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Effects of Parenting and Community Violence on Aggression-Related Social Goals: A Monozygotic Twin Differences Study

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Abstract

Community violence exposure and harsh parenting have been linked to maladaptive outcomes, possibly via their effects on social cognition. The Social Information Processing (SIP) model has been used to study distinct socio-cognitive processes, demonstrating links between community violence exposure, harsh parenting, and maladaptive SIP. Though much of this research assumes these associations are causal, genetic confounds have made this assumption difficult to rigorously test. Comparisons of discordant monozygotic (MZ) twins provide one empirical test of possible causality, as differences between MZ twins must be environmental in origin. The present study examined effects of parenting and community violence exposure on SIP - specifically aggressive and avoidant social goals - in a sample of 426 MZ twin dyads (N=852 twins, 48% female). Phenotypically, we found that lower positive parenting and greater harsh parenting were associated with greater endorsement of dominance and revenge goals. We also found that indirect and direct community violence exposure was associated with greater endorsement of avoidance goals. Using an MZ difference design, we found that the relationships between lower levels of positive parenting and endorsement of dominance and revenge goals were due, in part, to environmental processes. Moreover, the relationships between the impact of indirect and direct community violence exposure and avoidance goals, as well as between the impact of indirect community violence exposure and revenge goals, appeared to be due to non-shared environmental processes. Our results establish social and contextual experiences as important environmental influences on children's social goals, which may increase risk for later psychopathology.

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Conflict of Interest:

The authors declare that they have no conflict of interest.

Keywords

Social Goals; Community Violence; Parenting; Monozygotic Twin Differences

Growing up in poverty exposes children to adversities within both the home and in the community (Evans, 2004). At the family level, poverty has been associated with parenting that is harsher and lower in warmth (Grant et al., 2003). At the neighborhood level, children living in poverty are exposed to greater levels of community violence, both directly (i.e., witnessing violence) and indirectly (i.e., hearing about violence) (Sampson et al., 1997). Not surprisingly, harsh parenting and community violence exposure are related to a variety of maladaptive outcomes, including psychopathology broadly (Burke et al., 2008; Fowler et al., 2009) and aggression and antisocial behavior specifically (Kawabata et al., 2011; Guerra et al., 2003). To improve these outcomes, it is critical to understand the specific mechanisms through which harsh parenting and community violence exposure influence children's behavior.

One way in which exposure to these harsh conditions may increase risk for later aggression and psychopathology is by influencing the way children think about social situations and their goals in these situations. Dodge and colleagues (Dodge et al., 1990; Crick and Dodge, 1994) have proposed a model of social information processing (SIP), which draws on social and cognitive theories of interpersonal interaction (Selman, 1971; Newell and Simon, 1972). The SIP model posits that children process social information in a series of five cognitive processes: encoding a social cue, interpreting the cue, clarifying social goals, constructing a response, and deciding on the response (Crick and Dodge, 1994). This model has been extensively studied within developmental models of aggression, with a wealth of research showing that aggressive children are more likely to: selectively attend to environmental cues associated with hostile intent, make hostile attributions of intent in others, endorse more hostile social goals, construct more aggressive solutions, and anticipate greater success with the execution of aggressive responses (Pettit and Mize, 2007; Orobio de Castro et al., 2002).

The Development of SIP

As hostile patterns of SIP may lead to aggression, it is important to understand how maladaptive cognitions around aggressive solutions might develop. From a social learning perspective, harsh parenting is thought to teach children that violence and aggression are part of daily life and social interactions (Bandura, 1977). Indeed, several studies have found links between harsh parenting and maladaptive SIP. For example, in a 3-year longitudinal study, Dodge and colleagues (1995) found that children who had experienced physical abuse before age 5 demonstrated more encoding errors, hostile attribution biases, greater aggressive response generation, and greater anticipation of positive outcomes following their aggression. These patterns, in turn, lead to greater aggression. Extending to more normative forms of parenting, MacKinnon-Lewis and colleagues (2014) found that hostile attribution biases mediated the link between mother-child conflict and aggression in a sample of European-American and African-American middle schoolers. Moreover, negative parental behaviors such as negative emotionality, criticism, and covert and overt hostility predict

children's hostile attribution biases and aggressive tendencies in school (e.g., Dodge et al., 1990; Gulley et al., 2014; McDonald et al., 2013; Nix et al., 1999).

There is also evidence that positive parenting, which includes monitoring and involvement, as well as affective demonstrations of warmth, may protect children from later maladaptive behavioral outcomes. Because positive and harsh parenting are separable constructs and not simply two ends of the same dimension (Baumrind, 1997; Lunkenheimer et al., 2017) there is a need for studies that examine how positive parenting might serve as a protective factor for children growing up in disadvantaged neighborhoods and exposed to a myriad of risk (Smith et al., 1995). For example, cross-cultural meta-analytic work has shown that parental warmth, involvement, and monitoring are positively associated with domains of psychological adjustment such as emotional stability, positive self-adequacy, positive worldview, and school engagement (Khaleque, 2013; Simons-Morton et al., 2009), as well as lower rates of delinquency (Hoeve et al., 2009; Keijsers, 2016).

Beyond parenting, community violence exposure may also lead to observational learning in which children see models of aggression and how aggression can lead to positive outcomes (Bandura, 1986; Patterson, 1982). In a study of over 4,000 children aged 14–17 in urban neighborhoods, witnessing violence was positively correlated with beliefs that aggression is a normative and socially acceptable strategy for problem solving (Bradshaw, 2004). Guerra et al. (2003) also found that community violence exposure stimulated increases in positive endorsement of aggressive responses during later elementary school years. Additionally, Ziv (2012) found that SIP mediated the link between community violence exposure and problem behavior in a group of urban preschool-aged children. Thus, there is growing evidence that experiences such as harsh and conflictual parenting and community violence exposure may lead to more aggression-related patterns of SIP- thus increasing risk for aggressive behavior.

Isolating Social-contextual Effects

A critical confound in much of the extant literature examining the effects of harsh parenting and community violence exposure on aggression broadly, and in the SIP model more specifically, is the role of genetic influence. Namely, it is possible that relationships between parenting and community violence exposure and maladaptive SIP are mediated by both the child and/or the caregiver's genetic makeup. For example, parents who have histories of antisocial behavior may engage in more harsh parenting behaviors and pass on genes increasing risk for antisocial behavior and maladaptive SIP. Thus, what appears to be an effect of parenting on SIP could actually reflect passive gene-environment correlation. Similarly, in relation to community violence exposure, it is possible that a child's inherited risk for maladaptive SIP and aggression might also lead the child to seek more dangerous environments and thus be exposed to more community violence (i.e., active gene-environment correlation). With these genetic confounds, it is difficult to know the extent to which experiences of harsh parenting or community violence exposure are non-heritable "environmental" risk factors versus gene-environment correlations. One methodological approach that can address these confounds and isolate non-heritable environmental processes is the use of a monozygotic (MZ) twin difference design. Because MZ twins are genetically identical, differences in their respective experiences that are correlated with

differences in their outcomes provide a direct index of non-shared environmental influences on that association (Plomin et al., 2001; Pike et al., 1996). This design fully circumvents genetic confounds on the association because genotype is equated between twins. Although no studies have examined SIP processes and their development using an MZ difference design, this design has been used to examine the link between harsh parenting and aggression. For example, Asbury et al. (2003) found that twin differences in negative parental feelings and harsh discipline were correlated with twin differences in behavior problems in a sample of 4-year old twins. This study supports the notion that harsh parenting has some non-heritable, non-shared environmental effects on the development of aggression. Furthermore, there is evidence that these associations are predictive across time. A study that used longitudinal data from over 2,000 MZ twin pairs found that the MZ twin receiving more parent-reported negative discipline at age 7 was more likely to have higher levels of conduct problems at age 12 (Viding et al., 2009). Though these studies demonstrate the potential use of MZ difference designs to identify non-shared, non-heritable parenting effects on aggression, no studies have used an MZ difference design to examine the role that parents and exposure to community violence play in the development of maladaptive patterns of SIP, including social goal formulation.

Children's Social Goals

Finally, though much previous research has focused on earlier steps in the SIP process (e.g., hostile attribution bias), relatively less research has examined how parenting and community violence exposure affect the goals that children have in potentially ambiguous social situations. Meta-analytic work has demonstrated a consistent link between these social goals and the responses children select (i.e., wanting to exact revenge leads to choosing aggression; Samson et al., 2012), highlighting the need to understand how individual variation in social goal selection develops. In one of the few studies examining parenting as a predictor of social goals, Hughes and colleagues (2004) examined a sample of aggressive second- through fourth-graders and found that higher levels of harsh parental discipline predicted a greater likelihood that children would select goals to be dominant or extract revenge. Relatedly, McDonald et al. (2013) found that child perceptions of positive parenting were the strongest predictor of decreases in dominance and revenge goals over a year in sample of highly aggressive 4th graders. While these studies provide evidence of an association between parenting and social goals specifically, it is important to examine if these relations extend to a more normative sample and the extent to which these associations are causal. In terms of community violence exposure, no research has directly examined social goals as an outcome. However, Shahifnar and colleagues (2001) found that witnessing severe violence was positively correlated with children's beliefs that aggressive solutions would lead to positive outcomes in a sample of juvenile offenders ages 13–17. In sum, although there is some evidence that parenting and community violence exposure may affect goal formulation, this remains an understudied area of investigation.

Additionally, the few studies that exist in this area have focused on aggression-related social goals such as revenge and dominance, but no prior studies have explored other forms of maladaptive goal clarification, such as avoidance. That is, although exposure to aggression may contribute to more aggressive social goals via social learning (Bandura, 1968), it is

possible that harsh and scary experiences, such as harsh parenting and community violence exposure, may also lead children to avoid social interactions (Sturge-Apple et al., 2012; Rosenthal, 2000). Thus, research is needed that examines the extent to which exposures to harsh parenting and community violence may lead to both aggression-related goals (i.e., dominance, revenge) and to anxiety and trauma-related goals (i.e., avoidance), particularly in community samples that contain a range of children with normative and maladaptive outcomes.

The Current Study

The goals of the present study were thus to examine the relationships between parenting, community violence exposure, and social goals in ambiguous social contexts in an at-risk sample (i.e., over-sampled for neighborhood impoverishment) of 426 MZ twin dyads (852 children) aged 6–10. We examined this question during middle childhood as it is an important period for children's social cognitive development due to increasingly complex peer and family interactions, and it is also the period that has been the focus of much of the SIP literature (Samson et al., 2012; Orobio de Castro et al., 2002). In addition to examining harsh parenting, we also examined positive parenting, given prior indications that protective aspects of parenting may buffer the effects of living in poverty and promote less aggressive social cognition. We also examined both indirect versus direct types of community violence exposure (i.e., hearing about violent events versus witnessing violent events directly). Finally, we examined both aggressive and avoidant social goals to identify the extent to which parenting and exposure to community violence may differentially impact the types of social goals children construct. We examined these relationships both phenotypically and using an MZ differences design to explore the extent to which phenotypic relationships were environmental in origin, as is typically assumed. We hypothesized that both harsh parenting and community violence exposure would be associated with higher levels of dominance and revenge goals because these experiences model violence as a successful social solution. In contrast, we hypothesized that higher levels of positive parenting would be associated with lower levels of dominance and revenge goals because warm and supportive parenting provides a template for prosocial behavior. We also hypothesized that exposure to indirect and direct community violence that was perceived as highly impactful by the child would lead to greater avoidance goals, as these experiences would teach children that social situations are dangerous and to be avoided.

Method

Participants

The 426 MZ twin pairs included in the current study were assessed as part of the [name of study removed for blind review], an independent project within the [name of study removed for blind review] [citation removed for blind review]. The [name of study removed for blind review] includes both a population-based and at-risk sample of twin families (N=1030 twin pairs including DZ twins) living in Michigan. In collaboration with the Michigan Department of Health and Human Services, recruitment was carried out via anonymous mailings to twin families within a 120-mile radius of a large midwestern university.

Recruitment procedures for the population-based and at-risk samples were identical except that for the latter, mailings were restricted to families residing in neighborhoods with rates of poverty at or above the 2008 mean of 10.5%, the Census mean at study onset (United States Census Bureau, 2008). This recruitment strategy yielded overall response rates of 62% for the population-based sample and 57% for the at-risk sample. To be eligible for participation in the [name of study removed for blind review], neither twin could have a cognitive or physical condition that would preclude completion of the study protocol (as assessed via parental screen; e.g., a significant developmental delay). For more detail on recruitment procedures, see [citation removed for blind review].

The present study included data from all 260 MZ twin pairs from the population-based sample and all 166 MZ twin pairs from the at-risk sample (48% female, both samples). Zygosity was established using physical similarity questionnaires administered to the twins' primary caregiver, which have demonstrated accuracy of 95% or better (Peeters et al., 1998). The twins ranged in age from 6 to 10 years old at time of recruitment, although several ($n = 11$ twin pairs) had turned 11 years old by the time the family participated (M_{age} for full sample = 8.00 years, $SD = 1.50$ years). With both samples of MZ twins combined, mothers endorsed the following ethnic identities for the twins: White, 83.1%; African American, 6.3%; Native American, 1.6%; Latino, 1.2%; Pacific Islander, 0.7%; Asian, 0.9%; Other, 6.1%. The average reported combined annual family income was between \$40,000 and \$45,000. More than a third (36.7%) of families in the current study reported annual incomes below \$50,000, less than the living wage in Michigan of \$56,693 for one parent and two children- the minimum number of family members in the household (Glasmeier, 2018).

Consistent with our recruitment strategy, there were differences between the population-based and at-risk MZ twin samples in terms of reported income. A significantly higher proportion of families within the population-based sample reported annual incomes of over \$50,000 than families within the at-risk sample, $\chi^2(1, N = 270) = 13.16, p < .001$. Additionally, families within the at-risk sample were over twice as likely as families in the population-based sample to report incomes under \$25,000, $\chi^2(1, N = 53) = 9.93, p < .01$. This last figure is particularly important as it crosses the 2008 Census Bureau poverty threshold for a family of 4, \$22,050 (U.S. Census Bureau, 2008). Thus, recruitment methods for the current study led to a sample that represents the areas from which the samples were drawn, with an effective oversampling of twins living in poverty. This enrichment for poverty was ideal for the current study, as children living in poverty are more likely to be exposed to harsh parenting and neighborhood violence (Evans, 2004), and are more likely to exhibit aggression (Raver et al., 2015).

Study Protocol

Children provided assent and parents provided informed consent for themselves and their children. Twins and parents completed questionnaires, clinical interviews, and videotaped interaction tasks. Questionnaires were read aloud to children with reading difficulties, as assessed by Test of Word Reading Efficiency (Torgesen et al., 1999). The Social Cognitive Assessment Profile (SCAP, Hughes et al., 2004) and Kid Screen for Adolescent Violence Exposure (Kid-SAVE, Flowers et al., 2000) were administered to children by a trained

research assistant. Approval was obtained from the [name of university removed for blind review] Institutional Review Board. Participants were compensated for their time.

Measures

Parenting.—Twin perceptions of parenting were assessed using the Parent Environment Questionnaire (PEQ). The PEQ is a 42-item inventory that assesses five factorially derived aspects of the relationship of each parent–child dyad in the family (Elkins et al., 1997): Conflict, Parent Involvement, Child Regard for Parent, Parent Regard for Child, and Structure. For the present study, we used twin self-reports of the Conflict (12 items; $\alpha = .75$) and Involvement (12 items; $\alpha = .70$) scales as indexes of harsh parenting and positive parenting, respectively. Each item is rated on a 4-point Likert scale ranging from “definitely false” to “definitely true”. Sample items from the Conflict scale include, “My parent often criticizes me” and “My parent sometimes hits me in anger”. Possible scores for the Conflict subscale range from 12–48 with higher scores indicating greater levels of harsh, conflictual parenting. Sample items from the “Involvement” scale, which contains items tapping both involvement and warmth, include “My parent and I do not do a lot of things together”, and “My parent comforts me when I am discouraged or have had a disappointment”. Sum scores for the Involvement subscale also range from 12–48, with higher scores indicating more involved, warm, and supportive parenting.

We focused on youth reports of parenting for three reasons: First, research shows that the child’s (versus parent’s) perception of the parenting relationship can be the best predictor of outcomes such as antisocial behavior specifically (Yoshizawa et al., 2017), and positive psychosocial adjustment broadly (Khaleque, 2013). Second, youth reports may be less influenced by social desirability bias, as parents are more motivated to report their parenting and the parent-child relationship as more positive than it may be (Weis and Lovejoy, 2002). Third, our use of separate informants for twins 1 and 2 (i.e., their individual self-reports) enhances the methodological rigor in the MZ difference analyses, since the difference scores are computed across two informants (rather than within a given informant; e.g., if we made use of maternal informant-reports of her two twins).

Community Violence Exposure.—We used twin self-reports of the KID-SAVE (Flowers et al., 2000) to measure the frequency and impact of violent events the child has witnessed or heard about in their school and neighborhood. For the present study, we used the Traumatic and Indirect Violence frequency and impact subscales. The Traumatic Violence subscale (10 items; $\alpha = .78$) contains items related to directly witnessing acts of violence in one’s community (e.g. “I have seen someone get killed”, “I have seen someone get beaten up”). The Indirect Violence subscale (17 items; $\alpha = .71$) contains items related to hearing about acts of violence in one’s community (e.g. “I have heard about someone getting badly beat up”). Possible scores for both the Frequency and Impact portions of the Traumatic Violence subscale range from 0–20. Each endorsed item is rated for Frequency (0 = Never, 1 = Sometimes, 2 = A lot) and Impact (0 = Not at all upsetting, 1 = Somewhat upsetting, 2 = Very upsetting). Possible scores for both frequency and impact range from 0–34, with higher scores indicating more frequent and/or impactful experiences of community violence exposure.

Social Goals.—To assess children’s social goals in ambiguous and provoking situations, we employed the Social Cognitive Assessment Profile (SCAP; Hughes et al., 2004), which presents children with four hypothetical vignettes depicting ambiguous peer provocations and four vignettes depicting overtly aggressive peer provocations. Children were encouraged to pretend to be the protagonist in each of the vignettes. For this study, we used the Goals subscale, in which children were asked three questions addressing the importance of each of three types of social goals: dominance (e.g., “How important is it for you to show the other boy/girl that you can’t be pushed around?”; $\alpha = .77$), revenge (e.g., “How important is it for you to get back at him/her?”; $\alpha = .92$), and avoidance (e.g., “How important is it for you to get away as quickly as possible?”; $\alpha = .74$). Children rated the importance of each goal on a scale of 1 to 4 (1= Not Important, 2= Somewhat Important, 3= Important, 4= Very Important). The responses for each goal were averaged for a mean score that ranges from 1–4, with higher scores indicating endorsement of more dominant, vengeful, or avoidant social goals.

Covariates.—Parents completed a demographic questionnaire. To control for race in analyses, race was coded as follows: 0= White, 1=Non-white. Twin age, as well as twin gender, were additional covariates. Additionally, parents reported the approximate annual combined income of the household on a scale of 1 to 10 (1 = *Under \$15,000*, 10 = *Over \$50,000*), which was controlled for in all phenotypic (i.e., non-genetically informed) models.

Data Analysis Plan

All analyses were performed using SPSS version 24 (IBM Corp., 2016). On average, the rate of missing data for all variables of interest was low (2–3%). Data were missing at random across all demographic and study variables. Thus, we accommodated missing data using pairwise deletion for bivariate correlations and maximum likelihood for the multilevel models. Before analyzing data, we mean-centered all predictor variables.

Phenotypic associations.—We computed zero-order correlations among all variables to examine general phenotypic associations between parenting, exposure to community violence, and social goals. That is, each twin was treated as an independent subject without addressing the nesting within twin pair. We also computed intra-class twin correlations to confirm that twins were not perfectly correlated on any measure (a condition of MZ twin difference analyses). We ran a series of multilevel models to examine the phenotypic or observed effects of parenting and community violence exposure on social goals while modeling the nesting of twins within families. Child gender, age, race and family income were included as covariates. Separate models were run for each outcome and predictor.

Isolating non-shared environmental influences via MZ difference design.—We computed between-twin difference scores for all variables of interest and examined associations between co-twin differences in particular experiences (e.g., parenting, exposure to violence) and differences in their outcomes (social goals). As noted above, MZ difference analyses are particularly informative, as they unambiguously indicate whether associations among parenting, community violence exposure, and social goals are environmental in origin, a necessary element of ‘causality’. Because twins are nested within family (i.e., the

same age, gender, race, family income), covariates were not used in the MZ difference models.

Results

Zero-order phenotypic relationships among variables.

Table 1 presents descriptive statistics and bivariate correlations for all study variables, as well as MZ twin or intra-class correlations. We use the terms ‘Full Sample’ and ‘Twin Differences’ to differentiate between values derived from all 852 twins from values obtained from within-pair differences. The means and standard deviations of MZ difference scores were calculated by taking the absolute value of the difference scores to provide an index of the magnitude of absolute differences between twins.

As expected, twins were not identical on any measure, providing very clear evidence for the existence of nonshared environmental influences on the variables of interest. Consistent with our hypotheses, at the zero-order level, greater endorsement of positive parenting was related to lower endorsement of dominance, revenge, and avoidance goals, and higher levels of harsh parenting were related to greater endorsement of each of these social goals. Greater frequency of exposure to both direct and indirect violence, as well as higher ratings of the impact of violence, were related to greater endorsement of revenge and avoidance, but not dominance goals (except greater impact of indirect violence was positively correlated with dominance goals). These significant correlations were modest to small in effect size.

Are parenting and exposure to violence associated with endorsement of social goals?

Table 2 presents results from a series of multilevel models examining the phenotypic effects of parenting and community violence on children’s social goals while accounting for twin nesting within family and controlling for gender, age, race, and family income using the SPSS MIXED command. See Appendix 1 for table with complete model estimates.

Parenting.—We found that higher levels of positive parenting were associated with lower endorsement of dominance goals and revenge goals. Similarly, higher levels of harsh parenting were associated with higher endorsement of both dominance and revenge goals. When both harsh and warm parenting variables were entered into the same multi-level model, we found that harsh parenting uniquely predicted higher levels of dominance goals ($B = .009$, $SE = .001$, $p < .05$) and positive parenting uniquely predicted revenge goals ($B = -.014$, $SE = .002$, $p < .05$).

Community Violence Exposure.—Consistent with hypotheses, we found that exposure to indirect violence predicted most social goals: greater reported frequency of exposure to indirect violence was positively related to greater endorsement of avoidance and revenge (but not dominance) goals. When youth rated the impact of exposure to indirect violence, these ratings predicted more avoidance, dominance, and revenge goal endorsement. However, for exposure to direct violence, only greater ratings for the impact of these experiences predicted avoidance goals and youth ratings of the frequency of exposure to direct violence was not related to endorsement of any goals. Thus, experiences of indirect

violence were most broadly associated with endorsement each type of social goal, particularly when youth rated the impact of these experiences. Though experiences of indirect violence predicted dominance and revenge goal endorsement, ratings of both frequency and impact of indirect violence and the impact of direct violence all were related to a greater endorsement of avoidance goals, highlighting the unique effect of exposure to community violence on avoidance responses to ambiguous social situations.

Are the associations of parenting and community violence with social goals environmental in origin?

Table 3 presents the results of correlations between MZ sibling difference scores. To decrease multiple testing, we only tested for correlations between variables that were related phenotypically in multilevel models.

Parenting.—Differential endorsement of positive parenting was negatively correlated with co-twin differences in their endorsement of both dominance and revenge goals, indicating that twins who endorsed less warm and involved relationships with parents were also more likely to endorse dominance and revenge goals, an association that persisted even when fully accounting for genetic and familial similarity between twins. By contrast, there was no evidence that the observed relationship between harsh parenting and social goals was non-shared environmental in origin, as twin differences in harsh parenting did not relate to twin differences in endorsement of dominance or revenge goals.

Community Violence Exposure.—MZ differences in ratings of the impact of indirect violence exposure were correlated with differences in revenge and avoidance, but not dominance goals. Put another way, the twin affected more by indirect violence exposure endorsed more revenge and avoidance goals than his or her co-twin, and did so over and above their genetic and familial similarity. Similarly, the relationship between the direct violence impact and avoidance goals was also explained in part by non-shared environmental effects. Surprisingly, differences in twin ratings of the frequency of indirect exposure to violence were not associated twin differences in endorsement of any social goal, suggesting these associations may not be environmental in origin.

Discussion

The present study examined associations between aggression-related social goals and parenting and community violence exposure, respectively, within a sample of 426 monozygotic twin pairs. At the phenotypic level, we found that low levels of positive parenting and higher levels of harsh parenting predicted greater child endorsement of dominance and revenge goals. We also found that exposure to indirect and direct violence was associated with greater endorsement of avoidance goals, with some indication that exposure to indirect violence also was related to increased revenge and dominance goals. Examining the environmental origin of these associations using an MZ twin difference design, we found evidence of environmental influences on the relationship between low positive parenting and endorsement of dominance and revenge goals. Moreover, the relationship between the perceived impact of indirect and direct violence exposure and

avoidance goals also appeared to be non-shared environmental in origin. Thus, links between parenting and dominance and revenge goals, and exposure to community violence and avoidance goals, appear to have non-heritable environmental components (i.e., not only due to gene-environment correlation). These results highlight the likely causal role of parents and community violence in the development of social goals related to aggression.¹

Parenting and Social Goals

We found that positive, but not harsh, parenting was related to both revenge and dominance goals in phenotypic and MZ difference models. These findings suggest that positive parenting has observable non-shared environmental effects on children and provides evidence that understanding the protective nature of positive parenting is a critical avenue of investigation for understanding prosocial cognitive development. These results build on findings in a clinical sample by McDonald et al. (2013) by demonstrating that positive parenting impacts social goals and that these results are present even within a community sample. Thus, the findings linking low levels of positive parenting to revenge and dominance goals are an important step towards understanding the intergenerational transmission of aggression-related cognitions. It could be that parents who are less warm and involved provide less buffering from the cognitive effects of examples of aggression in the media and community, which may promote the development of these hostile social goals. Alternately, a lack of parental involvement could reflect poor monitoring of the youth's activities, which has been connected to many poor outcomes in adolescence, including community violence exposure (Dishion and McMahon, 1998).

In line with previous work (Heidgerken et al., 2004), we did find a positive association between harsh parenting and the two hostile social goals at the phenotypic, but not at the twin differences level, suggesting that the relationship between harsh parenting and hostile social goals may be genetically mediated. In fact, there is research that suggests that harsh parenting contains gene-environment correlation in that it, at least partially, reflects the parents' own antisocial behavior or impulsivity (Klahr and Burt, 2014). These results are consistent with past work that has demonstrated associations between harsh parenting and aggression-related SIP, but extend these findings to hostile social goal formation.

Violence Exposure and Social Goals

The relationship between the impact of indirect violence exposure and revenge goals was significant across all levels of analysis, with clear evidence of a nonshared environmental effect of the impact of indirect violence exposure on revenge goals. These findings provide evidence for a non-heritable effect of community violence exposure on aggression-related social goals. These results are consistent with research that suggests that community violence exposure provides a social template and powerful observational learning whereby children see exacting revenge through aggression as normative and potentially rewarded behavior (e.g., Bradshaw et al., 2009). Moreover, these findings are consistent with previous studies that have found positive associations between community violence exposure and

¹We also used regression to examine the effects of the interaction of parenting and community violence exposure on social goals in both phenotypic and twin difference models. However, we found no evidence of significant interaction effects.

aggressive SIP (see Calvete and Orue, 2011; Guerra et al., 2003) and extends this work by looking at social goals. Thus, it appears that exposure to community violence impacts multiple levels and steps in social information processing. Interestingly, Shahifnar and colleagues (2001) found that only *direct* victimization, and not witnessing (i.e., indirect) violence, was related to higher levels of aggression-related social goals (though they did find a positive association between witnessing violence and anticipation of positive outcomes following aggression). However, the study was carried out in a sample of incarcerated adolescent boys, whereas the current study was composed of younger, mixed gender, and community-based youth. Moreover, this previous study only measured the frequency of community violence exposure and not impact, which is important because there is evidence that the effect of adverse experiences on adjustment are mediated by how children perceive them (Neiderhiser et al., 1998; Powers et al., 1994).

Although our focus was on aggression-related social goals, some of the most interesting findings were that the impact of both indirect and direct violence exposure was associated with higher levels of avoidance goals in phenotypic and MZ difference analyses. Thus, not only did we find non-heritable effects of community violence exposure on aggression-related social goals, but also on avoidance goals. These results suggest that whereas witnessing violence in one's community might provide models of aggressive behavior for some children, it might also cause other children to withdraw from situations where there is a possibility of conflict, because they have been impacted or traumatized by what they have seen in their communities. That is, though indirect violence exposure may help children learn that aggression is useful, more direct forms of violence exposure may scare and harm children and teach them to avoid even ambiguous situations as they can lead to violence directed at the child. In fact, there is evidence that exposure to community violence is associated with increased generalized anxiety symptoms, which are often accompanied by patterns of avoidance (Burgers and Drabick, 2016). Thus, one major contribution of this study is to widen the focus of SIP-related social goals to emphasize that harsh experiences, such as exposure to community violence, not only promote hostile social goals, but also avoidance. Though avoidance may be adaptive in dangerous neighborhoods, it may also impact the development of children's social competence and undermine the development of relationships critical to success (Ollendick et al., 2001).

Limitations

Our study had several strengths, including a large genetically-informed sample of MZ pairs enriched for poverty and associated risk factors, and the use of a strong MZ difference design. However, there are several limitations to consider when interpreting the findings. First, although the MZ-twin difference results provide an unambiguous index of nonshared environmental mediation, the cross-sectional design of the study limits our ability to make clear directional or causal inferences. Cross-sectional studies involve an important methodological shortcoming that prevents drawing strong conclusions about the possible cognitive mediation of the influence of community violence on aggressive behavior (Cole and Maxwell, 2003). Second, we used only child-report measures for our analyses. Observational and multi-informant methods could bolster causal inferences about the relationship between parenting, community violence exposure, and aggression-related social

goals. Third, it is also important to note that the effect sizes for all correlations were relatively small. Fourth, though MZ difference designs offer an unambiguous assessment of non-shared environmental effects, there are limitations to the design including that twins, particularly MZ twins, may not represent singletons and thus the generalizability of the results may be limited (Rutter, 2002). Additionally, because MZ twins have identical DNA and live in the same family, the differences between them are typically relatively small. In this study, there was meaningful variance between twins on the constructs of interest, but these differences were still small in magnitude (i.e., less than a standard deviation for most constructs). That is to say, though the differences were substantial enough to yield results, they were relatively modest in magnitude. These modest magnitudes are very common in the broader MZ difference literature (Asbury et al., 2003; Burt et al., 2006; Viding et al., 2009), but highlight the uniqueness of the MZ design which may undermine generalizability to other populations. It is important to note that the MZ difference designs only indicate if there are any non-shared environmental effects and do not preclude that a substantial amount of the relationships between these variables is genetic or due to gene-environment interaction or shared environmental effects. Other genetically informed designs (e.g., adoption, molecular genetic studies) could help to identify specific genetic and environmental risk factors that interact to promote the development of maladaptive social goals.

Contributions and Clinical Implications

The results contribute to the broader literature in several ways. First, we identified a specific mechanism through which harsh parenting and exposure to community violence might impact later behavioral outcomes (i.e. via their effects on children's social goals). Second, we demonstrated that some of these relationships were nonshared environmental effects through the use of a genetically-informed design. Third, this study is novel in that it is one of only a few studies to directly examine social goals as part of SIP broadly and specifically as an outcome related to community violence exposure. Fourth, these results help to broaden our understanding of the effects of community violence exposure on SIP by demonstrating associations with both aggression and avoidance-related social goals. These links to avoidance goals are important because past work has focused almost exclusively on aggression-related SIP.

In terms of clinical implications, prior treatment studies have demonstrated that targeting children's social information processing broadly has been effective in bringing about reductions in aggression (Hudley and Graham, 1993; Lochman and Wells, 2002), which provides alternate evidence that environmentally mediated processes are involved in the formation and prevention of aggression. Most research on SIP in the context of aggression has focused on other steps in the SIP chain, to the neglect of social goals, and only some interventions target aggressive social goal formation (Lochman and Wells, 2002). Thus, developing more targeted treatments for children exposed to community violence that emphasize having fewer dominance and revenge, and more, prosocial goals might prove fruitful. These findings also suggest that interventions for children exposed to community violence should not only focus on decreasing patterns of hostility in social interactions, but also target patterns of avoidance that might arise from trauma associated with witnessing violence (Sturge-Apple et al., 2012). Given our findings related to positive parenting,

encouraging warm positive and involved parenting could be an important component of encouraging prosocial development in children exposed to adversity.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Means, standard deviations, and phenotypic correlations for all variables

Variable	M (SD)	M (SD)	Intraclass Correlations		1	2	3	4	5	6	7	8	9
	<i>Full Sample</i>	<i>Twin Differences</i>											
1. Positive Parenting	39.67 (5.63)	5.15 (4.05)	.33***		1								
2. Harsh Parenting	20.63 (5.88)	5.51 (4.58)	.27***		-.41***	1							
3. Indirect Violence (F) ^a	2.05 (2.39)	1.61 (1.96)	.44***		-.05	.12**	1						
4. Indirect Violence (I) ^b	1.31 (2.25)	1.59 (2.28)	.24***		-.04	.08*	.77***	1					
5. Direct Violence (F) ^a	0.08 (0.52)	0.11 (0.63)	.03		.02	.04	.44**	.40***	1				
6. Direct Violence (I) ^b	1.31 (2.26)	1.17 (2.03)	.01		.02	.04	.39***	.41***	.88***	1			
7. Avoidance Goals	2.49 (0.70)	0.66 (0.50)	.28***		-.12**	.09*	.11**	.15**	.09*	.10**	1		
8. Dominance Goals	2.32 (0.68)	0.63 (0.48)	.32***		-.16***	.14***	.03	.08*	.03	.03	.52***	1	
9. Revenge Goals	1.63 (0.83)	0.63 (0.71)	.36***		-.22***	.17***	.08*	.12*	.12**	.10**	.41***	.49***	1

Notes: N = 852;

*
p < .05,**
p < .01,

p < .001; all Pearson correlations;

^a (F) = Frequency Subscale;^b (I) = Impact Subscale

Table 2

Estimates and Standard Errors of Fixed Effects of Multilevel Models

	Avoidance Goals	Dominance Goals	Revenge Goals
	Estimate (SE)	Estimate (SE)	Estimate (SE)
Positive Parenting	-.01 (.00)	-.01 (.00)	-.02 (.01)
Harsh Parenting	.01 (.00)	.01 (.00)	.01 (.01)
Indirect Violence: Frequency	.03 (.01)	.01 (.01)	.03 (.01)
Indirect Violence: Impact	.05 (.01)	.02 (.01)	.04 (.01)
Direct Violence: Frequency	.08 (.05)	.02 (.05)	.09 (.05)
Direct Violence: Impact	.13 (.05)	.02 (.05)	.07 (.06)

* Notes: p< .05,

** p<.01,

*** p<.001; controlling for gender, age, race, and income

Table 3

Correlations of MZ Twin Difference Scores

	<i>r</i>		
	Avoidance Goals	Dominance Goals	Revenge Goals
Positive Parenting	-	-.10***	-.12*
Harsh Parenting	-	.06	.07
Indirect Violence: Frequency	.09	-	.07
Indirect Violence: Impact	.11*	.09	.10*
Direct Violence: Frequency	-	-	-
Direct Violence: Impact	.14**	-	-

* Notes: $p < .05$,** $p < .01$,*** $p < .001$; we only tested for correlations between variables that were correlated in phenotypic models to decrease the number of statistical tests.