactivity and were used in the current study. Higher scores on the BRI index indicate problems in metacognitive problem solving. The inhibit subscale assesses difficulty in "putting the brakes" on behavior and acting without thinking (e.g., *I get out of control more than my friends; I don't think of consequences before acting*). The shift subscale focuses on getting upset by a change of plans and getting stuck on a topic or tending to perseverate (e.g., *I get disturbed by an unexpected change [such as teacher daily activity]; I have trouble thinking of a different way to solve a problem when I get stuck*). The emotion control subscale measures being easily upset, explosive, and having small events trigger big emotional responses (e.g., *I have angry outbursts; I overreact to small problems*). The original BRIEF indices evinced adequate reliability (alphas ranged from .80-.98). BRI subdomains (i.e., inhibit, shift, and emotion control) in this study evinced adequate reliability (alphas ranged from .79 to .84), as did the BRIEF BRI index (α = .92).

Data Analyses

A series of descriptive analyses were conducted (i.e., means, standard deviations, ranges and correlations for key study variables) in SPSS. To identify patterns of SIP, latent profile

analyses (LPA; McCutcheon, 1987) were conducted in M*plus* 6.0 (Muthén & Muthén, 1998-2010) for SIP year 1 and year 2. The latent profile analysis was used to identify individuals who had similar levels or patterns of responses on the three SIP indicator variables: hostile attribution bias, response generation, and justification of aggression.

Different solutions were tested iteratively (i.e., 1, 2, 3 etc. latent profiles) and the best fitting solution was determined by comparative model fit. Because there are no definitive tests of the "true" number of classes (Nylund et al., 2007), selection of the model requires consideration of substantive theory as well as statistical support. Five indices of model fit were computed: Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), Sample Size Adjusted Bayesian Information Criterion (SSA BIC), Lo-Mendell-Rubin adjusted likelihood ratio test (LMR-LRT), and the sample size-adjusted LMR (SSA LMR) (Muthén & Muthén, 1998-2010).

Models with the lowest AIC, BIC, and SSA BIC values, or the point at which these indices began to level off (as shown in a scree plot), as considered the best fitting models (Muthén, 2004). The LMR-LRT compares the estimated model to a model with one less class (*k*-1). Thus, a non-significant *p*-value suggests that the additional class does not result in a significant improvement in fit. For models with the same or similar levels of goodness of fit, the more parsimonious model is favored. In addition to model fit parameters, entropy, an index of classification accuracy (Ramaswamy, DeSarbo, Reibstein, & Robinson, 1993), and posterior probability of latent class assignment were also referenced. Higher entropy (values closer to 1) (Ramaswamy et al., 1993) and higher average posterior probabilities (> .70) within each class indicate greater confidence in class assignment (Nagin, 2005).

The measurement model that provided the best fit to the data was selected for each time point. Next, latent transition analysis (LTA; Nylund, 2007) of SIP was conducted. LTA, a type of longitudinal analysis that examines change in latent classes over time, was used to investigate change and continuity in children's SIP over the one-year study period. LTA builds upon latent profile analysis (LPA) and autoregressive modeling, particularly Markov models. After identifying the best latent class solution in LPA modeling, latent class membership at time 2 was regressed on latent class membership at time 1. Transitional probabilities indicated the extent to which there was continuity or change in SIP from year 1 to year 2. As the main aim of the study was to assess how continuity and change in SIP related to key factors, multinomial logistic regression was used to compare individuals who shifted latent classes (over the year) to those who remained stable. A series of multinomial logistic regressions were used to test whether: (a) exposure to community violence, (b) aggressive behavior, and (c) executive functioning (i.e., behavior regulation), respectively, were related to (in)stability in one's SIP style over time.

Results

Descriptive Analyses

Results of descriptive analyses for key study variables are presented in Table 1. There is a significant correlation between each of the components of SIP over time: Hostile attribution bias ($r = .42$, $p < .001$), response generation ($r = .36$, $p < .001$), and justification of

aggression (r = .27, p < .001). Exposure to community violence measured at year 1 was positively and significantly associated with exposure at year 2 (r = .50, p < .001). Similarly, children's self-reported aggression was correlated over time (r = .38, p < .001). Gender was not significantly associated with many of the study variables, although Year 2 justification of aggression, and lifetime and community violence exposure were exceptions. As such, latent variable analyses were conducted on the full sample of boys and girls.

Identifying Distinct Patterns of SIP at Year 1 and Year 2

To address our first study aim, determining if there was heterogeneity in SIP over time, LPA was used to assess whether unique SIP profiles emerged among children (see Table 2). Although the LMR-LRT indicated that the 4-class solution provided the best fit to the data, the introduction of new classes did not add any unique information (e.g., just variations on the same pattern, no new theoretically meaningful group) to the more parsimonious two-class solution. As reported in Table 2, a two-group solution (class 1 n = 146, class 2 n = 272) provided the most parsimonious fit to the data for year one SIP. The decision to select a two-group solution was supported by several fit statistics (e.g., BIC, SSA BIC, and LMR-LRT). Entropy (.88) and posterior probabilities (class 1 = 0.95, class 2 = 0.97) indicated that individuals were well matched to a class in the two-class solution. Specifically, class 1 was high on hostile attribution bias and aggressive response generation and relatively low on justification of aggression; class 2 was lower across all three facets of SIP.

At year 2, fit statistics indicated that a two-group solution provided the best fit to the data (class 1 n = 144, class 2 n = 192; see Table 2). Average posterior probabilities were also high (class 1 = 0.93, class 2 = 0.95). Based on LPA, it appeared that there was some heterogeneity (albeit only two groups) in the individuals' SIP. At both year 1 and year 2, latent classes were similar. High levels of hostile attribution bias, aggressive response generation, and relatively lower levels of justification of aggression characterized latent class 1. Lower levels of these SIP aspects characterized latent class 2.

Patterns of Change or Stability in SIP over Time

First, each of the components of SIP year 1 and SIP year 2 (i.e., hostile attribution bias, response generation, justification of aggression) were entered into a latent transition framework in M*plus* for a total of six variables. Because two latent classes were derived at each time point, a total of four latent transition patterns were possible: (1) a stable high SIP latent class; (2) a stable low SIP latent class; (3) a group of children who were low in aggressive SIP at year 1 but shifted to high aggressive SIP at year 2; and (4) a group of children who were high in aggressive SIP at year 1 but shifted to low aggressive SIP at year 2 (model fit: LL = -2582.26, df = 27, BIC = 5328.23, SSABIC = 5242.55, entropy = .76). In general, there was continuity over time in SIP, with most children exhibiting stable high aggressive or stable low aggressive SIP profiles. Among children in the high aggressive SIP class in year 1, 61% remained in this high aggressive SIP class in year 2. Specifically, as the largest class, class 4 (46.2%, n = 199, posterior probability [pp] = 0.89) represented the stable high (HIGH) group. As SIP scores ranging from 2.41 to 5.30 this class shall be referred to as the HIGH SIP class. The latent transition probability based on the estimated model for the stable HIGH SIP class was 0.61. Of children in the low SIP class in year 1,

62% remained classified by the low SIP class in year 2. That is, 24% of individuals (n = 103) remained stable and low (LOW) in their SIP over time (scores ranged from 2.07 to 3.40). As such, this class will be called the LOW SIP class. The posterior probability for the LOW class was high (0.84) suggesting accurate classification of individuals.

However, some children transitioned from less aggressive SIP profiles to more aggressive ones and vice versa. Among children in the low aggressive SIP class in year 1, 38% shifted to membership in the high aggressive SIP class in year 2. In particular, 8.2% of children (n = 35, pp = 0.90) were represented by an increase (INC) in SIP, becoming more hostile in one's attributions, generating more aggressive responses, and feeling more justified in one's aggression. Among children in the INC SIP class, SIP scores ranged from 2.09 to 5.17. On average, scores across the three SIP components increased by 1.48 units (difference between time 1 and time 2 hostile attribution bias = 2.26, response generation = 1.87, justification of aggression = 0.33).

Alternately, of children in the high aggressive SIP class in year 1, 39% shifted to membership in the low aggressive SIP class in year 2. Characterized as the inverse of the INC class, 21.7% of children (n = 93, posterior probability = 0.78) reported a decrease (DEC) in SIP over time. For children in the DEC SIP class, scores on SIP ranged from 2.11 to 4.85, with average scores across the three SIP components decreasing by 0.83 units (difference between time 1 and time 2 hostile attribution bias = 1.15, response generation = 1.14, justification of aggression = 0.19).

The next step examined whether the four SIP profiles differed by demographic information. While there were no significant differences between the four SIP profiles by gender or race, significant differences emerged by age and grade level. ANOVAs indicated significant differences in SIP groups by age (F = 4.18, p = .01). Specifically, children characterized by an INC SIP (M_{age} = 9.00, SD = 1.06, range 7, 11) profile were significantly younger than children in either the LOW (M_{age} = 9.61, SD = 1.17, range 8, 12) or HIGH (M_{age} = 9.69, SD = 1.05, range 8, 13) SIP groups (p's < .05 and = .01, respectively). Additionally, children characterized by an INC SIP profile tended to be in lower grades (M_{grade} = 3.40, SD = .74, range 2, 5) than children in either the LOW (M_{grade} = 3.91, SD = .84, range 2, 5) or HIGH (M_{grade} = 3.96, SD = .81, range 2, 5) SIP classes (p's < .05 and = .01, respectively).

Factors Related to Change in SIP Styles over Time

The test of our second aim involved examining how exposure to community violence, aggression, and executive functioning accounted for continuity and change in SIP profiles over the one-year study period. LTA SIP group was modeled as the outcome variable in a series of multinomial logistic regressions. Individuals were assigned to one of four groups based on their most likely LTA membership. The stable HIGH SIP group was used as the reference because it was the largest of the four classes. Then, in separate models, the associations between the SIP profile over time and three factors were examined. Exposure to community violence included lifetime exposure, exposure in the year prior to assessment 1, and between year 1 and year 2 assessments. Aggressive behavior was measured twice (i.e., aggressive behavior in the year prior to assessment 1 and aggressive behavior between year 1 and year 2 assessments). Lastly, executive functioning was assessed at year 2.

Table 3 presents the results of how exposure to community violence was associated with different patterns of continuity and change in SIP profiles over time. Children characterized by the stable HIGH SIP pattern reported significantly greater exposure to community violence, both in their lifetime and in the year prior to the first assessment, compared to children in the INC or DEC SIP classes. There was no significant difference between the HIGH and LOW classes in lifetime exposure and exposure in the year prior to the first assessment. Moreover, children who declined in SIP reported significantly lower levels of exposure to community violence between the year 1 and year 2 assessments compared to individuals who remained in the high SIP class (B = -0.04, OR = 0.96, CI = 0.93, 0.99, $p < .01$). In contrast, there was no difference between children in the HIGH, INC, and LOW SIP groups in level of exposure to community violence between year 1 and year 2.

To further probe for differences in community violence exposure, a difference score was created (i.e., year 2 mean score for exposure minus year 1) and used as a predictor of SIP profile in a post-hoc multinomial logistic regression. Interestingly, while children in the INC SIP class reported the greatest increase in community violence exposure from year 1 to year 2 (M = 3.63 unit increase), this increase was not significantly different from their peers (LOW [M = 2.22], DEC [M = 1.44], and HIGH classes [M = 2.02]). Nonetheless, based on results from the planned multinomial logistic regression, children in the HIGH class were exposed to the most violence, overall, in their community. This suggests that chronic exposure to community violence may relate to stable aggressive SIP profiles over time.

Next, we examined how aggressive behavior in the year prior to the first assessment and in the year between assessments were linked to continuity and change in SIP. Individuals in the HIGH SIP class were more likely to self-report aggressive behavior at year 2 than were children in any of the other SIP classes (see Table 3). This pattern of findings did not remain significant for year 1 reports of aggression (HIGH > LOW, INC but only at the trend level). Similar to the procedure described for testing differences in community violence exposure, we further probed for differences between time 1 and time 2 aggression. Difference scores were created (year 2 mean score for aggression minus year 1) and entered as a predictor of SIP profile status in a post-hoc multinomial logistic regression. All children reported an increase in aggression, with the most marked increase for children in the HIGH class (M = 4.44) followed by children in the INC class (M = 3.29). Post-hoc multinomial logistic regression suggested that an increase in aggression from was related to membership in the stable HIGH SIP profile more than membership in the LOW SIP or DEC SIP profiles (B = -.10, SE = 0.046, p = .01).

We also examined the association between profiles of SIP over time with executive functioning. The analyses indicated that children in the HIGH SIP class exhibited poorer executive functioning (i.e., measured by inhibit, shift, and emotional control subdomains) than did children in the DEC SIP class (see Table 3). However, there was no significant difference between children in the HIGH or INC SIP classes.

Lastly, because SIP variables may become more crystallized with age we conducted additional, post-hoc multinomial logistic regression analyses to explore the possible influences of age on the pattern of findings. We stratified the sample into early elementary

(i.e., 2nd and 3rd graders; $n = 162$) versus later elementary schoolers (i.e., 4th and 5th graders; $n = 267$). For early elementary school students, all analyses yielded non-significant differences in the three outcomes by SIP class with the exception of year 1 aggression (HIGH > DEC, $p = .05$). The pattern of findings for the later elementary school students was similar to those from our aggregated sample. Although there was no significant difference between children in the HIGH and INC SIP classes in aggression (years 1 and 2; $p = .07$), there was a trend that children in the HIGH SIP class exhibited poorer executive functioning than children in the LOW SIP class.

Discussion

The present findings extend prior literature by using LTA to identify profiles of stability or change in SIP over a one-year period. Results advance the literature by examining the extent to which exposure to community violence, aggression, and executive functioning relate to variability in SIP profiles. A person-centered latent variable procedure was used (LPA, LTA) enabling the grouping of participants with similar SIP profiles. Compared to traditional variable-centered approaches that take a dimensional course to examining a set of predictors, person-centered approaches enable researchers to model heterogeneity in the population (Molenaar & Campbell, 2009).

These findings illustrated a robust profile of SIP over time. Using the latent transition framework, a mixture solution was derived independently for each age. Regardless of the number of time points, each latent profile solution was estimated independent of other solutions at other time points. Increasing number of time points would have no bearing on the robustness of the model. Nevertheless, two very similar profiles were independently derived at both time points. The similarity in the patterns observed at the two time points suggests that the latent classes derived represent true heterogeneity in SIP within the sample.

The LTAs suggested that the two largest classes were comprised of children who remained stable in SIP over the one-year period (46% stable high and 24% stable low). This finding of stability among nearly 70% of the urban school children is in accord with prior longitudinal research suggesting that SIP may be relatively stable for most individuals by late childhood (Dodge, Laird, Lochman, & Zelli, 2002). However, just under one-third of the children exhibited a change in their SIP profiles, with more displaying a decreasing pattern (21.7%) than an increasing pattern (8.2%). How urban children process social information may not be immutable and may be contextually related. Even without the benefit of preventive interventions, environmental and constitutional factors may be related to shifts in SIP profiles.

Of particular interest was the relatively small, possibly vulnerable group of children who displayed an INC SIP pattern. An increase in exposure to community violence coupled with aggression and poor behavior regulation suggests that these increasingly aggressive SIP children may fare poorly in adolescence and young adulthood, similar to their stable HIGH SIP counterparts. Specifically, they may have an increased potential for engaging aggressive behavior in the future as a result of their increasingly hostile and aggressive SIP, which may be compounded by poor behavior regulation. Compared to highly aggressive SIP children,

the increasingly aggressive SIP children moved from having significantly less exposure to community violence (lifetime, year 1) to levels that were comparable to the high aggressive SIP children. Although we are cautious in interpreting this finding, it is appears that the community violence exposure may in turn have been associated with an increase in the level of aggressive SIP. This finding suggests that a violent environmental context may adversely affect a subset of urban children, even over a relatively short period of time. This may translate into further impairment in executive functioning and more aggressive behavior.

Nearly half of the community-based sample were identified as consistently high in aggressive SIP. These urban children were exposed to more community violence, were more aggressive, and had poorer executive functioning. This pattern of findings suggests a potentially cumulative effect on SIP, perhaps by reinforcing the perceptions, cognitions, and worldviews of children who are highly aggressive in their SIP style. One factor that may influence the way in which children act on these perceptions and cognitions is how they regulate their behavior. The finding that children with the stable HIGH SIP profile exhibited more executive functioning deficits than did the DEC SIP children also suggests that better behavior regulation may be a mechanism underlying less hostile, less aggressive SIP. Prevention and intervention efforts for urban children should include the key component of metacognitive problem solving.

There were inconsistent findings for stable high and low SIP groups regarding exposure to community violence and behavioral regulation. Although it is difficult to draw firm conclusions, different factors may be more relevant for different SIP profiles. Children in the stable low SIP group may maintain low levels of aggression, relative to their peers, which may help them maintain a chronically low aggression profiles. These children's beliefs and behaviors may be robust, despite exposure to community violence and poor behavior regulation. They may have a wider repertoire of coping behaviors that help buffer them from becoming aggressive.

Intuitively, it would seem that compared to the stable high SIP group, the stable low group should have been exposed to less community violence and have better regulatory capacities. The lack of these distinctions suggests that other protective factors may be at play. The stable low SIP group may be characterized by higher levels of empathy, which may serve as a buffer against aggressive SIP. Another possibility is that the stable low SIP group may exhibit relatively higher IQ scores than their peers, which could reduce one's bias when processing social information. We are, however, cautious in our interpretation of these null findings.

Another interesting finding is the relatively limited variation in the justification of aggression measure both across children and time. This suggests that there may be more stability in mean-level, normative beliefs about aggression relative to the other components of SIP. This finding is consistent with Huesmann and Guerra's (1997) results documenting stability in children's normative beliefs about aggression by fourth grade. As our sample included fifth graders (and older children), relative stability in the participants' perceived justification of aggression is possible. This may especially be the case within an urban environmental context that generally supports a culture of violence (Bradshaw & Garbarino,

2004). Nevertheless, the normative beliefs about aggression are an important element of the SIP model, which are closely coupled with the on-line processing aspects of the social-cognitive model (Huesmann, 1998).

Limitations

It is important to consider some limitations when interpreting these findings. For example, only two data points were examined. Future research should examine several years of SIP to obtain a more dynamic understanding of heterogeneity in SIP processes over time. Additionally, we did not test for the important relation between SIP predicting patterns in the development of exposure to community violence, aggression, and executive functioning. Future research should include concurrent, longitudinal measures of these constructs in order to allow for a dynamic investigation of transactional relations. This approach would allow for auto-regressive, cross-lagged analyses that would elucidate the causal processes underlying SIP and aggressive behavior, community violence, and behavioral regulation.

We had insufficient numbers of children at each age range to test for developmental differences (e.g., stratify the LTA analyses by age) in SIP patterns over time. Similar to the approach taken by Davis-Kean, Huesmann, Jager, and Collins (2008), we conducted the analyses on the combined sample of students in grades 2-5. A related issue was that slightly younger children were more likely to display an INC SIP profile. However, this age difference was not particularly developmentally meaningful (e.g., the age differences ranged from .61 to .69 years, on average the age disparity was .65 years). Although there were some differences in class membership by age and/or grade, the results of the regression analyses that included these variables as covariates were very similar to the unadjusted analyses.

Furthermore, our post-hoc analyses on the age-stratified sample to explore developmental stage (early vs. later elementary school students) yielded a relatively similar pattern of results to those from our aggregated analyses. However, this was only the case for later elementary school children. We are cautious in our interpretation of the non-significant findings for early elementary school children. The effects are likely attenuated due to the small cell sizes after splitting our sample by SIP group and developmental stage. As such, we must exercise caution in interpreting these null findings as an actual developmental difference in factors associated with SIP groups. Similarly, the two distinct findings that emerged for later elementary school students (i.e., non-significant differences between children in the HIGH and INC SIP class in aggression; trend for poorer executive functioning HIGH > LOW SIP children) also warrant this caveat. Investigating developmental change in SIP profiles will be a critical direction for future work. In particular, nascent research has detected developmental changes in specific aspects of SIP (i.e., early steps such as attributions and later steps such as response evaluation and decision) (Davis-Kean et al., 2008). Researchers could employ LPA with a larger sample size and wider age distribution with a more nuanced measure of specific SIP steps.

A related issue is the developmental progression of executive function. Progression over time was unable to be examined because the BRIEF, the measure of executive function, was only introduced to the project at time 2. The ability to regulate impulses and emotional reactivity increases throughout early adolescence, and self-regulation undergoes rapid

changes beginning with the onset of puberty (Steinberg, 2008). The majority of studies on SIP and executive function have not controlled for pubertal status (e.g., pre-pubertal vs. pubertal), and the present study is no exception. It may be useful to examine other factors related to different subgroups of individuals typified by increasing, decreasing, or stable SIP, such as type of aggression (reactive vs. proactive), or the context of the exposure to violence (e.g., family, community, school).

A major limitation of the current study is the reliance on self-report data. The current findings may, nonetheless, be influenced by shared method variance. While all studies of SIP are self-report, self-reported aggression and community violence exposure may be complemented by data from other raters. Child-reports of aggression and violence may be more reliable than official records (Farrington, 2003) and tends to correlate with teacher-reports (Boxer, Edwards-Leeper, Goldstein, Musher-Eizenman, & Dubnow, 2003). Self-report is also well suited for assessing social cognitions (Crick & Dodge, 1994) and executive functioning (Steinberg, 2008), as children may be the most sensitive informants when reporting their internal thought processes. Research is needed to determine the extent to which these findings generalize to other sources of information regarding aggression, such as parent, peer, or teacher reports. Similarly, behavioral or neurocognitive assessments of executive functioning may further elucidate the role of behavioral inhibition and emotion regulation in instability of SIP profiles over time.

Finally, it will be useful to examine other factors—both risk and protective—associated with patterns of increasing, decreasing, or stable SIP. Both form (relational, physical) and function (reactive and proactive) of aggression might be examined. Similarly, delineating the form of violence exposure—indirect (witnessed violence) and direct (victimization)—will be important. Although the current study focused on risk factors as associative characteristics of SIP patterns over time, it will be important to consider how protective factors are related to the patterns, especially the DEC SIP group. For instance, as prosocial interactions with peers have been related to positive reappraisal coping in response to peer rejection experiences (Goodman & Southam-Gerow, 2010), prosocial experiences may help to build a “benign attribution bias.” Prosocial protective factors may also enhance positive emotions that broaden and build children's thought-action repertoires (e.g., promoting prosocial or non-aggressive responses to problems), thereby “undoing” the narrowing effects of anger (Fredrickson, 2001).

Implications for Research, Policy, and Practice

Taken together, these findings shed light on the interrelations between (in)stability in SIP profiles and key contextual and individual level factors. The results suggest that certain aspects of children's SIP profiles (e.g., attribution bias, response generation) may be malleable in late childhood, whereas others (e.g., justification of aggression) may be less so. These patterns may be functionally related to factors such as community violence exposure and executive functioning; more research on these domains is needed. Urban children with deficits in executive functioning and those exposed to high levels of neighborhood violence may present stable aggressive SIP styles. These children may require indicated preventive

interventions to alter their aggressive cognitions, such as Lochman and Wells' (2003) Coping Power program.

Ultimately, it will be important to identify intervention efforts that can effect change among children with stable high aggressive SIP profiles, and thus may be the most resistant to change. Understanding factors related to stability in aggressive SIP in the context of interventions will help to further address *for whom* and *under what conditions* interventions work (Guerra, Boxer, & Cook, 2006). For example, there was little variation in the justification of aggression both across time and across classes. While justification of aggression may not be driving shifts in SIP profiles, it is an important part of the SIP model (Huessman, 1998; Huesmann & Guerra, 1997). Further research is needed to better understand factors associated with changes in these beliefs over time and whether there are developmental periods associated with (in)stability in this particular component of SIP.

These findings, together with prior research (e.g., Huessman & Guerra, 1997), suggest that these beliefs may be somewhat stable by the fourth/fifth grade. These beliefs may be difficult to change, despite participation in preventive interventions targeting normative beliefs (Sullivan et al., 2008). That there was little variation in justification of aggression points to the need for early interventions that target these normative beliefs among younger children. Growing up in an environmental context with prevalent community violence contributes to urban children adopting similar notions of the acceptability of aggression (i.e., culture of violence) (Bradshaw & Garbarino, 2004). Thus, interventions should be sensitive to the unique needs of urban children.

Current findings indicate that children with increasingly aggressive SIP styles may be key targets for preventive interventions aiming to alter SIP styles (e.g., Lochman & Wells, 2003). Reductions in community violence exposure may also reduce their aggressive SIP profiles. For instance, the difference between HIGH and DEC SIP classes in regard to exposure to community violence suggests a potentially buffering effect of reductions in exposure to community violence. It may be the case that the children whose aggressive SIP profiles decreased also experienced a decline in the amount of community violence they experienced over the past year. Positive changes in one's community and social climate at various levels (e.g., peer dyads, family, classroom, school, neighborhood) may relate to less aggressive SIP profiles in a relatively short period of time. In turn, less aggressive SIP profiles could relate to reductions in aggression, and potentially reduce the risk for future exposure to community violence (Lambert, Bradshaw, Cammack, & Ialongo, in press).

Whether and how these types of prevention efforts could effect change among urban children characterized by stable high SIP profiles—who may be the most resistant to change—is an area warranting further research. Furthermore, additional research is needed to better understand the extent to which the impact of preventive interventions vary as a function of other risk factors, such as patterns of SIP, poor executive functioning, and history of aggressive behavior among urban youth.

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References

Achenbach, TM. Manual for the youth self-report and 1991 profile. Burlington, VT: University of Vermont, Department of Psychiatry; 1991.

Anderson CA, Dill KE. Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. Journal of Personality and Social Psychology. 2000; 78:772–790. [PubMed: 10794380]

Bandura, A. Aggression: A social learning analysis. Englewood Cliffs, NJ: Prentice Hall; 1973.

Boxer P, Edwards-Leeper L, Goldstein SE, Musher-Eizenman D, Dubow EF. Exposure to “low-level” aggression in school: Associations with aggressive behavior, future expectations, and perceived safety. Violence and Victims. 2003; 18:691–705. [PubMed: 15109121]

Bradshaw CP, Garbarino J. Social cognition as a mediator of the influence of family and community violence on adolescent development: Implications for intervention. New York Academy of Sciences. 2004; 1036:85–105.

Bradshaw CP, Rodgers CRR, Ghandour LA, Garbarino J. Social-cognitive mediators of the association between community violence exposure and aggressive behavior. School Psychology Quarterly. 2009; 24:199–210.

Burks VS, Laird RD, Dodge KA, Pettit GS, Bates JE. Knowledge structures, social information processing, and children's aggressive behavior. Social Development. 1999; 8:220–236. [PubMed: 20011226]

Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). 2010. Available from Centers for Disease Control Website, www.cdc.gov/injury

Collins, LM.; Lanza, ST. Latent class and latent transition analysis: With applications in the social, behavioral, and health sciences. Hoboken, NJ: John Wiley & Sons, Inc; 2010.

Cooley M, Turner SM, Beidel DC. Assessing community violence: The children's report of exposure to violence. Journal of the American Academy of Child and Adolescent Psychiatry. 1995; 34:201–208. [PubMed: 7896653]

Cooley-Strickland M, Quille TJ, Griffin RS, Stuart EA, Bradshaw CP, Furr-Holden D. Community violence and youth: Affect, behavior, substance use, and academics. Clinical Child Family Psychology Review. 2009; 12:127–156. [PubMed: 19472053]

Crick N, Dodge KA. A review and reformulation of social information-processing mechanisms in children's social adjustment. Psychological Bulletin. 1994; 115:74–101.

Davis-Kean PE, Huesmann LR, Jager J, Collins WA. Changes in the relation of self-efficacy beliefs and behaviors across development. Child Development. 2008; 79:1257–1269. [PubMed: 18826524]

Dodge KA, Frame CL. Social cognitive biases and deficits in aggressive boys. Child Development. 1982; 53:620–635. [PubMed: 7094675]

Dodge KA, Laird R, Lochman JE, Zelli A. Multidimensional latent-construct analysis of children's social information processing patterns: Correlations with aggressive behavior problems. Psychological Assessment. 2002; 14:60–73. [PubMed: 11911050]

Dodge KA, Pettit GS. A biopsychosocial model of the development of chronic conduct problems in adolescence. Developmental Psychology. 2003; 39:349–371. [PubMed: 12661890]

Farrington, DP. What has been learned from self-reports about criminal careers and the causes of offending? Report for the Home Office. London: Home Office; 2003.

Fite JE, Goodnight JA, Bates JE, Dodge KA, Pettit GS. Adolescent aggression and social cognition in the context of personality: Impulsivity as a moderator of predictions from social information processing. Aggressive Behavior. 2008; 34:511–520. [PubMed: 18459110]

Fontaine RG, Yang CM, Dodge KA, Pettit GS, Bates JE. Development of response evaluation and decision (RED) and antisocial behavior in childhood and adolescence. Developmental Psychology. 2009; 45:447–459. [PubMed: 19271830]

Fredrickson BL. The role of positive emotions in positive psychology. American Psychologist. 2001; 56:218–226. [PubMed: 11315248]

Furlong, M.; Smith, D. Anger, hostility, and aggression: Assessment, prevention, and intervention strategies for youth. Brandon, VT: Clinical Psychology Publishing; 1994.

Gioia, GA.; Isquith, PK.; Guy, SC.; Kenworthy, L. Behavior Rating Inventory of Executive Function: Professional Manual. Lutz, FL: Psychological Assessment; 2000.

Goodman K, Southam-Gerow MA. The regulating role of negative emotions in children's coping with peer rejection. Child Psychiatry and Human Development. 2010; 41:515–534. [PubMed: 20464475]

Granic I, Patterson GR. Toward a comprehensive model of antisocial development: A dynamic systems approach. Psychological Review. 2006; 113:101–131. [PubMed: 16478303]

Gronau RC, Waas GA. Delay of gratification and cue utilization: An examination of children's social information processing. Merrill-Palmer Quarterly: Journal of Developmental Psychology. 1997; 43:305–322.

Guerra NG, Boxer P, Cook CR. What works (and what does not) in youth violence prevention: Rethinking the questions and finding new answers. New Directions for Evaluation. 2006; 110:59–71.

Guerra NG, Huesmann LR, Spindler A. Community violence exposure, social cognition, and aggression among urban elementary school children. Child Development. 2003; 74:1561–1576. [PubMed: 14552414]

Hoaken PNS, Shaughnessy VK, Pihl RO. Executive cognitive functioning and aggression: Is it an issue of impulsivity? Aggressive Behavior. 2003; 29:15–30.

Huesmann, LR. The role of social information processing and cognitive schema in the acquisition and maintenance of habitual aggressive behavior. In: Geen, RG.; Donnerstein, E., editors. Human aggression: Theories, research, and implications for policy. San Diego, CA: Academic Press; 1998. p. 73-109.

Huesmann, LR.; Guerra, NG.; Miller, L.; Zelli, A. The role of social norms in the development of aggression. In: Zumkley, H.; Fraczek, A., editors. Socialization and aggression. New York: Springer; 1992. p. 139-151.

Kirsh SJ. Seeing the world through Mortal Kombat-colored glasses: Violence video games and the development of a short-term hostile attribution bias. Childhood. 1998; 5:177–184.

Lambert SF, Bradshaw CP, Cammack NL, Ialongo NS. Examining the developmental process of risk for exposure to community violence among urban youth. Journal of Prevention & Intervention in the Community. in press.

Landsford JE, Malone PS, Castellino DR, Dodge KA, Pettit GS, Bates JE. Trajectories of internalizing, externalizing, and grades for children who have and have not experienced their parents' divorce. Journal of Family Psychology. 2006; 20:292–301. [PubMed: 16756405]

Lazarsfeld, PF.; Henry, N. Latent Structure Analysis. Boston, MA: Houghton Mifflin; 1968.

Lemerise EA, Arsenio WF. An integrated model of emotion processes and cognition in social information processing. Child Development. 2000; 71:107–118. [PubMed: 10836564]

Lochman JE, Wells KC. Contextual social-cognitive mediators and child outcome: A test of the theoretical model in the Coping Power program. Development and Psychopathology. 2002; 14:945–967. [PubMed: 12549711]

Lochman JE, Wells KC. Effectiveness of the coping power program and of classroom intervention with aggressive children: Outcomes at a 1-year follow-up. Behavior Therapy. 2003; 34:493–515.

Metropolitan Area Child Study (MACS) Research Group. A cognitive-ecological approach to preventing aggression in urban settings: Initial outcomes for high-risk children. Journal of Consulting and Clinical Psychology. 2002; 70:179–194. [PubMed: 11860044]

McCutcheon, AL. Latent class analysis. Newbury Park, CA: Sage; 1987.

Molenaar PCM, Campbell CG. The new person-specific paradigm in psychology. Current Directions in Psychology. 2009; 18:112–117.

Musher-Eizenman DR, Boxer P, Danner S, Dubow EF, Goldstein SE, Heretick DML. Social-cognitive mediators of the relation of environmental and emotion regulation factors to children's aggression. Aggressive Behavior. 2004; 30:389–408.

Muthén, B. Latent variable analysis: Growth mixture modeling and related techniques for longitudinal data. In: Kaplan, D., editor. Handbook of quantitative methodology for the social sciences. Newbury Park, CA: Sage Publications; 2004. p. 345-368.

Muthén, LK.; Muthén, BO. Mplus User's Guide. 6th. Los Angeles, CA: Author; 1998-2010.

Nagin, DS. Group-based Modeling of Development. Cambridge, MA: Harvard University Press; 2005.

Nylund, K. Unpublished doctoral dissertation. University of California; Los Angeles: 2007. Latent transition analysis: Modeling extensions and an application to peer victimization.

Nylund KL, Asparouhov T, Muthén B. Deciding on the number of classes in latent class analysis and growth mixture modeling. A Monte Carlo simulation study. Structural Equation Modeling. 2007; 14:535–569.

Perry DG, Perry LC, Rasmussen P. Cognitive social learning mediators of aggression. Child Development. 1986; 57:700–711. [PubMed: 3720399]

Ramaswamy V, DeSarbo W, Reibstein D, Robinson W. An empirical pooling approach for estimating marketing mix elasticities with PIMS data. Marketing Science. 1993; 12:103–124.

Steinberg L. A social neuroscience perspective on adolescent risk-taking. Developmental Review. 2008; 28:78–106. [PubMed: 18509515]

Steinberg L, Albert D, Cauffman E, Banich M, Graham S, Woolard J. Age differences in sensation seeking and impulsivity as indexed by behavior and self-report: Evidence for a dual systems model. Developmental Psychology. 2008; 44:1764–1778. [PubMed: 18999337]

Sturge-Apple ML, Davies PT, Cummings EM. Typologies of family functioning and children's adjustment during the early school years. Child Development. 2010; 81:1320–1335. [PubMed: 20636698]

Sullivan TN, Farrell AD, Bettencourt AF, Helms SW. Core competencies and the prevention of youth violence. New Directions for Child and Adolescent Development. 2008; 122:33–46. [PubMed: 19021245]

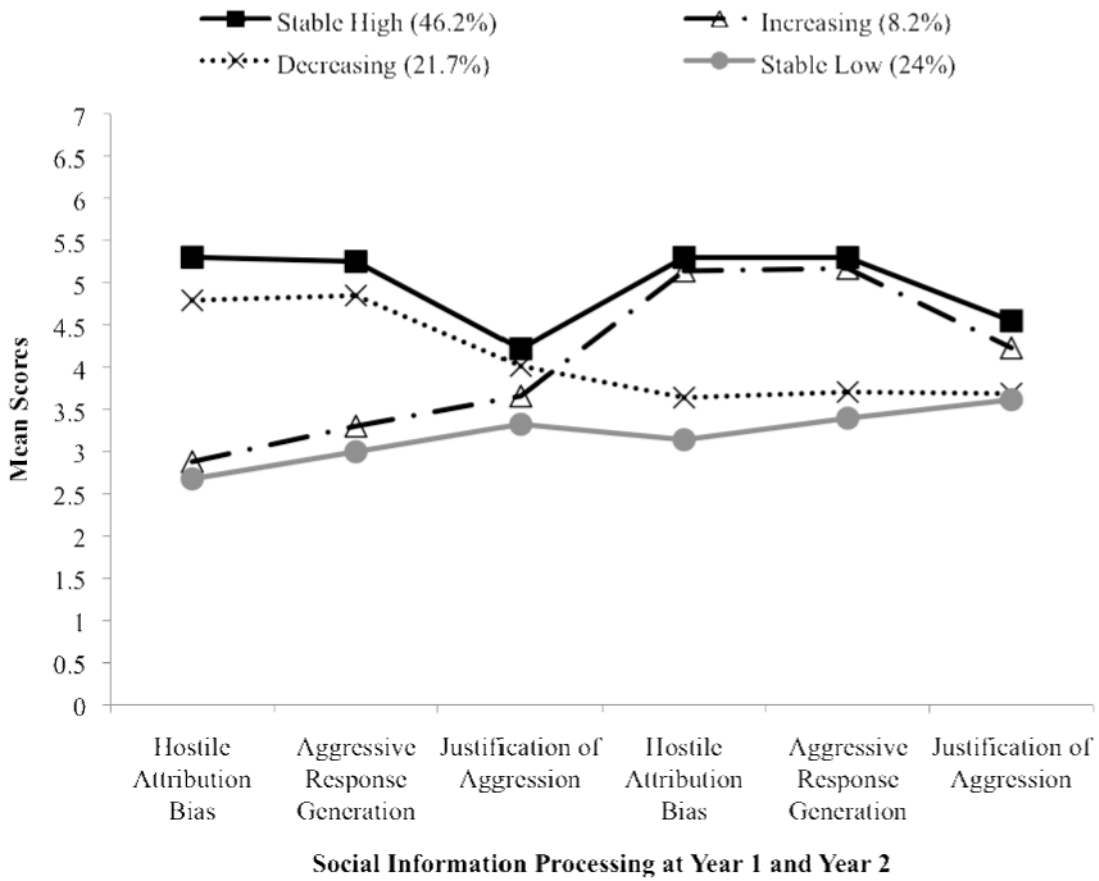

Figure 1.

Latent Transition Analysis of Social Information Processing Profiles Over a One-Year Study Period.

Note. The three subscales comprising the social information processing profile at year 1 and year 2 are listed along the x-axis. The mean scores for each of the subscales are provided by class membership. The mean scores on the justification of aggression measure were rescaled on the figure (only) for ease of visual interpretation.

Table 1

Means, Standard Deviations, Ranges, and Correlations for Study Variables

	M (SD)	Range	2	3	4	5	6	7	8	9	10	11	12	Male
Social information processing														
1. HAB Y1	4.38 (1.28)	(1.50, 6.58)	0.71 ***	0.26 ***	**0.42** ***	0.35 ***	0.19 ***	0.09^{t}	0.09^{t}	0.13 *	0.10 *	0.13 *	0.05	-0.07
2. RG Y1	4.51 (1.18)	(1.33, 7.00)	-	0.34 ***	0.27 ***	**0.36** ***	0.22 ***	0.11 *	0.09^{t}	0.13 *	0.22 ***	0.19 ***	0.03	-0.02
3. JA Y1	2.28 (0.48)	(1.00, 3.60)		-	0.11 *	0.19 **	**0.27** ***	0.12 **	0.07	0.05	0.27 ***	0.18 ***	0.02	0.09
4. HAB Y2	4.36 (1.13)	(1.75, 6.58)			-	0.69 ***	0.23 ***	0.04	0.10^{t}	0.10^{t}	-0.02	0.10	0.09	-0.05
5. RG Y2	4.44 (1.13)	(1.25, 7.00)				-	0.41 ***	0.07	0.01	0.17 **	0.09	0.28 ***	0.24 ***	-0.02
6. JA Y2	2.27 (0.50)	(1.00, 4.00)					-	0.10^{t}	0.11^{t}	0.23 ***	0.18 ***	0.35 ***	0.31 ***	0.12 *
Exposure to Community Violence														
7. Lifetime	22.58 (11.54)	(0.00, 51.00)						-	0.91 ***	0.50 ***	0.27 ***	0.29 ***	0.24 ***	0.11 *
8. Past Year Y1	18.13 (11.17)	(0.00, 47.00)							-	**0.50** ***	0.20 ***	0.25 ***	0.25 ***	0.08
9. Past Year Y2	19.96 (11.14)	(0.00, 49.00)								-	0.16 ***	0.45 ***	0.40 ***	0.12 *
Aggressive Behavior														
10. YSR Y1	1.41 (1.95)	(0.00, 14.00)									-	**0.38** ***	0.12 *	0.03
11. YSR Y2	5.03 (4.76)	(0.00, 28.00)										-	0.57 ***	-0.03
Executive Functioning														
12. BR	55.96 (14.29)	(12.00, 94.00)											-	-0.03

Note: Bold indicates correlations over time. Y1 = year 1, Y2 = year 2, HAB = Hostile Attribution Bias, RG = Response Generation, JA = Justification of Aggression, YSR = Youth Self Report, BR = Behavior Regulation. Male is participant's gender, which was dummy coded 0 = girl, 1 = boy.

^{t} = .06,

* p<.05,

** p<.01,

*** p<.001

Table 2

Social Information Processing Latent Profile Analyses for Year One and Year Two

Number of classes	Log likelihood	BIC	SSABIC	Entropy	LMR-LRT	Class size (%)
SIP Time 1 LPA						
1 class	-1641.100	3318.413	3299.373	-	-	Class1 n=418
2 classes	**-1453.320**	**2967.418**	**2935.686**	**0.875**	**0.000**	**Class1=35**
						Class2=65
3 classes	-1426.025	2936.547	2892.121	0.798	0.001	Class1=43
						Class2=27
						Class3=30
4 classes	-1406.645	2921.928	2864.809	0.853	0.003	Class1=16
						Class2=36
						Class3=28
						Class4=20
5 classes	-1397.920	2928.620	2858.808	0.832	0.0766	Class1=19
						Class2=16
						Class3=6
						Class4=24
						Class5=35
SIP Time 2 LPA						
1 class	-1278.777	2569.554	2573.424	-	-	Class1 n=336
2 classes	**-1163.922**	**2386.015**	**2354.294**	**0.784**	**0.000**	**Class1=43**
						Class2=57
3 classes	-1133.853	2349.706	2304.735	0.774	0.376	Class1=18
						Class2=45
						Class3=37
4 classes	-1117.339	2339.386	2282.288	0.717	0.832	Class1=31
						Class2=20
						Class3=33
						Class4=16

Note. Bayesian Information Criterion (BIC), Sample Size Adjusted Bayesian Information Criterion (SSABIC), Akaike Information Criterion (AIC), and the Lo-Mendell-Rubin adjusted likelihood ratio test p-value (LMR-LRT; Lo, Mendell, & Rubin, 2001). Bolded model indicates best fitting model.

Table 3

Relation between Exposure to Community Violence and SIP Class Membership

	M (SD)	B	Std. Error	df	Exp(B)	CI	Planned Comparisons
Lifetime Exposure to Community Violence							HIGH > INC, DEC
Stable Low SIP (LOW)	22.31 (10.36)	-0.014	0.011	1	0.986	0.965 – 1.007	
Increasing SIP (INC)	18.14 (9.31)	-0.051**	0.018	1	0.950	0.917 – 0.985	
Decreasing SIP (DEC)	21.18 (12.05)	-0.023*	0.012	1	0.977	0.955 – 0.999	
Stable High SIP (HIGH)	24.24 (12.02)						
Past Year Exposure to Community Violence (Y1)							HIGH > INC, DEC
LOW	17.62 (9.92)	-0.018	0.011	1	0.982	0.961 – 1.004	
INC	15.14 (9.55)	-0.041*	0.018	1	0.960	0.926 – 0.995	
DEC	16.24 (11.30)	-0.030**	0.012	1	0.970	0.948 – 0.994	
HIGH	19.87 (11.82)						
Past Year Exposure to Community Violence (Y2)							HIGH > DEC
LOW	19.00 (9.28)	-0.025*t*	0.013	1	0.976	0.950 – 1.002	
INC	18.77 (12.02)	-0.027	0.018	1	0.974	0.941 – 1.008	
DEC	17.17 (10.13)	-0.042**	0.014	1	0.959	0.933 – 0.986	
HIGH	22.04 (11.89)						

Note. Stable High is the reference group.

t = .07,

* $p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$.

Table 4

Relation between Aggression (top) and Behavioral Regulation (bottom) and SIP Class Membership

	M(SD)	B	Std. Error	df	Exp(B)	CI	Planned Comparisons
Past Year Aggression Year (Y1)							HIGH > all groups
Stable Low SIP (LOW)	1.17 (1.53)	-0.130^{t}	0.070	1	0.878	0.765 – 1.007	
Increasing SIP (INC)	0.97 (1.27)	-0.216^{t}	0.127	1	0.806	0.629 – 1.033	
Decreasing SIP (DEC)	1.38 (2.06)	-0.062	0.066	1	0.940	0.826 – 1.069	
Stable High SIP (HIGH)	1.63 (2.16)						
Past Year Aggression (Y2)							HIGH > all groups
LOW	3.79 (3.24)	-0.119***	0.037	1	0.888	0.826 – 0.954	
INC	4.26 (2.30)	-0.088*	0.045	1	0.916	0.830 – 1.000	
DEC	4.22 (4.27)	-0.090**	0.033	1	0.914	0.857 – 0.975	
HIGH	6.18 (5.37)						
Behavioral Regulation							HIGH > DEC
LOW	56.14 (12.22)	-0.013	0.011	1	0.987	0.967 – 1.008	
INC	54.51 (14.68)	-0.021	0.013	1	0.979	0.954 – 1.005	
DEC	51.30 (14.80)	-0.036***	0.010	1	0.964	0.945 – 0.984	
HIGH	58.53 (14.32)						

Note. Stable High is the reference group. Higher scores on aggression indicated more aggressive behavior. Higher scores on behavioral regulation indicate impairment in executive functioning and poor behavior regulation.

^{t} = .07,

* $p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$.