

Media violence exposure and aggression in adolescents: A risk and resilience perspective

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Media violence exposure (MVE) is associated with aggressive outcomes in adolescents. However, based on the differential susceptibility hypothesis, this risk is expected to vary based on the individual's unique risk and protective factors. Using survey data from 1,990 adolescents (Mean age = 15.6 ± 1.10 years; 48% female) and content analysis of U.S. top-grossing films and popular TV shows, we evaluated the effect of MVE in relation to both risk (i.e., family conflict, impulsivity, sensation seeking) and protective factors (i.e., parental monitoring, parental involvement, parental mediation). Relative weights analyses revealed that MVE was one of the strongest predictors of aggression, after impulsivity and family conflict. The cumulative risk score showed a linear and quadratic relation with the likelihood of aggression, with MVE and family conflict having an interactive relation in predicting aggression. Parental monitoring remained a significant protective factor even when all risk factors were accounted for. Targeted preventive interventions that reduce family conflict, promote parental monitoring, and reduce exposure to violent media may be effective in reducing aggressive tendencies and related negative outcomes.

KEYWORDS

adolescents, aggression, family conflict impulsivity, media violence exposure, parenting behaviors

1 | MEDIA VIOLENCE EXPOSURE AND AGGRESSION IN ADOLESCENTS: A RISK AND RESILIENCE PERSPECTIVE

Adolescents in the United States spend an average of 4.5 hr per day watching TV (Rideout, 2016). Content analysis of popular TV shows and movies reveals that more than 60% of TV programming (Wilson et al., 2002) and 89% of films watched by adolescents in the United States contain violent content (Bleakley, Jamieson, & Romer, 2012). As violent imagery in TV and movies becomes more prevalent (Bushman, Gollwitzer, & Cruz, 2015), evidence from cross-sectional (Swing & Anderson, 2014), longitudinal (Gentile & Bushman, 2012; Huesmann, Moise-titus, Podolski, & Eron, 2003; Krahé & Möller, 2010), and meta-analytic studies (Bushman & Huesmann, 2006;

Krahé, 2014; Paik & Comstock, 1994) highlight the important role of media violence exposure (MVE) as a risk factor for aggressive outcomes (Anderson & Bushman, 2002). Here we use a risk and resilience approach to examine the effect of TV and movie violence exposure, the most common and well-researched type of MVE among adolescents (Strasburger & Wilson, 2014), and evaluate its role as a risk factor for adolescent aggression, as compared to other risk (i.e., family conflict, impulsivity, sensation seeking) and protective factors (i.e., parental monitoring, parental involvement, parental mediation). We also assess the durability of the MVE – aggression link when included with other predictors, and examine the effects of cumulative risk and protective factors. Finally, we test if the effects of risk and protective factors vary with adolescent age, gender, or race.

1.1 | TV and movie violence exposure and its effects on aggression

Aggression is broadly defined as behavior intended to harm someone (Bushman et al., 2016). Several longitudinal studies have documented effects of MVE on increases in aggressive tendencies in children and adolescents (e.g., Anderson, Bushman, Donnerstein, Hummer, & Warburton, 2015) that operate similarly across cultures (Anderson et al., 2017). For example, Huesmann et al. (2003) followed 6–10 years old children in the United States for 15 years and found that TV violence exposure predicted an increase in aggression during early adulthood. Krahé & Möller (2010) assessed reciprocal influences between MVE and aggression using a German sample of middle-schoolers followed for 2 years, and found evidence only for unidirectional effects with MVE predicting greater aggression over time. Besides physical aggression, other forms of aggression, such as bullying and cyberbullying, have also been linked to MVE (Fanti, Demetriou, & Hawa, 2012).

Most research examining the effect of MVE on aggression has focused on the unique effects of single risk factors, controlling for other predictors. While this research is valuable in establishing the significance of MVE as a risk factor, such risk factors do not operate independently, e.g., MVE effects on aggression can be exacerbated in the context of high levels of family conflict (Fikkers, Piotrowski, Weeda, Vossen, & Valkenburg, 2013). Thus, it is important to examine how MVE impacts aggression in relation to other risk (e.g., family conflict) and protective factors (e.g., parental monitoring).

Using a risk and resilience approach, Gentile and Bushman (2012) found that MVE was a strong predictor of aggression, relative to other risk factors such as hostile attribution bias, and parental media involvement, in a sample of 430 elementary school children. Further, the presence of multiple risk factors was associated with greater involvement in aggression than a single risk factor, and protective factors such as parental media involvement reduced the likelihood of aggression even in the presence of multiple risk factors. The present study uses a similar approach to examining the MVE-aggression link with a diverse set of risk and protective factors in a large, national sample of mid-late adolescents.

1.2 | Theoretical models for understanding the MVE-aggression link

Media can operate as a particularly strong socializing agent for adolescents, who given developmental needs of identity exploration and peer approval, will often imitate glamorous media characters (Arnett, 1995). Portrayals of violence in TV and movies are often unrealistic, associated with rewards, and lacking negative consequences (Strasburger & Wilson, 2014), which reinforces observational learning, making adolescents more likely to engage in similar real-life behavior. The differential susceptibility hypothesis posits that some adolescents may be more susceptible to MVE effects due to their unique set of risk and protective factors (Valkenburg & Peter, 2013). Empirical tests have found significant interactive effects

between MVE and family conflict (Fikkers et al., 2013), and between MVE and peer norms in influencing aggression (Fikkers, Piotrowski, Lugtig, & Valkenburg, 2016). These findings highlight the need to understand the effects of multiple risk and protective factors together as opposed to identifying the unique effect of one risk factor in isolation.

1.3 | Family influences on adolescent media use and aggression

Families are an important socializing agent for adolescents even though there is an increased reliance on peers during later adolescent years. The joint effects of family variables and MVE on aggression have only been examined in a Dutch longitudinal sample (Fikkers et al., 2013). The “double-dose” or interaction effect was found to be significant only in case of family conflict, possibly due to its content-similarity with MVE and aggression (Fikkers et al., 2013). Parental mediation was not found to moderate the effect on MVE on aggression (Fikkers, Piotrowski, & Valkenburg, 2017). Nevertheless, there could be other family variables besides family conflict, such as parental monitoring and parental involvement, that could operate in tandem with MVE (in a linear or interactive manner) to influence aggression, but this has not been examined.

Longitudinal (Padilla-Walker, Coyne, & Collier, 2016) and meta-analytic (Collier et al., 2016) research on parental mediation suggests that restrictive forms of parental mediation (e.g., forbidding access or setting rules regarding media use/content) can impact media use, but these strategies have little influence on aggression-related outcomes. Use of active mediation strategies (e.g., discussion of media content to facilitate better understanding and internalization of values) can have a protective influence on aggression by deglamorizing and contextualizing what children watch (Collier et al., 2016; Padilla-Walker et al., 2016). The effect of parental mediation also may be contingent on parenting style with autonomy-supportive styles promoting stronger internalization of rules (Valkenburg, Piotrowski, Hermanns, & de Leeuw, 2013).

The effects of media and parenting behavior can also vary based on adolescent age, gender, or race. For instance, restrictive parental mediation is less likely to be successful with older teens who are more autonomous in their decision-making (Padilla-Walker, Coyne, Kroff, & Memmott-Elison, 2018). Parental monitoring can be more protective among adolescent boys than girls (Borawski, levers-Landis, Lovegreen, & Trapl, 2003), and the effects of MVE can vary based on adolescent race (Bleakley et al., 2017a). Although the protective effect of parental monitoring and involvement has been reported for both White and Black youth, race differences in the effects of parental inputs have also been observed (Spriggs, Iannotti, Nansel, & Haynie, 2007).

1.4 | Personality risk factors

Theoretical models suggest that exposure to violent media increases aggressive behavior by exacerbating impulsive tendencies (Anderson & Carnagey, 2014). Swing & Anderson's (Swing & Anderson, 2014)

cross-sectional research with college undergraduates found that MVE was positively associated with impulsivity/attention problems, which in turn was linked to aggression, suggesting a mediational role of impulsivity. Other experimental (Hummer et al., 2010; Kronenberger et al., 2005) and longitudinal studies (Gentile, Swing, Lim, & Khoo, 2012) have also reported increases in impulsivity/attention problems and decreases in cognitive control after prolonged exposure to violent media content. Despite the salient role of impulsivity, few studies have examined its effect on aggression in relation to MVE and other risk and protective factors. Controlling for the effect of a theoretical mediator such as impulsivity when assessing MVE effects on aggression likely undermines the true association between the two variables. Therefore, we test the durability of the MVE-aggression link by systematically accounting for effects of competitor variables (e.g., family conflict), confounds (e.g., gender), and theoretical mediators (e.g., impulsivity). Sensation seeking has also been linked to violent media use (Slater, 2003) and found to moderate the effect of MVE on aggressive tendencies (Slater, Henry, Swaim, & Cardador, 2004); therefore, we also included it as a potential risk factor in our models.

1.5 | Research questions

We examined the effects of following four risk factors (i.e., MVE, family conflict, impulsivity, sensation seeking) and three protective factors (i.e., parental monitoring, parental involvement, parental mediation) on adolescent aggression.

RQ 1: (a) How does MVE compare with other risk and protective factors in predicting adolescent aggression? (b) How durable is the effect of MVE when included in the model with other competitor predictors (e.g., family conflict), mediators (e.g., impulsivity), and potential confounds (e.g., gender)?

We predicted that MVE will be a stronger predictor of adolescent aggression than parental influences, with the exception of family conflict (Gentile & Bushman, 2012). We expected significant interactions between MVE and family conflict (Fikkers et al., 2013), and between parental restrictive mediation and age (Padilla-Walker et al., 2018). We predicted that the effect of MVE on aggression will remain significant even when accounting for the effects of other risk and protective factors in our model.

RQ 2: What is the cumulative effect of multiple risk factors (i.e., MVE, family conflict, impulsivity, and sensation seeking) in predicting adolescent aggression? What is the nature of the relationship between the number of risk factors and the likelihood of aggression?

We predicted that MVE would be associated with an increase in aggression beyond the effect of other risk factors. We expected that each additional risk factor would be associated with an increase in aggression, and that there would be a linear and quadratic relationship between the number of risk factors and likelihood of aggression (Gentile & Bushman, 2012).

RQ 3: Do protective factors (i.e., parental monitoring, parental involvement, parental mediation) have protective effects on aggression even when accounting for all risk factors and covariates?

We expected all protective factors to have significant negative associations with the aggression outcome. In the case of parental restrictive mediation, we expected to find an interaction with age, such that parental mediation would only have a protective effect for younger adolescents, and might have a risk-enhancing effect for older youth (Padilla-Walker et al., 2018).

RQ 4: Are there differences in the effects of risk and protective factors based on adolescent age, gender (male vs. female), or racial identity (Black vs. White)?

Age, gender, and race-based differences were explored for all risk and protective factors individually. No a-priori hypotheses are specified.

2 | METHODS

This study uses data from a content analysis of popular entertainment media titles and an online survey administered to a sample of 2,424 adolescents aged 14–17 years, recruited from online opt-in panels through survey company GfK between November 13 and December 14, 2015. Most respondents (76%) were recruited through their parents; the remaining were recruited directly. The purpose of the larger study was to examine Black and White differences in media exposure and its effects on risk behaviors; therefore, Black adolescents were oversampled for a roughly equal sample of Black and White respondents. Given the sampling design and research focus, we selected the non-Hispanic Black ($n = 1,000$) and non-Hispanic White ($n = 990$) participants to be included in the current sample (total $n = 1,990$). Nearly half (47%) of the sample reported receiving free or reduced lunch at school.

2.1 | Content analysis

2.1.1 | Movie sample

The top 30-grossing movies of 2014 according to *Variety* magazine were selected as representing popular mainstream movies (e.g., *Guardians of the Galaxy*, *Captain America: Winter Soldier*, *Transformers Age of Extinction*). Black-oriented movies were defined as those in which Black actors comprised half or more of the main characters and/or the movie had a Black-oriented narrative (Schooler, Ward, Merriwether, & Caruthers, 2004; Sheridan, 2006). Of the top 500 movies for 2013 and 2014 (1,000 total), according to www.boxofficemojo.com, 33 were selected (e.g., *Baggage Claim*, *Fruitvale Station*, *Holla II*). The final sample included 29 mainstream movies and 34 Black-oriented movies (one film originally coded with mainstream movies (*Ride Along*) met the criterion for a predominately Black cast).

2.1.2 | TV show sample

Nielsen ratings estimates for adolescents aged 14–17 were used to determine the narrative television shows from the 2014–2015 season (from September 22, 2014 and June 28, 2015) that would be coded.

The lists were separated by Black and non-Black adolescents (Ellithorpe & Bleakley, 2016). The goal was to create separate lists of the top 30 shows watched by Black adolescents and non-Black adolescents (including primarily White viewers, but also Hispanic, Asian, and others). Old shows airing repeat episodes and syndicated shows were also included, but only when the number of repeats aired were equivalent to at least one season of that show (Bleakley et al., 2017b). Four shows appeared on both the top 30 list for non-Blacks and top 30 list for Blacks (e.g., *Empire*, *Family Guy*), thus 56 shows were coded (e.g., *NCIS*, *Modern Family*, *Blackish*, *The Walking Dead*). Episodes from the 2014–2015 season were coded, with the exception of a handful of shows in syndication or reruns (e.g., *How I Met Your Mother*) in which case the last season produced was coded. Either 3 or 5 episodes were randomly selected from each season for coding. If a show had 10 or fewer episodes in the 2014–2015 season, three episodes were randomly selected ($n = 5$, 8.9% of shows). If a show had more than 10 episodes that season, 5 episodes were randomly selected ($n = 47$, 83.9% of shows). If a show had a 15-min runtime, six episodes were selected to equate the amount coded to a half-hour show ($n = 4$, 7.1% of shows).

2.1.3 | Content coding procedures

The television and movie content were coded by trained coders in 5-min segments using a directed, quantitative, previously-validated coding scheme (Bleakley et al., 2012; Bleakley, Romer, & Jamieson, 2014). After multiple training sessions, the coders achieved inter-coder reliability for identifying the presence of each behavior as calculated by Krippendorff's alpha (Hayes & Krippendorff, 2007) using a separately validated test sample of 59 segments. Each segment was coded for the portrayal of violence. Violence was defined as "intentional acts where the aggressor makes or attempts to make some physical contact to inflict injury or harm" ($\alpha = 0.94$) (Yokota & Thompson, 2000).

2.2 | Online survey

2.2.1 | Media violence exposure (MVE)

Exposure to violent media content was calculated using content analysis of movies and TV shows and participants' exposure to film titles and TV shows. Content-specific exposure was operationalized by multiplying the proportion of segments for each film containing violent behavior by each participant's self-reported exposure to the film (indicated on the survey for whether they had seen each film: never (0), once (1), or more than once (2)) or television show (how often they watched each coded television show in the past year, on a scale from 0 = never to 3 = often). Using a previously tested approach (Bleakley et al., 2008; Bleakley, Hennessy, Fishbein, & Jordan, 2011), these scores were summed across all movie and all television titles, separately, to create a measure of violence exposure in movies and in television. The measures were then standardized and averaged to create a composite media violence exposure index (Cronbach's $\alpha = 0.77$).

2.2.2 | Aggression

This variable was assessed using three items: involvement in a physical fight, face-to-face bullying, and cyberbullying. Participants were asked if they had been involved in a physical fight in the past 6 months (Centers for Disease Control and Prevention, 2015). Response options ranged from 0 times (1) to 12 or more times (8); ($M = 1.48$ SD = 1.09). The variable was recoded to Yes (1)/No (0). Face-to-face bullying was assessed by asking about having threatened, teased, or spread rumors about someone (who is not the same strength or power) in the past 6 months. Response options included Yes (1)/No (0). Cyberbullying was assessed by asking about having threatened, teased, or spread rumors about someone (who is not the same strength or power) in the past 6 months electronically (i.e., through email, chatrooms, instant messaging, websites, or texting). Response options included Yes (1)/No (0). The three types of aggressive behavior were correlated at $r = 0.20 - 0.50$ ($KR - 20 = 0.53$). Since the MVE measure included in this study assesses TV and movie exposure, which can include different types of aggression, we modeled our aggression outcome as a combined measure of tendency to engage in aggressive behavior such as physical fighting, bullying, and/or cyberbullying. As such, the three dichotomous variables were combined to create a count outcome of aggression, ranging from 0 (no involvement) to 3 (involvement in all three aggressive behaviors).

2.2.3 | Family conflict

Family conflict was assessed using five items from the conflict subscale of the Family Environment Scale (Moos & Moos, 1994). Adolescents reported on a scale of 1 (never) to 4 (often), how often family members did the following things at home: (1) criticize each other, (2) hit each other, (3) curse, (4) argue, and (5) become so angry that they start throwing things at each other (Cronbach's $\alpha = 0.81$, $M = 2.02$ SD = 0.70).

2.2.4 | Parental monitoring

Perceived parental monitoring, or the extent to which an adolescent believes his or her parents knows their whereabouts/activities, was measured by eight items (e.g., "How often do your parents know what you do during your free time?") ranging from never (1) to always (5) (Cronbach's $\alpha = 0.92$, $M = 3.80$ SD = 0.94) (Kerr, Stattin, & Burk, 2010).

2.2.5 | Parental involvement

Adolescents' perceived parental involvement was assessed using three items for which the respondent indicated how often "my parents or the adults who takes care of me spend time just talking with me," "my family does something fun together," and "you eat dinner with your parents." All items were on a scale from (1) Never to (4) Almost every day, and were averaged to create a composite index (Cronbach's $\alpha = 0.77$; $M = 2.95$ SD = 0.79).

2.2.6 | Restrictive parental mediation

Adolescents were asked how often do your parents “forbid you from watching certain TV shows/movies because they have too much violence in them,” and “tell you that you are not allowed to watch TV shows/movies because they are meant for adults.” Response options ranged from Never (1) to Very often (5). Scores were averaged to a composite index (Cronbach's $\alpha = 0.87$; $M = 2.53$ $SD = 1.20$).

2.2.7 | Active parental mediation

Adolescents were asked how often do your parents tell you that “fighting and shooting in the media is different than it is in real life,” “what you see in movies and commercials is different than real life,” “people you see in the media are too harsh or rude to each other,” and “there is too much violence in the media.” Response options ranged from Never (1) to Very often (5). Scores were averaged to a composite index (Cronbach's $\alpha = 0.88$; $M = 2.89$ $SD = 1.13$).

2.2.8 | Impulsivity

Impulsivity was measured using nine yes/no items adapted from the Junior Eysenck Impulsivity Scale (Eysenck, Easting, & Pearson, 1984) (e.g., “Do you usually do and say things without stopping to think?”). Scores were averaged to create a composite index (Range: 0–1; $M = 0.47$ $SD = 0.31$; Cronbach's $\alpha = .80$).

2.2.9 | Sensation seeking

Sensation seeking was measured using four items (e.g., “I like to do frightening things”) representing each of the four dimensions (i.e., experience seeking, boredom susceptibility, thrill/adventure seeking, and disinhibition) of the Brief Sensation Seeking Scale (Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002). Responses were coded on a 5-point scale ranging from strongly disagree to strongly agree. Scores were averaged to create a composite sensation seeking score (Range: 1–5; $M = 3.29$ $SD = 1.00$; Cronbach $\alpha = .87$).

2.2.10 | Age, gender, and race

Adolescent self-reported age (14–17 years), gender (Male = 0, Female = 1), and race (White = 0; Black = 1) were included as direct predictors of the three outcomes and as moderators of family influences. Free lunch at school (an indicator of socioeconomic status (SES)) was included as additional covariate.

2.3 | Statistical analysis

Descriptive analyses were conducted using *t*-tests or chi-square as appropriate, and correlations among the model variables were assessed. For RQ 1, our goal was to establish the relative importance of MVE compared to other risk and protective factors. We tested this using two approaches: First, we used Johnson's relative weight

analysis to determine relative importance of each predictor, based on its unique contribution to the overall R^2 (Johnson, 2001). We also evaluated the probability of involvement in the aggression outcome at the highest and lowest values of each predictor and compared the relative strength of each risk and protective factor. Second, we used a “destructive testing” approach (Prot & Anderson, 2013), to evaluate the strength of the relationship between MVE and aggression, controlling for potential confounds (e.g., gender), competitor variables (e.g., family conflict), and theoretical mediators (e.g., impulsivity). Proposed interactions between risk/protective factors and MVE, and between MVE and covariates (age, gender, race) were included in the models when significant.

For RQ2, we transformed the four risk factors (i.e., MVE, family conflict, impulsivity, sensation seeking) into dichotomous variables (with participants in the top 25th percentile coded as 1) and summed them to create a cumulative risk index ranging from 0 (no risk factor present) to 4 (all 4 risk factors present), with presence of risk factor defined as being in the top 25th percentile. These procedures are similar to those employed in previous studies (e.g., Appleyard, Egeland, van Dulmen, & Sroufe, 2005; Gentile & Bushman, 2012). The group with four risk factors ($n = 22$) was combined with the three risk factors group due to low sample size. The final cumulative risk index ranged from 0 to 3, with 44% of the sample ($n = 869$) reporting no risk factor, 35% ($n = 697$) reporting one risk factor, 15% ($n = 302$) reporting two risk factors, and 6% ($n = 116$) reporting three or four risk factors. We examined the effect of this cumulative risk index as a predictor of adolescent aggression. Interaction effects between risk factors if present were included as separate predictors in the model.

Further, we examined whether MVE increased the risk for aggression beyond the presence of the other risk factors. This was done by creating “low risk” and “high risk” profiles for all risk factors. The “low risk” profile included the 5th percentile value for all risk factors, “high risk” included 95th percentile value on all risk factors. Next, we compared the predicted probabilities of aggression for low versus high risk on MVE for the low vs. high risk profiles for other risk factors combined, i.e., does high (vs. low risk) on MVE increase the predicted probability of aggression in both the low-risk group (comprised of low risk on family conflict, impulsivity, and sensation seeking) and the high-risk group (comprised of high risk on family conflict, impulsivity, and sensation seeking)?

For RQ3, we transformed the primary protective factors (i.e., parental monitoring, parental involvement, and parental active mediation) into dichotomous variables, with participants in the top 25th percentile coded as 1. The effects of these protective factors on aggression were assessed in relation to the cumulative risk index, both individually and as a composite ranging from 0 = no protective factor present (59%, $n = 1,161$), 1 = 1 protective factor present (27%; $n = 539$), 2 = 2 protective factors present (10%; $n = 208$), to 3 = all 3 protective factors present (4%; $n = 71$). The purpose of these analyses was to establish whether protective factors can have a significant effect (independent and cumulative) in the context of multiple risk factors. Parental restrictive mediation was not classified as a primary risk or protective factor because its effect can vary based on the age of

TABLE 1 Correlation matrix and means (SD) for study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Aggression													
2 MVE	0.24	-											
3 Family conflict	0.27	0.15	-										
4 Restrictive mediation	0.10	0.21	-0.05	-									
5 Active mediation	0.11	0.23	-0.03	0.71	-								
6 Parental monitoring	-0.15	0.02	-0.18	0.27	0.34	-							
7 Parental involvement	-0.08	0.09	-0.22	0.27	0.35	0.65	-						
8 Impulsivity	0.35	0.12	0.19	0.09	0.11	-0.17	-0.08	-					
9 Sensation seeking	0.20	0.16	0.13	-0.01	0.02	-0.09	-0.07	0.31	-				
10 Age	-0.02	-0.03	-0.01	-0.15	-0.06	-0.10	-0.08	-0.04	-0.02	-			
11 Gender (female = 1)	-0.11	-0.05	0.01	-0.01	-0.03	0.08	0.001	-0.04	-0.01	0.03	-		
12 Race (Black = 1)	0.02	0.25	0.11	-0.01	-0.06	-0.22	-0.20	0.003	-0.03	-0.001	0.03	-	
13 Free lunch at school	0.11	0.17	0.14	0.00	0.004	-0.11	-0.08	0.10	-0.01	-0.05	-0.02	0.27	-
Range;	0-3;	0-39;	1-4;	1-5;	1-5;	1-5;	1-4;	0-1;	1-5;	14-17;	0/1;	0/1;	
M	0.48	9.28	2.02	2.53	2.89	3.80	2.95	0.47	3.29	15.59	0/1;	50%	
(SD)	(0.80)	(6.23)	(0.70)	(1.20)	(1.13)	(0.94)	(0.79)	(0.31)	(1.00)	(1.10)	49%	47%	

MVE, TV and movie violence exposure.

Value significant at $p < 0.05$ are highlighted in bold.

the child (Padilla-Walker et al., 2018). Given the cross-sectional nature of our data, it is difficult to ascertain whether a positive association between restrictive mediation and MVE indicates a risk-enhancing effect of restrictive mediation, or a parental response to concerns of MVE. If a significant interaction between restrictive mediation and age was observed, its effect was examined separately.

For RQ4, age, gender, and race-based differences were explored systematically using two- and three-way interaction terms with mean centered variables (Jaccard & Turrisi, 2003). Each of the interactions was tested individually in a step-wise manner. Three-way interaction terms were explored only if there was a significant interaction between risk and protective factors (e.g., MVE and family conflict), with the goal of identifying whether the interactive effect of the risk/protective factors varied based on adolescent age, gender, or race. Given the count nature of our outcome variable, all models were estimated using poisson regression, in STATA 14.0 with robust estimation procedures.

3 | RESULTS

Bivariate correlations and descriptive statistics for study variables are in Table 1. At a bivariate level, there were no age or race-based differences in aggression. Girls were less likely to report higher levels of aggression than boys, $\chi^2 (df = 3) = 51.3, p < 0.001$.

RQ1: Using a relative weights analysis, we found that the risk and protective factors combined with the covariates explained 23.2% variance in the outcome variable. Three interactions were significant: MVE X Family conflict (Figure 1); Restrictive mediation X Age (Figure 2), and Parental monitoring X Race. These interactions were included in the relative weights analysis. The strongest predictors were impulsivity (7.8%), family conflict (4.5%), and MVE (3.5%), followed by sensation seeking (2.0%), parental monitoring (1.2%), MVE by family conflict interaction (0.01%), gender (0.008%), parental active mediation (0.007%), parental restrictive mediation (0.005%), SES (0.005%) and parental involvement (0.004%), restrictive mediation by age interaction (0.003%), race (0.002%), parental monitoring by race interaction (0.001%), and age (0.001%). The percentages reported above denote the variance explained by each risk/protective factor, controlling for other factors.

Next, we estimated the change in predicted probability of the outcome (aggression) for each predictor at its minimum and maximum value, keeping all other predictors constant at their median value. The percentage change in predicted probability of aggression when MVE was at its lowest vs. highest value was 54.3%. There was a similar change in predicted probability of aggression (54%) when impulsivity was at its highest versus lowest value. Change in predicted probability of aggression for the remaining variables (highest vs. lowest value) was as follows: 41% for family conflict, 30% for parental monitoring, 15% for sensation seeking, 13% for parental active mediation, 3.1% for parental restrictive mediation, and 3.1% for parental involvement. Thus, the change in predicted probability of aggression when a certain predictor was at its lowest versus highest value was strongest for MVE and impulsivity, followed by family conflict and parental monitoring.

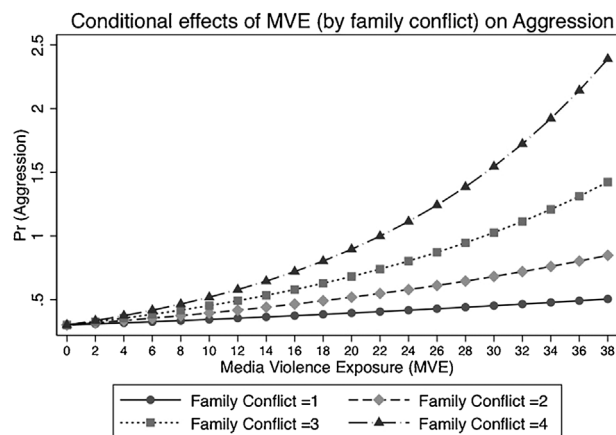


FIGURE 1 Interaction effects of media violence exposure (MVE) and family conflict on aggression

Further, we found that the association between MVE and aggression remained significant, even when including competitor variables (i.e., family conflict, other parental inputs), potential mediators (i.e., impulsivity, sensation seeking), and other covariates (i.e., age, gender, race). This analysis included testing of four separate regression models (see Table 2). In the first model, only MVE was included as a predictor of aggression. In the subsequent models, we added family climate, demographic covariates, and potential mediators, retaining all prior predictors in the model. Interactions between risk and protective factors if significant were retained. The theoretical mediators (i.e., impulsivity and sensation seeking) were added last to the model. In each of these models, the target link between MVE and aggression remained intact even when all the additional variables were included, suggesting a strong link between MVE and aggression.

RQ 2. For this set of analyses, we included the cumulative risk index as a predictor of the aggression outcome, along with individual protective factors and covariates. Each additional risk factor on the cumulative risk score was associated with an increase in the likelihood of involvement in aggressive behavior (see Table 3). Tests of the nature

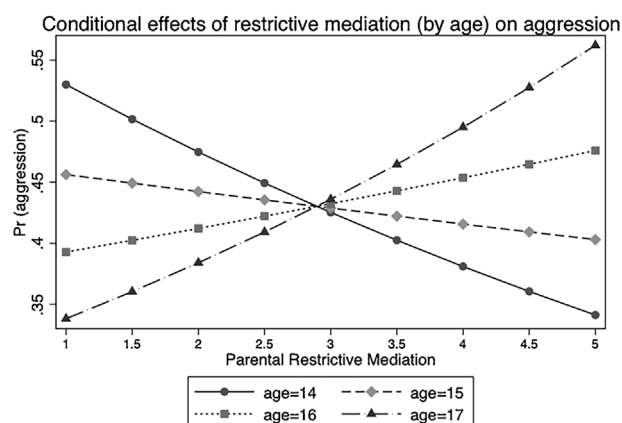


FIGURE 2 Interaction effects of parental restrictive mediation and adolescent age on aggression

TABLE 2 Regression estimates and standard errors from destructive testing approach testing “durability” of MVE's effect on aggression

Predictors	B (SE)	z-test, <i>p</i> -value
Model 1: MVE	0.05 (0.004)	10.96, <i>p</i> < 0.001
Model 2: MVE + family climate variables (i.e., family conflict, parental monitoring, parental involvement, parental active mediation, parental restrictive mediation) + interaction (family conflict × MVE)	0.06 (0.01)	4.52, <i>p</i> < 0.001
Model 3: MVE + family climate variables + covariates (i.e., age, gender, race) + interactions (family conflict × MVE; restrictive mediation × age; parental monitoring × race)	0.07 (0.01)	5.10, <i>p</i> < 0.001
Model 4: MVE + family climate + covariates + interactions + theoretical mediators (i.e., impulsivity, sensation seeking)	0.06 (0.01)	4.90, <i>p</i> < 0.001

MVE, Media Violence Exposure.

of relationship revealed a significant linear, χ^2 (*df* = 1) = 195.4, *p* < 0.001 and quadratic relation, χ^2 (*df* = 1) = 4.83, *p* = 0.03, between the number of risk factors and likelihood of aggression. Even when accounting for the effect of cumulative risk factors, there was a significant protective effect of parental monitoring. Restrictive mediation had a significant interaction with age, such that the effect of parental restrictive mediation was protective only at younger ages (age = 14 years), and risk enhancing at older ages (17 years) (see Figure 2). Parental active mediation exhibited a positive association with aggression, possibly due to competing effects given its strong correlation with restrictive mediation (*r* = 0.71).

In terms of predicted probabilities, we found that MVE increased the likelihood of aggression in both the low and high-risk groups defined by 5th versus 95th percentile on the remaining risk factors. Specifically, the marginal effects increased from 0.05 to 0.15 in the “low-risk” group when MVE value changed from low (5th) to high (95th). In the “high-risk” group, the marginal effects increased from 1.28 to 1.85 when MVE value changed from low to high. Thus, increase

in MVE was associated with an increase in predicted probability of aggression regardless of whether other risk factors were at low or high values, although the change in marginal effects was more pronounced in the “high-risk” group.

RQ 3. When including a cumulative resilience score as an additional predictor, we observed a linear relation between number of protective factors and likelihood of aggression, χ^2 (*df* = 1) = 6.79, *p* = 0.009, suggesting that there was a linear decline in aggression for each additional protective factor. The net effect of the resilience scale was significant, χ^2 (*df* = 3) = 9.15, *p* = 0.03 (see Table 4).

RQ 4. For each individual risk and protective factor, we examined whether their effect on aggression varied based on adolescent age, gender, and race. Age significantly moderated the effect of parental mediation such that the effect of parental mediation was significant and protective at age 14, *B* (SE) = −0.05 (0.02), *p* < 0.05, and significant and risk-enhancing at age 17, *B* (SE) = 0.05 (0.02), *p* < 0.05 (see Figure 2). Age did not moderate the effect of any other risk or protective factor. Gender did not moderate the effect of any risk or

TABLE 3 Poisson regression model with cumulative risk score and individual protective factors as predictors of aggression

	B (SE)	<i>p</i> -value	95% CI
Predictor variables			
Cumulative risk score			
1	0.70 (0.11)	<0.001	0.50, 0.91
2	1.23 (0.11)	<0.001	1.01, 1.44
3	1.61 (0.12)	<0.001	1.37, 1.86
Parental monitoring	−0.22 (0.05)	<0.001	−0.32, −0.13
Parental involvement	−0.04 (0.06)	=0.508	−0.15, 0.07
Parental active mediation	0.14 (0.05)	=0.002	0.05, 0.24
Parental restrictive mediation	−1.34 (0.38)	<0.001	−2.09, −0.60
Age	−0.25 (0.08)	=0.001	−0.40, −0.11
Parental restrictive mediation × age	0.09 (0.02)	<0.001	0.04, 0.14
Race (Black = 1)	−0.20 (0.08)	=0.008	−0.35, −0.05
Free/reduced lunch	0.21 (0.08)	=0.006	0.06, 0.36
Gender (female = 1)	−0.28 (0.07)	<0.001	−0.42, −0.13

TABLE 4 Poisson regression model with cumulative risk score and cumulative resilience score as predictors of aggression

	<i>B</i> (SE)	<i>p</i> -value	95% CI
Predictor variables			
Cumulative risk score			
1	0.76 (0.11)	<0.001	0.55, 0.96
2	1.30 (0.11)	<0.001	1.09, 1.51
3	1.75 (0.12)	<0.001	1.51, 1.99
Cumulative resilience score			
1	-0.11 (0.08)	=0.20	-0.27, 0.06
2	-0.32 (0.13)	=0.02	-0.58, -0.05
3	-0.40 (0.17)	=0.02	-0.75, -0.06
Parental restrictive mediation	-1.27 (0.39)	=0.001	-2.03, -0.50
Age	-0.23 (0.08)	=0.003	-0.39, -0.08
Parental restrictive mediation × age	0.09 (0.03)	<0.001	0.04, 0.14
Race (Black = 1)	-0.14 (0.07)	=0.05	-0.29, 0.002
Free/reduced lunch	0.23 (0.08)	=0.003	0.08, 0.39
Gender (female = 1)	-0.29 (0.07)	<0.001	-0.44, -0.15

TABLE 5 Poisson regression estimates for individual risk and protective factors and interaction effects

Predictor variables	<i>B</i> (SE)	<i>p</i> -value	95% CI
MVE	0.06 (0.13)	0.000	0.04, 0.09
Family conflict	0.52 (0.08)	0.000	0.37, 0.68
Impulsivity	1.48 (0.13)	0.000	1.21, 1.74
Sensation seeking	0.13 (0.04)	0.000	0.06, 0.21
Parental monitoring	-0.28 (0.07)	0.000	-0.41, -0.15
Parental involvement	-0.03 (0.06)	0.650	-0.14, 0.09
Parental active mediation	0.10 (0.05)	0.035	0.01, 0.18
Parental restrictive mediation	-1.20 (0.36)	0.001	-1.91, -0.49
Age	-0.22 (0.07)	0.002	-0.36, -0.08
Gender (female = 1)	-0.28 (0.07)	0.000	-0.41, -0.14
Race (Black = 1)	-0.72 (0.27)	0.009	-1.25, -0.18
Free/reduced lunch	0.13 (0.07)	0.076	-0.01, 0.28
Interaction effects			
MVE × family conflict	-0.01 (0.005)	0.008	-0.02, -0.003
Restrictive mediation × age	0.08 (0.02)	0.001	0.03, 0.12
Parental monitoring × race	0.16 (0.07)	0.03	0.01, 0.30

MVE, Media Violence Exposure.

protective factor. Race significantly moderated the effect of parental monitoring, such that the protective effect of parental monitoring on aggression was stronger among White youth, B (SE) = -0.28 (0.07), $p < 0.001$; 95% CI = -0.41 , -0.15 , than Black youth, B (SE) = -0.12 (0.06), $p = 0.04$; 95% CI = -0.24 , -0.01 . There were no significant three-way interactions. Regression estimates for all predictors and interaction terms can be found in Table 5.

4 | DISCUSSION

MVE emerged as a strong risk factor for aggression, and its effect remained robust controlling for a range of predictor variables (e.g., family conflict), confounds (e.g., gender), and theoretical mediators (e.g., impulsivity). MVE and family conflict had an interactive effect in influencing the likelihood of aggression, such that the risk-enhancing effect of MVE was amplified in the context of high family conflict (Fikkers et al., 2013). The cumulative risk score showed both a linear and a quadratic trend in relation to aggression.

Perceived parental monitoring had a direct protective effect on aggression, even when accounting for several risk factors, suggesting that parental supervision and knowledge of whereabouts can reduce opportunities for engaging in aggressive behavior, regardless of levels of MVE or impulsivity. Parental monitoring could also reflect more involved parents who can reduce risk through other channels not examined in this study, such as lower rates of deviant peer involvement. Positive parental involvement, however, did not have a significant effect, possibly due to its strong correlation with monitoring ($r = 0.65$). Of the two variables, monitoring had greater reliability ($\alpha = 0.92$ vs. 0.77).

Parental active mediation was found to be positively associated with aggression in our sample. Past research suggests that the effect of active mediation is not direct as it does not necessarily reduce the exposure to violent media but instead moderates the effects of violent media by deglamorizing and contextualizing it (Fikkers et al., 2017). We failed to detect a moderating effect of active mediation on the MVE-aggression link. This is consistent with other studies that suggest that parental mediation effects (especially active mediation) should be interpreted in the context in which these conversations are happening. For instance, active mediation in the context of autonomy-supportive parenting style is associated with lower MVE and aggression (Fikkers et al., 2017; Padilla-Walker et al., 2016). This could be one reason why we failed to detect a protective effect of parental active mediation. Another reason could be competing effects with restrictive mediation which was included as a separate predictor.

Parental restrictive mediation was negatively associated with aggression among younger adolescents, and positively associated with aggression in case of older youth. Restrictive mediation tends to decline from early to late adolescence (Padilla-Walker et al., 2018), hence the use of restrictive mediation with older youth likely represents a more atypical approach where parents are trying to enforce strict rules regarding media use that are likely to backfire. The positive association could also reflect parental responses to youth who

are already displaying high levels of MVE and aggression. Conceptually, restrictive mediation should operate by reducing exposure to violent media (Fikkers et al., 2017). However, given our cross-sectional data we could not test this potential mediational pathway.

Impulsivity (or lack of self-control) and sensation seeking were also significant predictors of aggression. Conceptually, impulsivity and sensation seeking should be modeled as potential mediators of MVE effects on aggression as opposed to additional predictors (Rohrer, 2018). However, given the cross-sectional nature of our data (Maxwell & Cole, 2007), and the focus on understanding the MVE-aggression link in the context of other risk/protective factors, we included them as separate predictors.

The following limitations should be noted when interpreting these results. First, we only examined effects of TV and movie violence exposure; other forms of interactive media, including videogames, internet, and social media, were not assessed. Nevertheless, the participants in our study reported 5–6 hr of TV and movie time on average; hence this was a relevant medium to examine for this sample. Second, the cross-sectional nature of our findings limits our ability to test directionality of effects or examine mediational pathways of influence. Furthermore, family processes examined here likely have bidirectional relations with adolescent behaviors including media use, which can only be tested using longitudinal data.

Our findings suggest that MVE is an important risk factor for aggression in adolescents, and that it operates in tandem with other risk and protective factors. The effect of MVE on aggression can be exacerbated in the context of family conflict, and the presence of multiple risk factors can increase risk for aggression in additive and interactive ways. Parental monitoring can have a protective effect even when accounting for multiple risk factors. Targeted preventive interventions that help reduce exposure to violent media content, strengthen self-regulation, and promote parental monitoring, could be effective in reducing adolescent aggression and related negative outcomes.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

ETHICAL APPROVAL

All procedures involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. All procedures were

approved by the University of Pennsylvania Institutional Review Board. This article does not contain any studies with animals performed by any of the authors.

INFORMED CONSENT

Informed consent was obtained from all individual participants included in the study.

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