



Published in final edited form as:

J Early Adolesc. 2022 March ; 42(3): 297–326. doi:10.1177/02724316211036747.

Beliefs as Mediators of Relations Between Exposure to Violence and Physical Aggression During Early Adolescence

Albert D. Farrell¹, Sarah Pittman¹, Amie F. Bettencourt², Krista R. Mehari³, Courtney Dunn¹, Terri N. Sullivan¹

¹Department of Psychology, Virginia Commonwealth University

²Department of Psychiatry and Behavioral Sciences, Johns Hopkins School of Medicine

³Department of Psychology, University of South Alabama

Abstract

This study examined beliefs about aggression and self-efficacy for nonviolent responses as mediators of longitudinal relations between exposure to violence and physical aggression. Participants were a predominantly African American (79%) sample of 2,705 early adolescents from three middle schools within urban neighborhoods with high rates of violence. Participants completed measures across four waves (fall, winter, spring, and summer) within a school year. Beliefs supporting proactive aggression, beliefs against fighting, and self-efficacy for nonviolence partially mediated relations between witnessing violence and physical aggression. Indirect effects for beliefs supporting proactive aggression and self-efficacy were maintained after controlling for victimization and negative life events. Beliefs supporting proactive aggression mediated the effects of violent victimization on physical aggression, but these effects were not significant after controlling for witnessing violence and negative life events. The findings underscore the importance of examining the unique pathways from witnessing community violence versus violent victimization to physical aggression.

Keywords

Aggression; Exposure to violence; beliefs about aggression; self-efficacy; African American adolescents

Adolescents growing up in many low-resource, urban communities report high rates of exposure to community violence (Richards et al., 2015). Longitudinal studies have identified multiple negative consequences of exposure to violence, particularly higher levels of externalizing problems such as physical aggression (Foster & Brooks-Gunn, 2009; McDonald & Richmond, 2008). However, few studies have investigated the processes through which exposure to violence produces these effects. One potential mechanism is through the influence of exposure to violence on adolescents' beliefs about the use of violent versus nonviolent strategies during interactions with their peers. According to the

social information processing model (Crick & Dodge, 1994; Huesmann, 1998), beliefs about aggression and self-efficacy to enact responses play a central role in influencing adolescents' use of physical aggression. Although several studies have found that exposure to community violence predicts beliefs about aggression (Calvete & Orue, 2011; Guerra et al., 2003; McMahan et al., 2013), there is limited research examining beliefs as mediators of the relation between adolescents' exposure to violence and their frequency of physical aggression. The goal of this study was to use longitudinal data to examine beliefs about the use of violence and self-efficacy for nonviolent responses to conflict as mediators of relations between exposure to violence through witnessing and victimization, and changes in physical aggression in a predominantly African American sample of early adolescents in urban neighborhoods with high rates of poverty and violence.

Relations Between Violence Exposure and Physical Aggression

Studies have found longitudinal relations between exposure to violence and adolescents' subsequent frequency of physical aggression (e.g., Farrell et al., 2014; Farrell, Thomson, Curran, & Sullivan, 2020; McMahan et al., 2013). There is, however, evidence that this relation may vary for witnessing violence versus experiencing violence through victimization. For example, Farrell et al (2014) found significant longitudinal effects on the frequency of physical aggression for witnessing violence, but not for violent victimization in a sample of over 1,000 adolescents from schools in low-income neighborhoods in four U.S. cities, in analyses that controlled for family poverty, family structure, and neighborhood concentrated disadvantage. In a recent study with a predominately African American sample of urban adolescents, Farrell, Thompson, Curran, and Sullivan (2020) found that witnessing community violence and victimization each predicted subsequent changes in physical aggression when examined in separate models. However, when both variables were included in a single model that also controlled for negative life events, witnessing violence uniquely accounted for variance in physical aggression but victimization did not. Bidirectional relations among victimization, witnessing violence and negative life events within this model indicated that witnessing violence and negative life events predicted changes in victimization, but victimization did not predict changes in witnessing violence or negative life events. This suggests that victimization may be part of a broader constellation of experiences associated with living in communities where adolescents are exposed to high rates of violence and other negative life events. These findings highlight the importance of investigating the specific effects of witnessing violence versus victimization, while accounting for the influence of other negative life events.

The Mediating Role of Beliefs

There is theoretical support for beliefs about aggression and nonviolence as mediators of relations between adolescents' exposure to violence and their frequency of physical aggression. According to social cognitive information-processing theories (Crick & Dodge, 1994; Huesmann, 1998), adolescents' responses in social situations are a function of a series of interrelated cognitive steps that include encoding and interpreting internal and external cues, identifying goals for the situation, accessing and constructing responses, and selecting and enacting a specific response. Each of these steps is influenced by the individual's beliefs

and attitudes, which are part of their internal database of memories of past experiences and structured knowledge (i.e., beliefs, schemas, scripts). Exposure to violence provides adolescents with aggressive models that support beliefs that violence is acceptable or even reinforced under particular circumstances. This may lead to the development of cognitive representations, such as scripts and normative beliefs that guide future behavior in specific social situations and settings (Crick & Dodge, 1994; Huesmann, 1998). Self-efficacy for nonviolence can also be learned—or unlearned—through direct victimization experiences or vicarious experiences such as witnessing violence and its consequences (Crick & Dodge, 1994). This suggests a process whereby witnessing or experiencing violence leads to the development of beliefs that support the use of aggression, which in turn increase an adolescents' frequency of engaging in physical aggression.

Although there is empirical support for the influence of beliefs about aggression on aggressive behavior, most prior studies have relied upon broad measures of beliefs about aggressive behavior (e.g., Guerra et al., 2003; McMahon et al., 2013; Nash & Kim, 2007). Such measures may not adequately capture the complexity of adolescents' belief systems. This was reflected in a qualitative study in which adolescents identified a variety of beliefs regarding their use of aggression in specific contexts (Farrell et al., 2008). In a subsequent quantitative study, Farrell, Bettencourt, and Mehari (2018), found support for four distinct factors representing adolescents' beliefs about the use of aggression that had unique cross-sectional associations with aggression. These included beliefs against fighting, beliefs that fighting is sometimes necessary, beliefs supporting reactive aggression, and beliefs supporting proactive aggression. Reactive aggression is defined as a defensive or angry response to provocation, whereas proactive aggression is defined as deliberate acts of aggression often used to achieve ones' goals (Crick & Dodge, 1996). These different types of aggression may reflect differences in social cognitive processes (Crick & Dodge, 1996), which underscores the importance of assessing multiple dimensions of beliefs. There is also empirical support for the influence of adolescents' beliefs about their self-efficacy to enact nonviolent responses on their frequency of physical aggression. For example, McMahon et al (2013) found that self-efficacy to resolve conflict peacefully was associated with decreases in aggression in a predominantly African American sample of early adolescents. Similarly, Bettencourt and Farrell (2013) found that adolescents who engaged in aggressive behavior reported lower self-efficacy for nonviolence.

Although several longitudinal studies have supported the notion that exposure to community violence predicts normative beliefs about aggression (Calvete & Orue, 2011; Guerra et al., 2003; McMahon et al., 2013), few studies have specifically examined beliefs as mediators of relations between exposure to violence and aggressive behavior. McMahon et al (2009) found that retaliatory beliefs and self-efficacy to control aggression mediated the relation between exposure to violence and aggressive behavior in a predominantly African American sample of adolescents. However, exposure to violence and beliefs were assessed at the same wave, making it difficult to determine the directionality of their relations. In addition, their use of a measure of that combined witnessing and victimization did not address potential differences across types of exposure. Guerra et al (2003) investigated longitudinal associations between witnessing community violence, beliefs, and aggressive behavior in a diverse sample of youth in urban areas. They found that witnessing predicted subsequent

increases in normative beliefs about aggression, which predicted subsequent increases in aggression. Their findings highlight the role of beliefs about aggression in adolescent's aggressive behavior following violence exposure. However, their study was limited by not considering multiple dimensions of beliefs.

The Present Study

The purpose of this study was to address existing gaps in the literature by investigating the following five dimensions of beliefs as mediators of the relations between witnessing violence and violent victimization, and physical aggression: self-efficacy for nonviolence, beliefs against fighting, beliefs supporting reactive aggression, beliefs supporting proactive aggression, and beliefs that fighting is sometimes necessary. This study's focus on mediating mechanism builds upon a prior study based on the same dataset that established longitudinal relations between exposure to violence and physical aggression (Farrell et al., 2020). It was designed to address several limitations of previous research. Prior studies investigating longitudinal relations between violence exposure and aggression have used composite measures that combined witnessing and victimization (e.g., McMahon et al 2009), despite evidence and theory that these two forms of exposure may differ in their associations with aggression (Farrell, Thomson, Curran, & Sullivan, 2020). The present study addressed this limitation by examining both the separate and combined effects of witnessing violence and victimization. We also controlled for the confounding influence of other negative events commonly experienced by adolescents in communities with high rates of poverty and violence (Sampson et al., 1997). Whereas prior studies have examined a single global dimension of beliefs about aggression (e.g., Guerra et al., 2003; Nash & Kim, 2007), we investigated multiple dimensions of beliefs. This study also differed from prior studies that examined changes across broad spans of time (e.g., Guerra et al., 2003), by investigating changes across four waves of data collected within a school year. This is important because the middle school years are a time when adolescents may experience frequent changes in their broader experiences (e.g., Seidman & French, 2004) that are not captured by collecting data on an annual basis. Finally, we focused on a predominantly African American sample of adolescents from highly burdened, under-resourced communities. Their disproportionately high levels of exposure to violence (Richards et al., 2015), makes it critical to identify malleable intervention targets, such as social-cognitive factors, to guide interventions for this population.

We hypothesized that (a) witnessing violence and violent victimization would predict lower self-efficacy for nonviolence and endorsement of beliefs against fighting, and higher endorsement of beliefs supporting aggression; (b) self-efficacy for nonviolence and all four types of beliefs about aggression would predict subsequent changes in physical aggression; and (c) self-efficacy for non-violence and beliefs about aggression would partially mediate relations between both forms of exposure to violence and physical aggression.

Method

Participants and Setting

This study examined data collected as part of an 8-year project that evaluated a bullying prevention program (Farrell et al., 2018; Sullivan et al., 2021). Participants were a random sample of students from three public middle schools in the southeastern United States that served students in urban neighborhoods with high rates of violence-related crimes. The majority of students at these schools (74% to 100%) were eligible for the federal free lunch program. During the first year of the project, a random sample of students from each grade were recruited from each school. In each subsequent year a new cohort of incoming 6th graders was recruited along with 7th and 8th graders to replace those who left the schools or discontinued participation. Participants remained eligible until they completed the 8th grade, left the school, or chose to withdraw from the study. The study was approved by the institutional review board of the authors' university. All participants provided written parental consent and informed assent. Students received a \$5 gift card for returning consent forms whether or not their parents gave consent for participation in the study. Close to 80% of all eligible participants were recruited.

The final sample of 2,705 students had a mean age of 12.35 ($SD = 1.03$) years at Wave 1. Data on sex based on school records identified 52% of students as female and 48% as male. Seventeen percent identified themselves as Hispanic or Latino/a. Twelve percent, most of whom (79%) had identified themselves as Hispanic or Latino, did not endorse any category for race, 6% identified multiple categories, 79% identified themselves as African American (including 6% who endorsed multiple categories), 6% as White, and 3% identified other racial categories. Twenty five percent reported living with both parents, 25% with a single mother and no other adult, and 23% with a parent and stepparent.

Procedures

The project that provided the data (see Farrell et al., 2018; Sullivan et al., 2021 for details and findings) used a multiple baseline experimental design to evaluate the Olweus Bullying Prevention Program (Olweus & Limber, 2010). The order and timing of initiating the intervention at each school was randomized. Once started, it continued at each school until the project ended. About two-thirds of participants (65%) completed measures during a year when the intervention was being implemented at their school. Students completed measures in the fall, winter, spring, and summer (waves 1 to 4, respectively) of each school year between 2010 and 2018 with the following exceptions. The first wave was collected in the winter, the last wave in the spring of the final year, and a change in funding source prevented collection of data in the fall of Year 6.

Students completed measures on a computer-assisted interview at school during the school year and in their homes or another community location during the summers. Participants who completed any portion of the survey received a \$10 gift card. The project employed a missing-by-design approach such that each participant was randomly assigned to complete measures at two of the four waves during each school year. This provides data missing completely at random. Graham et al. (2001) argued that planned missing designs can

provide unbiased estimates of parameters and tests of hypotheses nearly as powerful as traditional designs, but have the advantages of decreasing costs and increasing quality by reducing carryover effects, participant burden, fatigue, and attrition. Such designs are particularly appropriate for longitudinal studies that include repeated observations of the same measures.

Not all students participated during all three grades. Four of the ten cohorts entered the project in the 7th or 8th grade during Year 1, or were in the 6th or 7th grade in Year 8, and some left a school before completing the 8th grade. Consequently, data were available from all three grades for only 26% of participants, and from two grades for 25% of participants. Because of the limited number of students who participated during all three grades, we restricted our focus to investigating changes across four waves within a single school year. For students from whom data were obtained in more than one grade, we randomly selected data from one of their grades to ensure an independent sample. This provided longitudinal data within a single grade for 934 6th graders, 867 7th graders, and 904 8th graders. Within the final sample, data were obtained from 77% of participants at both of the waves to which they were assigned. Participants had missing data at one of their assigned waves for the following reasons: (a) 6.2% were not available for scheduling; (b) 6.1% left the school during the school year; (c) 3.7% had their data screened out because it did not appear that they completed the measures carefully based on their speed of completion or field notes from research staff administering the measures; (d) 3.1% declined to participate; and (e) 2.1% withdrew from the study or were no longer eligible.

Measures

Exposure Variables—The Survey of Exposure to Community Violence (SECV; Richters & Saltzman, 1990) assessed witnessing physical violence and violent victimization. The SECV, including various adapted versions, is one of the most frequently used measures of children and adolescents' exposure to violence. Scores of studies have supported its construct validity based on correlations with internalizing and externalizing problems, and post-traumatic stress disorder symptoms (see meta-analysis by Fowler et al., 2009). This project used a shortened version with 13 items assessing witnessing physical violence ($\alpha = .86$) and 7 representing violent victimization ($\alpha = .69$). Participants were asked not to include things they had seen or heard about only in video games, on TV, radio, the news, on the internet, or in movies. They rated their frequency of witnessing or experiencing each item in the past 3 months on a 6-point scale ranging from *Never* to *20 or more times*. Separate scores for witnessing and victimization were calculated by averaging ratings across items.

Negative life events.: The Urban Adolescents Negative Life Experiences Scale (UANLES) provided a broad measure of adolescents' frequency of experiencing nonviolent problem situations (Farrell, Thomson, Curran, & Sullivan, 2020). Items were based on a series of studies including qualitative research to identify stressful life events encountered by minority youth from poor urban communities (Farrell et al., 2007). Participants rated their frequency of experiencing 20 stressful life events in the past 3 months on a 5-point scale ranging from *Never* to *Almost every day*. Support for the construct validity of the UANLES

was found in a cross-sectional study that sampled data from the same project used in the current study (Thompson et al., 2020), which found strong associations between the UANLES and latent variables representing trauma-related distress, physical aggression, delinquency, and substance use. The total score based on the average across items had an alpha of .81.

Physical aggression—The Problem Behavior Frequency Scale – Adolescent Report Version 2 (PBFS-AR; Farrell, Thompson, Mehari, et al., 2020) was used to measure participants' frequency of physical aggression. It includes subscales that assess physical aggression, relational aggression, substance use, delinquency and victimization. Farrell, Gony, et al. (2018) found support for its factor structure and strong measurement invariance across sex, grade and sites within a multisite study. Concurrent validity is supported by correlations with related constructs (e.g., beliefs, values, and peer associations; Farrell et al., 2016), teacher ratings of students' behavior (Farrell, Gony et al., 2018), and school office referrals for disciplinary code violations (Farrell, Thompson, Mehari, et al., 2020). The Physical Aggression scale has five items (alpha = .77). Students report how frequently they engaged in each behavior in the past 30 days using a 6-point frequency scale from *Never* to *20 or more times*. We followed the recommended scoring procedure that was based on an item response theory analysis of the measure (Farrell, Thompson, Mehari, et al., 2020). This involves taking the mean across items after recoding each item into a 4-point scale by combining the three highest categories on the frequency scale.

Beliefs—The Self-Efficacy for Nonviolence Scale (Miller-Johnson et al., 2004) is composed of 7 items that assess adolescents' confidence they could control anger and resolve potential conflicts in nonviolent ways (alpha = .90). Responses are based on a 5-point scale ranging from *Very confident* to *Not at all confident*. Higher scores reflect higher levels of confidence to control anger and resolve potential conflicts in nonviolent ways.

The Beliefs About Fighting Scale (BAFS; Farrell, Bettencourt, & Mehari, 2018) assessed beliefs about the acceptability of aggression. This 19-item measure has separate scales to assess four types of beliefs that emerged in a prior qualitative study of factors influencing adolescents' decisions to engage in physical aggression or in nonviolent behavior during peer conflicts (Farrell et al., 2008). Results of a confirmatory factor analysis supported distinct factors representing Beliefs Against Fighting (5 items; alpha = .82), Fighting is Sometimes Necessary (5 items, alpha = .83), Beliefs Supporting Reactive Aggression (5 items; alpha = .86), and Beliefs Supporting Proactive Aggression (4 items; alpha = .76). Participants rated their level of agreement with each item on a 4-point scale: 1 - *Strongly disagree*, 2 - *Disagree*, 3 - *Agree*, 4 - *Strongly agree*. An evaluation of the BAFS found strong measurement invariance across gender, grade, and intervention condition (Farrell, Bettencourt, & Mehari, 2018).

Analysis Plan

Separate longitudinal models examined each of the five belief variables as a mediator of relations between one of the three exposure measures and the frequency of physical

aggression. All analyses were conducted in Mplus Version 8.4 (Muthén & Muthén, 2017). We used one-sided models consistent with our focus on witnessing violence and victimization as predictors rather than as consequences of beliefs and physical aggression, and to avoid the complications of including multiple mediation paths representing effects in different directions within the same model (see MacKinnon, 2008). Within these models, the belief variable at waves 2 through 4 was regressed on the exposure variable at the preceding wave, and the frequency of physical aggression at waves 2 through 4 was regressed on the exposure variable and the belief variable at the preceding wave (e.g., see Figure 1). Models also included autoregressive effects and controlled for dummy-coded covariates including male sex, grade (with 6th grade as the reference), and intervention status. Given the school-level design of the project, the intervention variable represented differences due not only to the intervention, but to school and cohort differences. The model included correlations among all variables assessed within the same wave. Measures of exposure (witnessing violence, victimization, or negative life events) at each wave were regressed on the covariates, but were otherwise treated as exogenous variables (e.g., were correlated with each other across all waves, and with the belief variables at all prior waves). We also examined a multivariate model that included all exposure variables and belief variables that emerged as mediators within the separate models.

We compared competing models to test the consistency of effects across time, evaluated the fit of each model based on the root mean square error of approximation (RMSEA), comparative fit index (CFI), and Tucker-Lewis index (TLI), and compared models based on the scaled chi-square difference test (Satorra & Bentler, 2010). We computed standard errors using a robust estimator (i.e., MLR) to account for non-normality and to address missing data. We estimated the magnitude of indirect effects through each of the purported mediators using bias-corrected bootstrap estimation methods outlined by MacKinnon (2008).

Results

Descriptive Statistics

Means, standard deviations, and correlations among the measures within waves 1 and 2 are reported in Table 1 (see Table S-1 in supplement for correlations across all four waves). Stability coefficients ranged from .56 to .72 for the three exposure measures and physical aggression, and from .34 to .62 for belief measures. Most variables within the same wave were significantly correlated. Witnessing violence and victimization were highly correlated with each other ($r = .62$ to $.67$), and with negative life events ($r = .40$ to $.53$). All but 5 of the 30 correlations among the five belief variables within each of the four waves were significant and in the expected direction, ranging in absolute value from .09 to .61. Most (i.e., 29 of 36) correlations between measures of exposure and belief variables were significant, ranging from .06 to .26 in absolute value (median = .13). Physical aggression was significantly correlated with self-efficacy and the beliefs scales, with correlations ranging in absolute value from .09 to .35 (median = .23). The pattern was generally similar across measures one or more waves apart, though their magnitudes were generally smaller.

Table 1 also reports d-coefficients representing mean differences at Wave 1 by sex, grade, and status of the intervention. There were sex differences on three of the nine variables such

that boys reported higher frequencies of witnessing violence, victimization, and less support for beliefs against fighting compared with girls. There were grade differences on nearly all of the variables. Compared with 6th graders, 7th and 8th graders reported lower frequencies of witnessing violence, and victimization, lower self-efficacy for nonviolence, and more support for beliefs that fighting is sometimes necessary and beliefs supporting reactive aggression. Eighth graders also reported less support for beliefs against fighting, greater support for beliefs supporting proactive aggression, and higher frequencies of physical aggression. Participants assessed during years the intervention was being implemented at their school reported lower frequencies of witnessing violence and beliefs that fighting is sometimes necessary. These differences were small, with d -coefficients ranging in absolute value from .13 to .32; only 4 of the 18 significant d -coefficients exceeded .25 in absolute value.

Mediation Models of Each Beliefs Measure

The initial models separately paired each belief variable with each exposure variable and allowed all path coefficients to vary across waves. All had acceptable fits based on the RMSEA (all $< .04$) and CFI (all $> .95$), but not on the TLI (.77 to .89) (see Tables S-2 to S-4 in supplementary materials for all fit indices). Adding second-order autoregressive effects (i.e., each endogenous variable at waves 3 and 4 was regressed on its prior values at waves 1 and 2, respectively) significantly improved the fit of each model based on the scaled chi-square difference test at $p < .001$, and improvement in fit indices (RMSEAs all $< .03$; CFIs all $> .98$; and TLIs = .92 to .99), and were therefore included in subsequent models. We next evaluated the consistency of the cross-variable relations within each model by holding them constant across waves. In every case, this did not decrease the fit based on the scaled chi-square test (see Tables S-2 to S-4 in supplement) and had a minimal effect on the fit indices. The resulting models for each beliefs measure fit the data very well (RMSEAs $< .02$, CFIs $> .98$ and TLIs $> .94$; see models WV1 to NLE5 in Table 2), and provided the basis for evaluating mediation effects. Standardized regression coefficients representing relations between Wave 1 and Wave 2 variables for each of the 15 models are reported in Table S-5 to S-7 in supplemental materials). Specific findings for witnessing violence, victimization, and negative life events are discussed in the following sections.

Witnessing violence models—As hypothesized, witnessing violence was inversely associated with subsequent changes in self-efficacy for nonviolence ($\beta_s = -.06$ at all waves, $p = .017$; see Figure 1) and beliefs against fighting ($\beta_s = -.05$ at all waves, $p = .02$), and was positively related to subsequent changes in beliefs supporting proactive aggression ($\beta_s = .10$ to $.11$ across waves, $p < .001$). Witnessing violence was not, however, associated with changes in beliefs that fighting is sometimes necessary or beliefs supporting reactive aggression. Four of the belief variables predicted subsequent changes in participants' frequency of physical aggression. Significant coefficients in the expected direction were found for self-efficacy for nonviolence ($\beta_s = -.08$ to $-.10$, $p < .001$), beliefs against fighting ($\beta_s = -.09$ to $-.10$, $p < .001$), beliefs supporting reactive aggression ($\beta_s = .08$ to $.09$, $p < .001$), and beliefs supporting proactive aggression ($\beta_s = .10$ to $.13$, $p < .001$), but not for beliefs that fighting is sometimes necessary. Bias-corrected bootstrap confidence intervals indicating the extent to which each belief variable at wave $t+1$ mediated the relation between

witnessing violence at wave t on the frequency of physical aggression at wave $t+2$ revealed significant indirect effects of witnessing violence across waves 1 to 3 and across waves 2 to 4 for self-efficacy for nonviolence (β s = .005, 95% CIs = [.001, .011] and [.002, .011], respectively), beliefs against fighting (β s = .005, 95% CIs = [.001, .010] and [.001, .011], respectively), and beliefs supporting proactive aggression (β s = .012 and .013, 95% CIs = [.005, .022] and [.006, .024], respectively).

Victimization models—Victimization was positively related to subsequent changes in beliefs supporting proactive aggression (β s = .09, p = .004), but was not significantly related to changes in any of the other belief variables. Path coefficients reflecting associations between each of the belief measures and subsequent changes in physical aggression had values similar to those in the models examining witnessing violence. As with witnessing violence, bias-corrected bootstrap confidence intervals revealed a significant indirect effect for beliefs supporting proactive aggression as a mediator of relations between witnessing violence across waves 1 to 3 (β = .011, 95% CI = [.004, .024]) and across wave 2 to 4 (β s = .012, 95% CI = [.005, .027]). Indirect effects were not significant in models for any of the other four belief variables.

Negative life events models—The negative life events scale was inversely associated with subsequent changes in self-efficacy for nonviolence (β s = $-.07$ to $-.08$, p = .001), and positively related to subsequent changes in beliefs supporting reactive aggression (β s = .04 to .08, p = .045) and proactive aggression (β s = .08, p < .001). Relations between each of the belief variables and changes in physical aggression were similar to those in the models for witnessing violence and victimization. Bias-corrected bootstrap confidence intervals for indirect effects provided support for self-efficacy for nonviolence (β s = .006 and .007, 95% CIs = [.002, .012] and [.003, .014]), and beliefs supporting proactive aggression (β s = .009 and .011, 95% CIs = [.004, .017] and [.005, .020]), respectively) as mediators of relations between witnessing violence across waves 1 to 3 and across wave 2 to 4.

Multivariate Mediation Model

Given the high correlations among the exposure variables (witnessing violence, victimization, and negative life events), we used a multivariate model to determine the combined and unique effects of the three exposure variables for predicting changes in each of the three belief variables that emerged as mediators in the separate analyses (i.e., self-efficacy for nonviolence, beliefs against fighting, and beliefs supporting proactive aggression; see Figure 2). As in the separate analyses of each belief variable, adding second order autoregressive effects significantly improved the fit of the model ($\chi^2[8] = 75.72$, p < .001). Further simplifying this model by holding all cross-variable coefficients constant across waves did not significantly decrease the fit ($\chi^2[30] = 35.12$, p < .238), and the resulting model fit the data well (see Model MV3 in Table 2). Within this model, we examined effects based on regression coefficients that indicated the extent to which each exposure variable accounted for a unique portion of the variance in each belief variable after controlling for covariates and autoregressive effects. We also examined their combined effects based on squared multiple partial correlation coefficients (pR^2 ; Cohen et al., 2003) that indicated the total proportion of residual variance in each belief variable a

(i.e., variance not accounted for by the covariates and autoregressive effects) accounted for by all three exposure variables. We used a similar approach to determine the individual and combined effects of the three belief variables on physical aggression. Coefficients representing relations across the first two waves are reported in Table 3, cross-variable coefficients across all waves are reported in Figure 2, and the full set of coefficients are reported in Table S-8 in supplemental materials.

Witnessing violence accounted for a unique proportion of variance in changes in self-efficacy for nonviolence ($\beta_s = -.08, p = .022$) and beliefs supporting proactive aggression ($\beta_s = .08$ to $.09, p = .018$). Negative life events also accounted for a significant proportion of the variance in changes in self-efficacy for nonviolence ($\beta_s = -.06$ to $-.07, p = .029$). In contrast, victimization was not associated with subsequent changes in any of the belief variables after controlling for witnessing violence and negative life events. The three exposure variables as a set accounted for a significant portion of residual variance for self-efficacy for nonviolence ($pR^2 = .012$ to $.016$ across waves, $p < .05$) and for beliefs supporting proactive aggression ($pR^2 = .016$ to $.021, p < .05$), but not for beliefs against fighting ($pR^2 = .004$ to $.005, p = ns$).

Each of the three belief variables was uniquely associated with subsequent changes in physical aggression in the expected direction. Coefficients ranged from $-.05$ to $-.06$ ($p = .023$) for self-efficacy for nonviolence, from $-.06$ to $-.08$ ($p = .021$) for beliefs against fighting, and from $.08$ to $.09$ ($p = .035$) for beliefs supporting proactive aggression. The three belief variables accounted for a significant proportion of residual variance in physical aggression ($pR^2_s = .022$ to $.033$ across waves, $p_s = .015$), after controlling for the covariates, autoregressive effects, and the three exposure variables at the prior wave.

Bias-corrected bootstrap estimates of the total indirect effect indicated that the three belief variables mediated the effect of witnessing violence at waves 1 and 2 on changes in physical aggression at waves 3 and 4 ($\beta_s = .014$ and $.015$ 95% CIs= $[.005, .025]$ and $[.006, .028]$, respectively). There were also significant specific indirect effects through beliefs supporting proactive aggression ($\beta_s = .006$ and $.007$ 95% CIs= $[.001, .017]$ and $[.001, .088]$, respectively), and through self-efficacy for nonviolence across waves 2 to 4 ($\beta = .004$, 95% CIs= $[.001, .016]$). Although this provided support for the belief variables as mediators of the relation between witnessing violence and physical aggression, the direct effect of witnessing violence remained significant within this model ($\beta_s = .09$ to $.11, p = .037$), which suggested partial mediation. There were no significant indirect effects of victimization on physical aggression. There was a significant total indirect effect of negative life events on physical aggression through the belief variables across waves 2 to 4 ($\beta = .008$, 95% CIs= $[.001, .017]$), but this effect was not significant across waves 1 to 3 based on the confidence interval ($\beta = .007$, 95% CIs= $[.000, .015]$), and none of the specific indirect effects was significant.

We also examined correlations among the residual variances within each wave. These reflect shared variance among the variables within each wave not accounted for by variables at the prior wave or covariates. Residuals for physical aggression were significantly correlated with residuals for self-efficacy for nonviolence ($r = -.10$ to $-.16, p < .01$) and beliefs supporting proactive aggression ($r = .12$ to $.24, p < .001$), but not with beliefs against

fighting). Among the three belief variables, self-efficacy was significantly correlated with beliefs against fighting ($r = .11$ to $.15$, $p < .01$) and beliefs supporting proactive aggression ($r = -.11$ to $-.17$, $p < .01$). The beliefs against fighting measure was not significantly correlated with beliefs supporting proactive aggression.

Sensitivity analyses

We conducted sensitivity analyses to determine the consistency of findings across sex, grades, and intervention condition. This involved multiple group models in which we compared the fit of models that allowed all parameters to vary across groups to models in which all path coefficients (except for covariate effects) were held constant across groups (see Table 2). These comparisons did not reveal any significant differences in parameter estimates across sex ($\chi^2(35) = 44.28$, $p = .135$), grades ($\chi^2(70) = 86.51$, $p = .088$), or across intervention condition ($\chi^2(35) = 44.69$, $p = .126$).

Discussion

Although the relation between exposure to violence and physical aggression has been well established (Fowler et al., 2009), few studies have examined the processes through which exposure to violence influences physical aggression. This study addressed that gap by investigating adolescents' self-efficacy for nonviolence and beliefs about the use of aggression as mediators of the relations between exposure to violence and engaging in physical aggression. The findings indicated that different types of exposure had different pathways to physical aggression, and the role of beliefs was nuanced, with relations varying based on the specific beliefs (e.g., beliefs supporting proactive aggression, self-efficacy for nonviolence). These findings highlight the importance of evaluating the specific effects of witnessing violence and violent victimization, and considering multiple domains of beliefs.

Support was found for the role of self-efficacy for nonviolence, beliefs against fighting and beliefs supporting proactive aggression as underlying mechanisms by which witnessing violence exerts a positive influence on changes in physical aggression. These findings are in line with prior studies that have identified beliefs about aggression and self-efficacy for nonviolence as mediators of positive relations between exposure to violence and changes in physical aggression (e.g., Calvete & Orue, 2011; Guerra et al., 2003; McMahon et al., 2013). Once the effects of experiencing victimization and negative life events were accounted for, only self-efficacy for nonviolence and beliefs supporting proactive aggression demonstrated unique indirect effects, such that witnessing violence was associated with beliefs more supportive of proactive aggression and lower self-efficacy for responding non-violently to conflict, which in turn contributed to subsequent increases in the frequency of engaging in physical aggression. However, it is worth noting that witnessing violence maintained a positive direct effect on physical aggression suggesting that beliefs about aggression and self-efficacy represent only part of the mechanism through which witnessing violence influences the development and maintenance of adolescents' physical aggression. More work is needed to identify other individual-level and contextual factors that may underlie these relations. Although the indirect effects were small, this is not surprising given the short interval across waves and high stabilities and correlations among variables within each wave

(Adachi & Willoughby, 2015). This is further compounded indirect effects which are the product of coefficients.

Associations Between Exposure to Violence and Beliefs

Witnessing violence was inversely related to subsequent changes in beliefs against fighting, and positively related to subsequent changes in beliefs supporting proactive aggression. These effects remained evident even after controlling for victimization and negative life events. In contrast, victimization was positively related, but only to subsequent changes in beliefs supporting proactive aggression, and this relation was no longer significant after controlling for witnessing violence and negative life events. These results provide partial support for our first hypothesis, and are consistent with social-cognitive frameworks, which suggest that witnessing violence contributes to schemas and scripts that support the use of aggressive behavior (Huesmann, 1998). The absence of relations between witnessing violence and beliefs that fighting is sometimes necessary and beliefs supporting reactive aggression was surprising and could indicate that witnessing violence impacts beliefs about the use of instrumental aggression rather than retaliatory beliefs (e.g., “It is okay to fight someone if they call you names or tease you”). It is possible that certain beliefs about aggression may be more stable over time, and therefore less likely to be influenced by witnessing violence. For example, adolescents may hold beliefs that fighting is sometimes necessary that are shaped by other contextual factors (e.g., early family environment, parental messages about fighting, affiliation with deviant peers) so that by the time they enter middle school, exposure to violence no longer has a strong influence on these beliefs. Dusing et al (2019) found that witnessing violence was positively associated with subsequent retaliatory beliefs, but only when the witnessed violence involved family members (not friends or strangers) suggesting the personal relevance of the violence witnessed may also matter in shaping beliefs. Taken together, it seems that witnessing violence only influences some beliefs about aggression, underscoring the importance of differentiating between specific beliefs and exploring more details about the nature of the violence exposure in future studies.

The lack of unique relations between violent victimization and beliefs suggests that victimization does not impact social information processes to the same extent as does witnessing violence. Although social-cognitive theories have often been extended to forms of violence exposure other than witnessing (e.g., victimization, hearing about violence), some evidence suggests that victimization impacts other aspects of social information-processing, such as hostile intent attributions (Calvete & Orue, 2011; Dodge et al., 1990) and hostile social goals (Shanifar et al., 2001). However, findings from the current study indicate that beliefs about aggression are acquired through witnessing or observing community violence, not through direct victimization. Perhaps victimization alters youths’ perceptions of others’ intentions and behaviors or beliefs about the world more broadly, but not their beliefs regarding the acceptability of aggressive behavior.

As with witnessing violence, experiencing negative life events was positively associated with subsequent changes in beliefs supporting proactive aggression, suggesting that such events may influence social-cognitive processes in a similar way as witnessing violence.

Some of the negative life events measured by the UANLES include adult models of negative behavior (e.g., drug use) and knowledge of others engaging in violence (e.g., someone you know had a gun). These experiences may reinforce adolescents' beliefs that aggression is an acceptable way to get what they want. Experiencing negative life events was the only exposure variable associated with subsequent changes in beliefs supporting reactive aggression. Perhaps adolescent's exposure to events over which they have little control (e.g., family members' behavior) reinforces perceptions that others are a threat, which reinforces reactively aggressive beliefs. This notion is in line with prior work that found that negative life events were more strongly related to post-traumatic stress symptoms (e.g., hyperarousal) than either witnessing or being the victim of community violence (Thompson et al., 2020). These findings also underscore the importance of accounting for concurrent negative life events when investigating the extent to which exposure to violence impacts youths' beliefs and behavior.

Witnessing violence and negative life events were inversely associated with changes in self-efficacy for nonviolence, whereas victimization was not. This is in line with prior work, which found that witnessing violence was associated with lower self-efficacy to avoid violence (Thomas et al., 2016). It is possible that witnessing others being the victims of violence and experiencing negative life events decrease adolescents' self-efficacy for nonviolence because they have seen others respond nonviolently without success or have internalized the belief that aggression is necessary for survival in certain situations (e.g., someone at school has a gun). In contrast, violence victimization was not associated with changes in self-efficacy for nonviolence. Perhaps youth who are victimized attribute the victimization to forces outside of their control (e.g., external locus of control) and therefore this experience does not alter (either positively or negatively) their confidence in using nonviolent responses. This finding is inconsistent with prior work by McMahon et al (2009) who found inverse associations between violence exposure and self-efficacy for nonviolence. However, because they combined experiences of witnessing and victimization, it is possible that their effects were confounded.

Consistent with prior cross-sectional findings (Bettencourt & Farrell, 2013; Farrell et al. 2019) and social information processing theories (Crick & Dodge, 1994; Huesmann, 1998), all five belief variables were significantly correlated with physical aggression in the expected directions. Longitudinal models indicated that all belief variables were related to subsequent changes in physical aggression with the exception of beliefs that fighting is sometimes necessary. Moreover, the multivariate model indicated that self-efficacy for nonviolence and beliefs against fighting, were uniquely inversely related to changes in adolescents' frequency of physical aggression, and beliefs supporting proactive aggression was uniquely positively related to changes in adolescents' frequency of physical aggression. These findings are consistent with prior studies that have found longitudinal associations between beliefs and aggression (e.g., Guerra et al., 2003; McMahon et al., 2013; McMahon et al., 2009; Nash & Kim, 2007). Our results suggest that adolescents' behaviors are likely guided by both general beliefs as well as situation-specific beliefs about aggression (Farrell et al., 2008; Huesmann, 1998).

We found sex differences across several measures. Boys reported higher frequencies of both witnessing violence and victimization by violence compared with girls, which is consistent with prior studies assessing frequency of violence exposure (Finkelhor et al., 2015). Boys also reported less support for beliefs against fighting compared with girls. We did not, however find sex differences in self-efficacy for nonviolence or on the other measures of beliefs. This differs from some prior studies that have found sex differences in beliefs about aggression in elementary school students (e.g., Guerra et al., 2003). This may reflect age differences in that aggression might be considered adaptive and necessary for survival for adolescent boys and girls up in communities with high rates of violence (Farrell, Bettencourt, & Mehari, 2018).

Limitations.

Several limitations should be noted. All measures were based on adolescents' self-report of their beliefs, experiences, and behavior, which could have inflated the degree of associations between the measures due to shared method variance. Nonetheless, self-report is the most appropriate method for assessing beliefs. Adolescents may also be more accurate reporters of their experiences of violence and negative life events because parents and teachers observe adolescents in limited contexts where they are typically less likely to engage in aggression. Prior research also suggests that parents under-report adolescents' exposure to violence (Martinez & Richters 1993). Because early adolescents experience frequent changes during middle school, we examined changes across four observations within a single school year. These relations might play out differently across broader spans of time. Finally, because the focus of this study was on a specific population (i.e., a predominately African American sample of urban early adolescents), the findings may not generalize to adolescents in other settings. Adolescents growing up in neighborhoods with high rates of violence and a lack of resources are more likely to experience a range of adverse experiences and lack protective factors (e.g., access mental health care, positive youth development programs) compared to their peers (Foster & Brooks-Gunn, 2009). They may also face structural inequalities that block access to protective factors. The findings from our study regarding exposure to violence must therefore be considered within a broader range of factors that could potentially impact both adolescent aggressive behavior and social cognitive processes. Nonetheless, this population is an important group on which to focus given their high risk for violence exposure. Further work is needed with other sample of adolescents at risk for exposure to violence and negative life events.

Implications

The findings from this study reflect the adverse effects of exposure to community violence, particularly witnessing violence, on beliefs that shape adolescents' behavior. Social information processes, and beliefs about aggression in particular, are salient mechanisms in understanding relations between witnessing violence and subsequent physical aggression. The findings highlight differences in the effects of witnessing violence versus victimization and the importance of studying them as distinct constructs. They also suggest that the effects of witnessing violence should be considered within the broader context of other negative life events that influence adolescents' social-cognitive processes and engagement in aggression. Findings also underscore the importance of assessing specific beliefs about

aggression and non-violence as mechanisms of relations between witnessing violence and physical aggression. Beliefs appear to play an important, but incomplete role in explaining how witnessing violence contributes to physical aggression. More research is needed to identify other factors that help to explain these relations (e.g., emotion regulation, peer and parental factors) and to identify factors that explain relations between exposure to violence and other forms of aggression (e.g., relational and cyber aggression).

The findings from this study have implications for prevention and intervention efforts. They highlight the importance of screening for adverse childhood experiences like witnessing violence in order to help identify youth in need of further intervention (e.g., Glowa et al., 2016). They also suggest that prevention programs should address beliefs about aggression among adolescents who have witnessed violence or experienced negative life events. Although interventions should target multiple specific beliefs about aggression, focusing on beliefs supporting proactive aggression may have the greatest impact on adolescent aggressive behavior. Violence prevention programs should also focus on providing adolescents with effective nonviolent alternatives to aggression and supporting the practice of these strategies to bolster adolescent's sense of self-efficacy in enacting such responses when faced with conflict. Moreover, prevention programs should target a wider range of adverse life experiences that influence social cognitive processing such as structural inequalities given that racial and ethnic minority youth disproportionately reside in low-income neighborhoods with high rates of violence. Finally, although this study only investigated beliefs about aggression and self-efficacy, adolescents who have been exposed to violence would likely also benefit from interventions that target other stages of social information processing (e.g., cue interpretation, social problem-solving) to decrease engagement in aggressive behavior.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This study was funded by the National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, CDC Cooperative Agreement 5U01CE001956, National Institute of Justice, grant number 2014-CK-BX-0009, and National Institute of Child Health and Human Development grant number 1R01HD089994. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention, the National Institute of Justice, or the National Institute of Child Health and Human Development.

The following studies referenced in this article were based on analyses of longitudinal data collected from participants in the same 8-year project as the current study (Farrell et al., 2020; Thompson et al., 2020).

References

- Adachi P, & Willoughby T (2015). Interpreting effect sizes when controlling for stability effects in longitudinal autoregressive models: Implications for psychological science. *European Journal of Developmental Psychology*, 12(1), 116–128. <https://doi.org/ggh7xj>
- Bettencourt AF, & Farrell AD (2013). Individual and contextual factors associated with patterns of aggression and peer victimization during middle school. *Journal of Youth and Adolescence*, 42(2), 285–302. 10.1007/s10964-012-9854-8 [PubMed: 23160659]

- Calvete E, & Orue I (2012). The impact of violence exposure on aggressive behavior through social information processing in adolescents. *American Journal of Orthopsychiatry*, 81(1), 38. 10.1111/j.1939-0025.2010.01070.x
- Cohen J, Cohen P, West SG, & Aiken LS (2003). *Applied multiple regression/correlation analysis for the behavioral sciences*, 3rd Edition. Lawrence Erlbaum Associates.
- Crick NR, & Dodge KA (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin*, 115(1), 74–101. 10.1037/0033-2909.115.1.74
- Crick NR, & Dodge KA (1996). Social Information-Processing Mechanisms in Reactive and Proactive Aggression. *Child Development*, 67(3), 993–1002. <https://doi.org/bhng32> [PubMed: 8706540]
- Dodge KA, Price JM, Bachorowski JA, & Newman JP (1990). Hostile attributional biases in severely aggressive adolescents. *Journal of Abnormal Psychology*, 99, 385–392. 10.1037/0021-843X.99.4.385 [PubMed: 2266213]
- Dusing CR, DiClemente CM, Miller KM, Onyeka C, Murphy BN, Richards MH, & Moore AI (2019). Aggression among high-risk African American young adolescents: Impact of relational proximity to perpetrators of violence. *Psychology of Violence*, 9(6), 653–663. 10.1037/vio0000220
- Farrell AD, Bettencourt AF, & Mehari KR (2018). Beliefs about fighting and their relations to urban adolescents' frequency of aggression and victimization: Evaluation of the Beliefs About Fighting Scale. *The Journal of Early Adolescence*, 39(6), 785–813. 10.1177/0272431618791297 [PubMed: 31105373]
- Farrell AD, Erwin EH, Allison KW, Meyer A, Sullivan T, Camou S, Kliever W, & Esposito L (2007). Problematic situations in the lives of urban African American middle school students: A qualitative study. *Journal of Research on Adolescence*, 17, 413–454. 10.1111/j.1532-7795.2007.00528.x
- Farrell AD, Erwin EH, Bettencourt A, Mays S, Vulin-Reynolds M, Sullivan T, Allison KW, Kliever W, & Meyer A (2008). Individual factors influencing effective nonviolent behavior and fighting in peer situations: A qualitative Study with Urban African American adolescents. *Journal of Clinical Child & Adolescent Psychology*, 37(2), 397–411. 10.1080/15374410801955821 [PubMed: 18470776]
- Farrell AD, Gony EA, Sullivan TN, & Thompson EL (2018). Evaluation of the Problem Behavior Frequency Scale–Teacher Report form for assessing behavior in a sample of urban adolescents. *Psychological Assessment*, 30, 1277–1291. doi:10.1037/pas0000571 [PubMed: 29389173]
- Farrell AD, Mehari KR, Kramer-Kuhn A, & Gony EA (2014). The Impact of victimization and witnessing violence on physical aggression among high-risk adolescents. *Child Development*, 85(4), 1694–1710. 10.1111/cdev.12215 [PubMed: 24410717]
- Farrell AD, Sullivan TN, Gony EA, & Le AH (2016). Assessment of adolescents' victimization, aggression, and problem behaviors: Evaluation of the Problem Behavior Frequency Scale. *Psychological Assessment*, 28, 702–714. doi:10.1037/pas0000225 [PubMed: 26372261]
- Farrell AD, Sullivan TN, Sutherland KS, Corona R, & Masho S (2018). Evaluation of the Olweus Bully Prevention Program in an urban school system in the USA. *Prevention Science*, 19, 833–847. 10.1007/s11121-018-0923-4 [PubMed: 29948437]
- Farrell AD, Thompson EL, Curran PJ, & Sullivan TN (2020). Bidirectional relations between witnessing violence, victimization, life events, and physical aggression among adolescents in urban schools. *Journal of Youth and Adolescence*, 49(6), 1309–1327. 10.1007/s10964-020-01204-2 [PubMed: 32008134]
- Farrell AD, Thompson EL, Mehari KR Sullivan TN, & Gony EA (2020). Assessment of in-person and cyber aggression and victimization, substance use, and delinquent behavior during early adolescence. *Assessment*, 27(6), 1213–1229. 10.1177/1073191118792089 [PubMed: 30071749]
- Finkelhor D, Turner HA, Shattuck A, & Hamby SL (2015). Prevalence of Childhood Exposure to Violence, Crime, and Abuse: Results From the National Survey of Children's Exposure to Violence. *JAMA Pediatrics*, 169(8), 746. 10.1001/jamapediatrics.2015.0676 [PubMed: 26121291]
- Foster H, & Brooks-Gunn J (2009). Toward a stress process model of children's exposure to physical family and community violence. *Clinical Child and Family Psychology Review*, 12(2), 71–94. 10.1007/s10567-009-0049-0 [PubMed: 19434492]

- Fowler PJ, Tompsett CJ, Braciszewski JM, Jacques-Tiura AJ, & Baltes BB (2009). Community violence: A meta-analysis on the effect of exposure and mental health outcomes of children and adolescents. 10.1017/S0954579409000145
- Glowa PT, Olson AL, Johnson DJ (2016). Screening for adverse childhood experiences in a family medicine setting: a feasibility study. *Journal of the American Board of Family Medicine*, 29, 303–307. [PubMed: 27170787]
- Graham JW, Taylor BJ, & Cumsille PE (2001). Planned missing-data designs in analysis of change. In Collins LM & Sayer AG (Eds.), *Decade of behavior. New methods for the analysis of change* (p. 335–353). American Psychological Association. 10.1037/10409-011
- Guerra NG, Huesmann LR, & Spindler A (2003). Community violence exposure, social cognition, and aggression among urban elementary school children. *Child Development*, 74, 1561–1576. 10.1111/1467-8624.00623 [PubMed: 14552414]
- Huesmann LR (1998). The role of social information processing and cognitive schema in the acquisition and maintenance of habitual aggressive behavior. In Geen RG & Donnerstein E (Eds.), *Human Aggression* (pp. 73–109). Academic Press. 10.1016/B978-012278805-5/50005-5
- MacKinnon DP (2008). *Introduction to statistical mediation analysis*. Taylor & Francis Group/Lawrence Erlbaum Associates.
- Martinez P, & Richters JE (1993). The NIMH community violence project, II: children's distress symptoms associated with violence exposure. *Psychiatry*, 56, 22–35. 10.1521/00332747.1993.1102461 [PubMed: 8488209]
- McDonald CC, & Richmond TR (2008). The relationship between community violence exposure and mental health symptoms in urban adolescents. *Journal of Psychiatric and Mental Health Nursing*, 15(10), 833–849. <https://doi.org/c3jjg3> [PubMed: 19012675]
- McMahon SD, Felix ED, Halpert JA, & Petropoulos LAN (2009). Community violence exposure and aggression among urban adolescents: Testing a cognitive mediator model. *Journal of Community Psychology*, 37(7), 895–910. <https://doi.org/cgbtdf>
- McMahon SD, Todd NR, Martinez A, Coker C, Sheu C-F, Washburn J, & Shah S (2013). Aggressive and Prosocial Behavior: Community Violence, Cognitive, and Behavioral Predictors Among Urban African American Youth. *American Journal of Community Psychology*, 51(3/4), 407–421. 10.1007/s10464-012-9560-4 [PubMed: 23229395]
- Miller-Johnson S, Sullivan TN, Simon TR, & Multisite Violence Prevention Project (2004). Evaluating the impact of interventions in the Multisite Violence Prevention Project: Samples procedures, and measures. *American Journal of Preventive Medicine*, 26 (1S), 48–61. 10.1016/j.amepre.2003.09.015 [PubMed: 14732187]
- Muthén LK, & Muthén BO (2017). *Mplus User's Guide* (8th ed.). Los Angeles, CA: Muthén & Muthén.
- Nash JK, & Kim JS (2007). Patterns of change over time in beliefs legitimizing aggression in adolescents and young adults: Risk trajectories and their relationship with serious aggression. *Social Work Research*, 31(4), 231–240. 10.1093/swr/31.4.231
- Olweus D, & Limber SP (2010). Bullying in school: Evaluation and dissemination of the Olweus Bullying Prevention Program. *American Journal of Orthopsychiatry*, 80, 124–134. 10.1111/j.1939-0025.2010.01015.x [PubMed: 20397997]
- Richards MH, Romero E, Zakaryan A, Carey D, Deane K, Quimby D, Patel N, & Burns M (2015). Assessing urban African American youths' exposure to community violence through a daily sampling method. *Psychology of Violence*, 5(3), 275–284. 10.1037/a0038115
- Richters JE, & Saltzman W (1990). Survey of exposure to community violence: Self-report version. DOI: 10.13140/RG.2.2.13714.04808
- Sampson RJ, Raudenbush SW, & Earls F (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science*, 277, 918–924. <https://doi.org/bg5rs9> [PubMed: 9252316]
- Satorra A, & Bentler PM (2010). Ensuring positiveness of the scaled difference chi-square test statistic. *Psychometrika*, 75(2), 243–248. 10.1007/s11336-009-9135-y [PubMed: 20640194]
- Seidman E, & French SE (2004). Developmental trajectories and ecological transitions: A two-step procedure to aid in the choice of prevention and promotion interventions. *Development and Psychopathology*, 16(4), 1141–1159. <https://doi.org/dgxmkj> [PubMed: 15704831]

- Shahinfar A, Kupersmidt JB, & Matza LS (2001). The relation between exposure to violence and social information processing among incarcerated adolescents. *Journal of Abnormal Psychology*, 110(1), 136–141. 10.1037/0021-843X.110.1.136 [PubMed: 11261387]
- Sullivan TN, Farrell AD, Sutherland K, Behrhorst K, Garthe R, & Greene A (2021). Evaluation of the Olweus Bullying Prevention Program in U.S. urban middle schools using a multiple baseline experimental design. *Prevention Science*, 22, 1134–1146. 10.1007/s11121-021-01244-5 [PubMed: 33903977]
- Thomas A, Caldwell CH, Assari S, Jagers RJ, & Flay B (2016). You do what you see: How witnessing physical violence is linked to violent behavior among Male African American adolescents. *Journal of Men's Studies*, 24, 185–207.
- Thompson EL, Coleman JN, O'Connor KE, Farrell AD, & Sullivan TN (2020). Exposure to violence and nonviolent life stressors and their relations to trauma-related distress and problem behaviors among urban early adolescents. *Psychology of Violence*, 10(5), 509–519. 10.1037/vio0000264

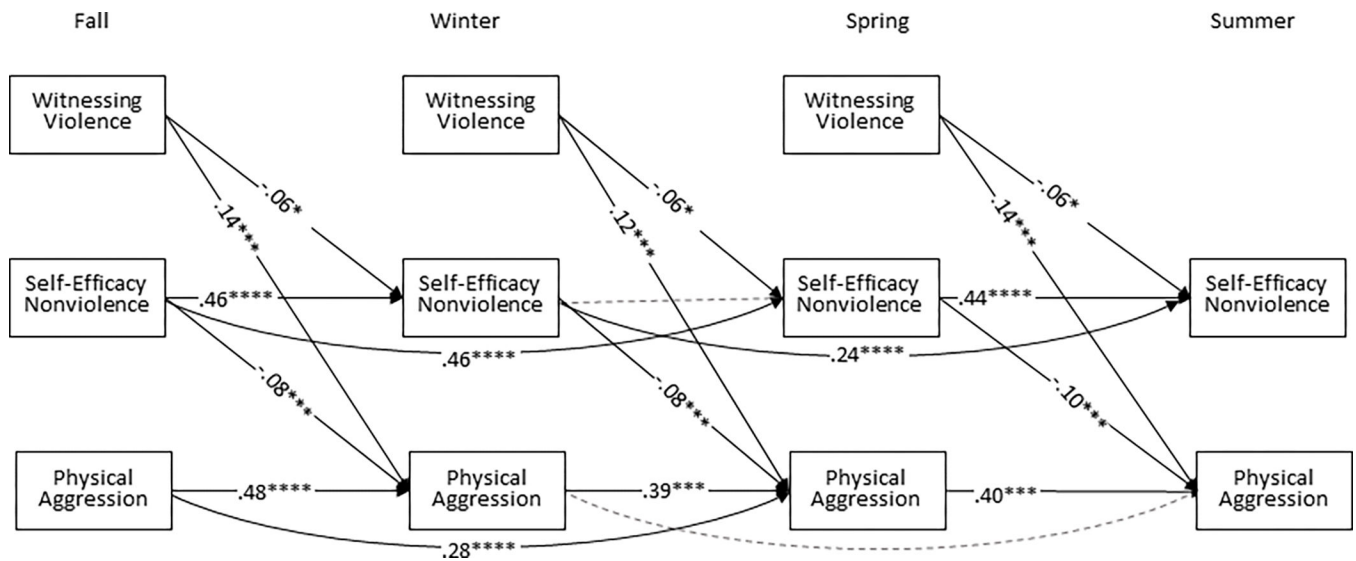


Figure 1: Standardized path coefficients for one-sided model representing self-efficacy for nonviolence as a mediator of the relation between witnessing violence and changes in physical aggression. Paths represented by dashed lines were included in the model, but were not significant at $p < .05$. Effects of covariates (sex, grade, and intervention status) on each variable, and correlations among residuals for variables within the same wave were included in the model, but are not shown. Witnessing violence was treated as an exogenous variable and was allowed to correlate with itself across waves, and with self-efficacy for nonviolence and physical aggression at the same wave and at all prior waves.

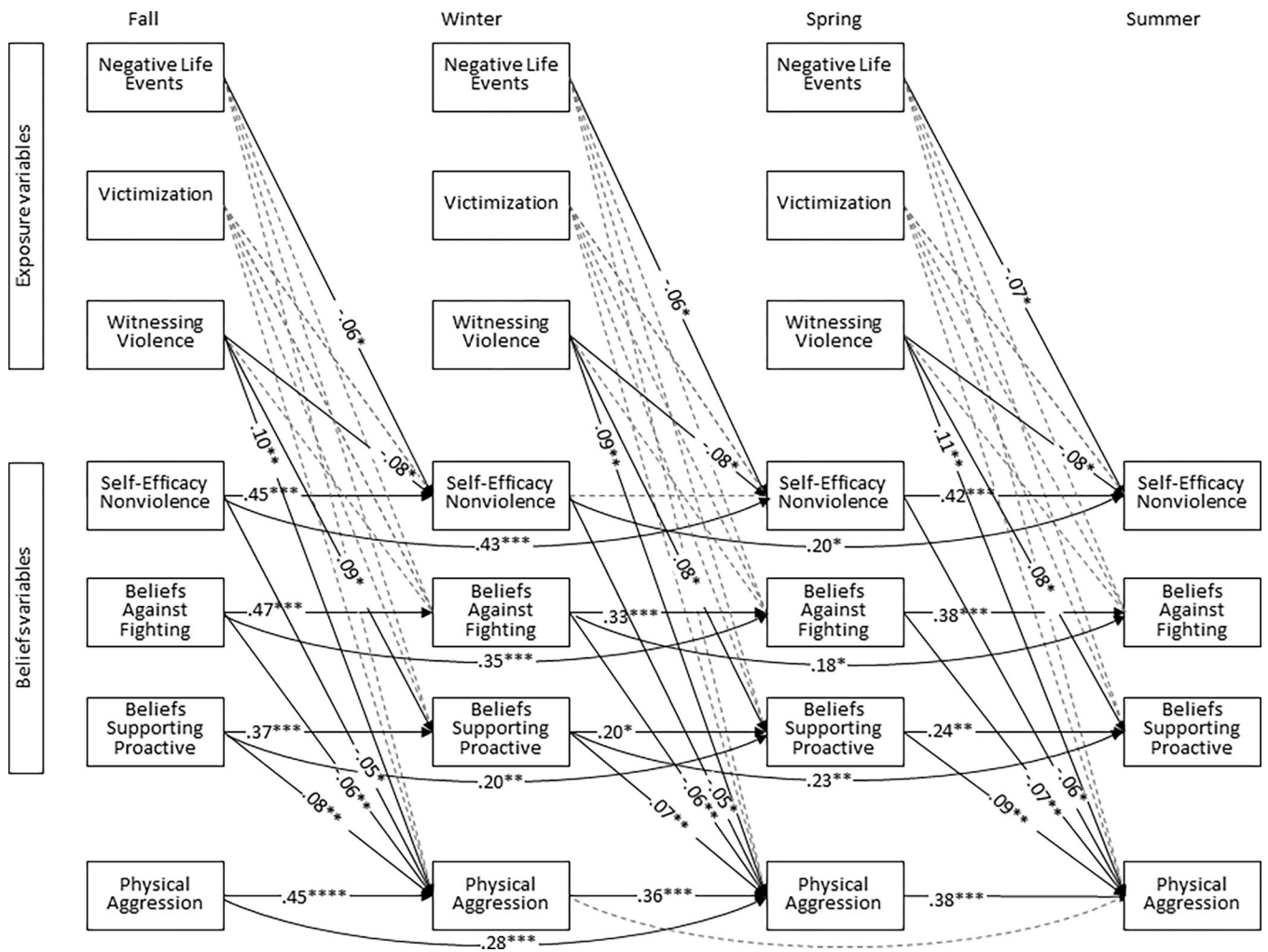


Figure 2: Standardized path coefficients for one-sided model representing belief variables as mediators of the relations between negative life events, victimization, and witnessing violence on changes in physical aggression. Paths represented by dashed lines were included in the model, but were not significant at $p < .05$. Effects of covariates (sex, grade, and intervention status) on each variable, and correlations among residuals for variables within the same wave were included in the model, but are not shown. The three exposure variables were treated as exogenous variables and were allowed to correlate with each other across all waves and with belief variables and physical aggression at the same wave and all prior waves.

Means, Standard Deviations and Correlations Among Wave 1 Variables (below the diagonal) and Wave 2 Variables (above the diagonal)

Table 1

	1	2	3	4	5	6	7	8	9	Mean	SD
1. Witness violence	.72***	.67***	.53***	-.11***	-.05	.15***	.24***	.26***	.53***	16.33	6.78
2. Victimization	.67***	.58***	.47***	-.05	-.08*	.07	.11**	.20***	.44***	12.83	4.90
3. Negative life events	.49***	.43***	.66***	-.11***	.08**	.24***	.21***	.17***	.48***	18.68	5.49
4. Self-efficacy for nonviolence	-.09**	-.02	-.12***	.47***	.17***	-.26***	-.41***	-.16***	-.22***	38.99	10.12
5. Beliefs against fighting	-.12***	-.15***	-.03	.13***	.51***	.36***	.02	-.03	-.13***	27.48	9.09
6. Belief fighting is sometimes necessary	.11**	.03	.14***	-.28***	.30***	.57***	.57***	.27***	.20***	24.63	8.98
7. Beliefs supporting reactive aggression	.14***	.04	.10**	-.37***	.02	.57***	.58***	.46***	.35***	20.23	8.43
8. Beliefs supporting proactive aggression	.15***	.18***	.15***	-.15***	-.09**	.22***	.41***	.41***	.34***	13.41	5.36
9. Frequency of physical aggression	.42***	.35***	.40***	-.23***	-.09**	.23***	.29***	.24***	.56***	13.90	5.54
Mean	17.10	13.06	19.46	39.90	28.32	25.31	20.51	13.45	13.98		
SD	7.33	5.14	5.55	9.58	8.78	9.05	8.60	5.41	5.39		
Mean differences (d-coefficients)											
Sex (male v female)	0.14**	0.25***	-0.09	0.11	-0.29***	0.02	0.00	0.08	-0.02		
Grade (7 v 6)	-0.19**	-0.13*	-0.08	-0.20**	-0.12	0.14*	0.13*	0.08	0.07		
Grade (8 v 6)	-0.20**	-0.18**	0.02	-0.28***	-0.19**	0.31***	0.32***	0.18*	0.21**		
Intervention v control status	-0.17**	-0.04	-0.11	-0.04	-0.06	-0.15*	-0.01	0.04	-0.10		

Note. N = 2,705. Values on diagonal (in bold) are stability coefficients representing correlations between Wave 1 and Wave 2 measures of each variable. Effect size estimates (d-coefficients) represent mean differences across groups at Wave 1.

* $p < .05$.

* $p < .01$.

* $p < .001$.

Table 2

Fit Statistics for Models Examining Beliefs as Mediators of the Relations Between Exposure to Violence Variables and Changes in Physical Aggression

Model	Description	χ^2	SCF	df	<i>p</i>	RMSEA	CFI	TLI
Beliefs as mediators of witnessing violence on physical aggression models								
WV1	Self-efficacy for nonviolence model	44.39**	1.30	23	.005	.019	.990	.958
WV2	Beliefs against fighting model	30.10	1.22	23	.147	.011	.997	.987
WV3	Fighting is sometimes necessary model	30.16	1.28	23	.145	.011	.997	.987
WV4	Beliefs supporting reactive aggression model	28.91	1.39	23	.183	.010	.998	.990
WV5	Beliefs supporting proactive aggression model	36.62*	1.45	23	.036	.015	.993	.971
Beliefs as mediators of victimization on Physical aggression models								
VIC1	Self-efficacy for nonviolence model	46.41**	1.33	23	.003	.019	.986	.941
VIC2	Beliefs against fighting model	27.08	1.29	23	.253	.008	.998	.990
VIC3	Fighting is sometimes necessary model	26.76	1.29	23	.266	.008	.998	.991
VIC4	Beliefs supporting reactive aggression model	26.80	1.44	23	.265	.008	.998	.991
VIC5	Beliefs supporting proactive aggression model	38.42*	1.47	23	.023	.016	.990	.957
Beliefs as mediators of negative life events on physical aggression models								
NLE1	Self-efficacy for nonviolence model	36.97*	1.16	23	.033	.015	.994	.972
NLE2	Beliefs against fighting model	28.63	1.09	23	.193	.010	.998	.99
NLE3	Fighting is sometimes necessary model	23.80	1.13	23	.415	.004	.999	.999
NLE4	Beliefs supporting reactive aggression model	32.96	1.23	23	.082	.013	.996	.982
NLE5	Beliefs supporting proactive aggression model	33.22	1.26	23	.077	.013	.995	.978
Multivariate models with witnessing, victimization and negative life events								
MV1	Initial model	305.63***	1.18	111	< .001	.025	.972	.899
MV2	AR2 effects added	200.78***	1.13	103	< .001	.019	.986	.945
MV3	Cross-var effects constrained across waves	233.66***	1.17	133	< .001	.017	.985	.956
Multivariate multiple group models by sex								
MSX1	Unconstrained across sex	381.76***	1.10	266	< .001	.018	.983	.953
MSX2	Constrained across sex	424.05***	1.15	301	< .001	.017	.982	.956
Multivariate multiple group models by grade								
MGR1	Unconstrained across grades	614.61***	1.05	399	< .001	.024	.971	.924
MGR2	Constrained across grades	694.37***	1.11	469	< .001	.023	.970	.932
Multivariate multiple group models by intervention status								
MTX1	Unconstrained across conditions	414.36***	1.11	266	< .001	.02	.98	.942
MTX2	Constrained across conditions	455.53***	1.16	301	< .001	.019	.979	.947

Note. *N* = 2,705. Multiple group constrained models held all effects except covariates constant across groups and waves. RMSEA = root mean square error of approximation, CFI = comparative fit index, TLI = Tucker-Lewis Fit index.

* *p* < .05.

*
 $p < .01$.

*
 $p < .001$.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 3

Standardized Regression Coefficients and Standard Errors (SE) for Across First Two Waves for the Model of all Three Belief Variables as Mediators of Relations Between Exposure Variables and Physical Aggression

Wave 1 predictors	Wave 2 Dependent variables							
	Self-efficacy for nonviolence		Beliefs against fighting		Beliefs supporting proactive aggression		Physical aggression	
	β	SE	β	SE	β	SE	β	SE
Male sex	.06*	.028	-.08**	.027	.00	.027	-.06*	.025
Grade 7	-.02	.033	-.06*	.031	.02	.031	.04	.028
Grade 8	-.03	.032	-.06*	.031	.04	.032	-.01	.029
Intervention condition	-.03	.029	-.15***	.027	-.03	.027	-.05*	.027
AR(1) ^a	.45***	.051	.47***	.046	.37***	.061	.45***	.048
R ² ^b	.213***	.047	.266***	.043	.151**	.048	.295***	.054
Witnessing violence	-.08*	.037	-.05	.033	.09*	.037	.10**	.035
Victimization	.07	.039	.01	.037	.03	.047	.02	.044
Negative life events	-.06*	.028	-.02	.026	.03	.029	.02	.025
Self-efficacy for nonviolence	<i>e</i>	<i>e</i>	<i>f</i>	<i>f</i>	<i>f</i>	<i>f</i>	-.05*	.022
Beliefs against fighting	<i>f</i>	<i>f</i>	<i>e</i>	<i>e</i>	<i>f</i>	<i>f</i>	-.06**	.019
Beliefs supporting proactive aggression	<i>f</i>	<i>f</i>	<i>f</i>	<i>f</i>	<i>e</i>	<i>e</i>	.08**	.029
Partial R ² ^c	.012*	.006	.004	.003	.021*	.009	.057***	.018

Note. N = 2,705. Coefficients represent regression of wave 2 variables listed in column headings on Wave 1 variables listed in row headings.

^aLag 1 autoregression of Wave 2 variable on its Wave 1 value.

^bProportion of variance accounted for by autoregressive effects and covariates.

^cProportion of residual variance (i.e., variance not accounted for by covariates and autoregressive effects) in beliefs measures accounted for by exposure to violence, and proportion of residual variance in physical aggression accounted for by exposure to violence and belief variables.

^eCoefficient for this variable reported under autoregressive lag 1 effect.

^fVariable not included in the model for this dependent variable.

* $p < .05$.

.100 > *p*
*
.10 > *p*
*

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript