

# The Relation of Violent and Criminal Behavior in Adolescents and Young Adults to Childhood Habitual Exposure to Media Violence

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Although numerous laboratory experiments over the last 60 years have shown that exposure to filmed or video game violence causes an increase in the likelihood of aggressive behavior in the observer or player shortly afterwards, and a few prospective longitudinal studies have shown that adult aggressive behavior is predicted by childhood exposure to media violence, no experiments and only a few longitudinal field studies have examined the association between childhood exposure to media violence and serious physical or criminal violence later in life. This paper reports on two recent non-experimental studies that test these relations using participants' retrospective recall of childhood media use. The first study reports new analyses of data from a previously published study of moderate to high risk adolescents. The analyses demonstrate that the violence in the TV programs or video games that the adolescents retrospectively report were their favorites in childhood predicts the likelihood of their behaving seriously physically violently when they are teenagers. The second study uses newly collected data on prisoners to demonstrate that the violence in the TV programs or video games that the prisoners retrospectively report were their favorites in childhood predicts the likelihood that, if imprisoned in young adulthood, they would be imprisoned for a violent crime as opposed to a non-violent crime. Multiple regression analyses show that these relations are unlikely to be due to the participants' retrospectively reported childhood preferences for media violence being confounded with their sex, educational achievement, parents' income or exposure to violence in their environment.

Violence | Media | Crime

Recent exhaustive narrative reviews<sup>1</sup>, meta-analytic reviews<sup>2,3,4,5,6,7</sup> and statements by scientific organizations<sup>8,9</sup> have concluded that exposure to media violence (on TV, in movies, on computers, or while playing violent video games) is a significant risk factor for later increased aggressive behavior, or in the case of Ferguson's studies<sup>6,7</sup>, presented information consistent with that conclusion even while disagreeing with the conclusion. For example, Calvert, et al.<sup>4</sup> in summarizing the APA's task force's meta-analyses of video game research state that:

"The research demonstrates a consistent relation between violent video game use and increases in aggressive behavior, aggressive cognitions, and aggressive affect and decreases in prosocial behavior, empathy, and sensitivity to aggression (page 11)", and "We concluded that violent video game use has an effect on aggression. This effect is manifested both as an increase in negative outcomes such as aggressive behavior, cognitions, and affect and as a decrease in positive outcomes such as prosocial behavior, empathy, and sensitivity to aggression (page 16)."

However, as the APA Task Force on Violent Media also reported, the research conducted and reviewed in this area has included only a few studies that provided data on the criterion outcomes of the greatest interest to the public – namely, very serious aggressive behavior that would qualify as criminally violent behavior. They<sup>4</sup> wrote,

"Although the media and the public often ask about the association between violent video game use and delinquency or violence, only one of the 31 studies (published since 2009) we reviewed included delinquency or violence as an outcome. Thus, too little research has addressed these outcomes to reach a conclusion." (p. 9).

Much the same is true of research attempting to relate childhood exposure to TV or film violence to later serious and criminal violence. There are good reasons for the dearth of research on whether media violence (be it video game violence, TV violence, or movie violence) affects criminally and seriously violent behavior. The ideal field research to examine early causes of criminally violent behavior would be a prospective longitudinal study of a representative sample of the population conducted over 10 or more years from childhood to young adulthood. Several such prospective longitudinal field studies that were cited in the recent APA technical report<sup>4</sup> or the Anderson et. al, 2003 review<sup>1</sup> have shown that greater exposure to TV violence or violent video

## Significance

Although multiple laboratory experiments have demonstrated that exposure to media violence causes a subsequent increase in mild aggressive behavior, and several longitudinal field studies have reported data consistent with this finding, only a few prospective longitudinal studies with small samples have reported evidence suggesting that exposure to media violence increases the risk of serious physical and criminal violence. This paper reports on two recent non-experimental studies with larger samples that show that violence of children's favorite media, reported retrospectively, correlates with the likelihood of their behaving violently (punching, beating, choking, cutting, shooting or threatening such) as teenagers, and the likelihood that, if imprisoned in young adulthood, they will be imprisoned for a violent crime rather than a non-violent one.

Reserved for Publication Footnotes

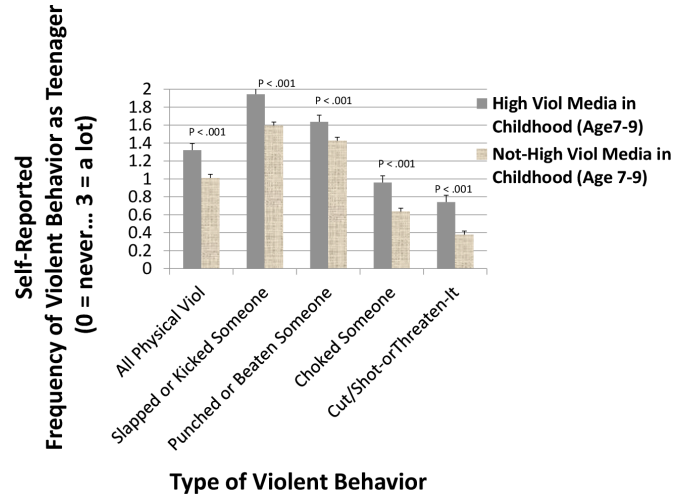
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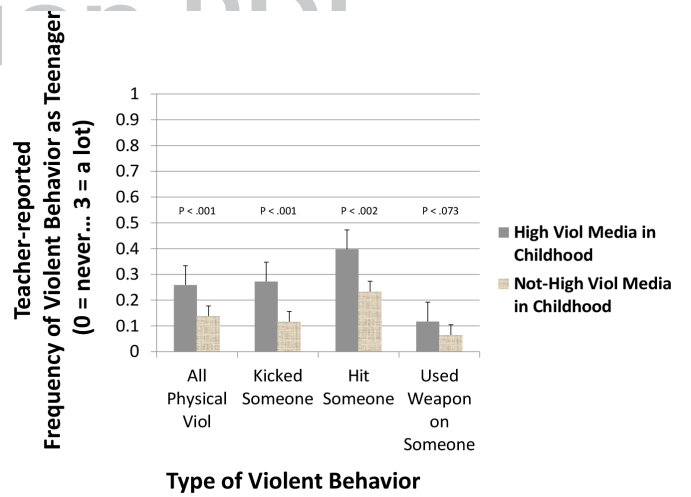
**Table 1. The correlations between the violence in youths' favorite childhood media (TV programs, video games, and movies) when they were 7 to 9 years old and their serious violent behavior when they were teenagers as well as with other relevant variables.**

	Mean (SD)	Correlation with Violence of Youth's Favorite Childhood Media (at Age 7 to 9)
<b>Self-reported Teenage Violent Behaviors (n = 812)</b>		
Freq Overall Physical Violence <sup>a</sup> (Ave of 4 scores)	1.09 (0.81)	0.26***
"How Often Slapped or Kicked Someone"	1.68 (1.04)	0.15***
"How Often Punched or Beaten Someone"	1.48 (1.14)	0.24***
"How Often Choked Someone"	0.72 (0.98)	0.26***
"How Often Cut or Shot Someone or Threatened To Do It To Them" <sup>a</sup>	0.48 (0.90)	0.18***
<b>Teacher-reported Teenage Violent Behaviors (n = 706)</b>		
Overall Physical Violence <sup>a</sup> (Ave if 3 scores)	0.17 (0.41)	0.12**
"How often hit someone <sup>a</sup> "	0.27 (0.60)	0.12**
"How often kicked someone <sup>a</sup> "	0.16 (0.47)	0.13**
"How often used a weapon on someone <sup>a</sup> "	0.08 (0.33)	0.08*
<b>Control Variables</b>		
Youth's Sex ( F = 0; M = 1) (n = 820)	60.4% M	0.47***
Youth's Age when interviewed (n = 820)	16.2 (1.34)	-.04
Youth's WRAT standardize score (n = 809)	86.0 (14.0)	0.05
Parents' Income (n = 699) <sup>b</sup>	4.19 (2.66)	-.07 <sup>+</sup>
Youth's Childhood Expos to Neighborhood Viol (n = 806) <sup>c</sup>	1.67 (1.12)	0.13***
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<b>Violence of Youth's Favorite Childhood Media (n = 810)<sup>d</sup></b>	2.12 (0.70)	1.00

Notes: <sup>a</sup>Scale is 0 = Never, 1 = Once, 2 = A few times, 3 = A lot;  
<sup>b</sup> Scale is 1 = \$10,000 - \$20,000, 2 = \$20,000 - \$29,999, ... 9 = \$90,000 and up  
<sup>c</sup> Scale is 0 =no exposure ... 4 = exposure to many violent situations  
<sup>d</sup> Scale is 0 = "no visible violence" ... 4 = "high visible violence"  
<sup>+</sup>p < .10 \*p < .05, \*\*p < .01, \*\*\*p < .001 (two-tailed probabilities)



**Fig. 1.** The frequency of self-reported violent behaviors during the teen years is higher for those teenagers who had been in the upper quartile ("High") on preference for violent media when they were 7 to 9 years old.



**Fig. 2.** The frequency of teacher-reported violent behaviors during the teen years is higher for those teenagers who had been in the upper quartile ("High") on preference for violent media when they were 7 to 9 years old.

games in childhood predicts greater risk for *physical aggression* 3 to 15 years later<sup>10,11,12,13,14,15</sup>. However, few such *prospective longitudinal* studies have investigated criminally violent behavior, because criminally violent behavior occurs at a very low rate in the population. For example, given that the murder rate in the USA is about 5 per 100,000; one would need to sample 400,000 individuals to expect to find even 20 children who grow up to be murders.

Nevertheless, two of the prospective longitudinal studies mentioned above have provided some suggestive data relating childhood exposure to media violence to increased risk of later criminally aggressive or violent behavior. One spanned 15 years and showed for a representative sample of 329 children in the Chicago area that there were significant relations between a child's exposure to TV violence between 6 and 10 years old and their criminal and violent behavior 15-year later when they were between 21 and 25<sup>12</sup>. In that study the researchers reported that the amount of early violent television viewing by a child was a significant predictor of them behaving seriously violently as a young adult (e.g., punching, beating, or choking another adult, physically attacking a spouse) and for boys was a significant risk factor for

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**Table 2. Predicting serious physically violent behavior in teenagers from the violence in their favorite media (TV programs, films, and video games) when they were 7 to 9 years old controlling for other factors**

Predictor	Standardized Effect on Self-reported Violent Behavior of Teenager $\beta$	Significance	Standardized Effect on Teacher-reported Violent Behavior of Teenager $\beta$	Significance
Sex (0 = female, 1 = male)	.05	t = 1.24, n.s.	-.05	t = 0.99, n.s.
Violence of Favorite Media in Childhood (Age 7-9)	.17***	t = 4.20, p < .001	.14**	t = 2.46, p = .014
Intellectual/Academic Skills	.04	t = 1.16, n. s.	-.10*	t = 2.29, p = .023
Parents' Income Level	-.14***	t = 3.65, p < .001	-.03	t = 0.78, n.s.
Exposure of Child to Neighborhood Violence	.30***	t = 8.17, p < .001	.23***	t = 5.39, p < .001
	R <sup>2</sup> = 0.181 (n = 675)	F(5,670) = 29.5, p < .001	R <sup>2</sup> = 0.092 (n = 582)	F(5,577) = 11.7, p < .001

Notes: \*p < .05, \*\*p < .01, \*\*\*p < .001

them being convicted of a crime in Illinois. These relations held even when demographic and parental factors were statistically controlled. In the other study of 748 children growing up in semi-rural New York<sup>11,15</sup>, the researchers found the amount of TV violence a child watched at age 8 was significantly correlated with the seriousness of any crimes for which they were arrested by age 30 even when early aggressiveness, IQ, and SES were statistically covaried out.

Although both these studies suggest that exposing children to media violence increase the risk that they will commit criminal violence as adults, both of these studies also have deficits. Neither included violent video game play in their assessment of exposure to media violence (only exposure to TV violence), and only a small number of males in each study had state conviction records for serious crimes by the time of the final data collection, limiting the impact of the findings.

One alternative to a prospective longitudinal study that can achieve a greater sample of individuals who commit serious criminally violent behavior is to sample from a population whose members have already committed such behaviors and obtain data retrospectively on key factors in their childhood environment including their exposure to violence. Of course, such a study does have significant threats to the validity of its conclusions. First, the participants' self-perceptions of their current behaviors and environment or current self-image may influence what they remember and say about their prior media use. This threat cannot be dismissed, but it can be minimized with appropriate retrospective recall methodologies as some studies of media effects have already shown<sup>16,17</sup>. Second, if a significant correlation is found between retrospectively reported childhood exposure to violence and later violent behavior, there is no way to determine from the cross-sectional data whether exposure is stimulating behavior, behavior is stimulating exposure, or some unknown psychological propensity is stimulating both reports of exposure to violence in childhood and later violent behavior. Nevertheless, the knowledge that there is an association between retrospectively reported media violence exposure in childhood and criminally violent behavior in adulthood would be a valuable addition to our scientific knowledge, particularly when combined with the existing findings from experiments and prospective longitudinal studies suggesting that media violence exposure in childhood stimulates later aggressive behavior<sup>10,11,12,13,14</sup>.

In this paper we report on two studies of this type in which we sampled from populations who were at high risk for having committed delinquent or criminally violent acts, assessed their current violent behaviors or criminal justice status through both official records and self-reports, and assessed their prior exposure to media violence and their prior behaviors through retrospective self-reports.

#### Study 1: New Analyses of Data from the Michigan High-Risk Adolescent Study

In Study 1 we reanalyze some of the data collected on adolescents as part of the Michigan High-Risk Adolescent Study<sup>16</sup>. In a previously published report about these data we derived a latent construct of teenage violent behavior based on data from multiple sources and showed it was related positively to a dichotomous media violence exposure 'risk' variable. For this current paper, we use correlation and regression analyses with continuous scales of serious violent behavior and of exposure to media violence; so the analyses can be better paralleled in Study 2 below with new data we have collected on adult prisoners.

#### Study 1: Methods

**Participants.** For Study 1, as reported previously<sup>16</sup>, we interviewed 820 adolescents, with sampling divided about evenly between a population of adolescents attending high schools (n = 430) in rural, suburban, and urban moderate-risk communities in Michigan (M age = 16.83 years, SD = 0.71; 45.9% racial/ethnic minority; 51.6% female) and a higher-risk population of adolescents (n = 390) who were adjudicated delinquents detained in county and state juvenile justice facilities in Michigan (M age = 15.55 years, SD = 1.53; 45.1% racial/ethnic minority; 26.4% female). High schools and delinquency facilities within an hour drive of Ann Arbor, MI were invited to participate, and the first ones that agreed were used. All participants and their parents provided written informed consent for participation in the study.

**Procedures.** All procedures (including recruitment procedures) were approved by the university institutional review board (IRB) regulating the implementation of the study, the state agency overseeing the state detention facilities, the federal Office of Human Research Protections, the IRB of the Centers for Disease Control, and the principals or directors of all schools and detention facilities involved in the project. All participants and the participants' parents provided written informed consent for participation in the study.

**Table 3. The correlations between the violence in prisoner's favorite childhood media (TV programs, video games, and movies) when they were 7 to 9 years old, their violent behaviors before they were imprisoned, whether they were imprisoned for a violent crime or non-violent crime, and some control variables.**

	Mean (SD)	Correlation with Violence of Prisoner's Favorite Childhood Media (at Age 7 to 9)
<b>Self-reported Violent Behaviors before Prison (n = 330)</b>		
Freq Overall Physical Violence <sup>a</sup> (Ave of 4 scores)	1.30 (0.94)	0.18**
"How Often Slapped or Kicked Someone <sup>a</sup>	1.77 (1.15)	0.06
"How Often Punched or Beaten Someone <sup>a</sup>	1.78 (1.17)	0.18**
"How Often Choked Someone <sup>a</sup>	0.76 (1.07)	0.14*
"How Often Cut or Shot Someone or Threatened To Do It To Them" <sup>a</sup>	0.87 (1.13)	0.23***
<b>Crime for which Imprisoned (n = 321)</b>		
Violent or Non-Violent Crime (1 = violent, 0 = non-violent)	0.49 (0.50)	0.32***
<b>Control Variables</b>		
Prisoner's Sex ( F = 0; M = 1) (n = 333)	55.3% M	0.53***
Prisoner's Educational Achievement <sup>b</sup> (n = 331)	7.00 (2.26)	0.03
Prisoner's Childhood Expos Neighborhood Viol <sup>c</sup> (n = 326)	1.51 (1.24)	0.13*
-		
<b>Violence of Prisoner's Favorite Childhood Media<sup>d</sup> (n = 315)</b>	1.62 (0.72)	1.00

Notes: <sup>a</sup>Scale is 0 = Never, 1 = Once, 2 = A few times, 3 = A lot;  
<sup>b</sup> Scale is 1 = 1<sup>st</sup> grade or less ... 10 = graduated from college."  
<sup>c</sup> Scale is 0 = no exposure ... 4 = exposure to many violent situations  
<sup>d</sup> Scale is 0 = "no visible violence" ... 4 = "high visible violence"  
<sup>\*</sup>p < .10 <sup>\*\*</sup>p < .05, <sup>\*\*\*</sup>p < .01, <sup>\*\*\*\*</sup>p < .001 (two-tailed probabilities)

We conducted extensive one-on-one interviews of the participants, and shorter interviews with their parents/guardians (of 728 youth), and the teachers/institutional-staff (of 717 youth) who dealt with them. We obtained self-reports from the participants and reports from their teachers or institutional staff on the frequency of their recent serious violent behaviors. From the participants we also collected information on their childhood media violence exposure using a guided recall procedure described below under measures. We obtained reports from parents on basic demographic information. More details are provided in SI.

All statistical analyses were done with the SPSS22 statistical package.

*Measures.*

*Violent media consumption.* From the youth we collected information on their childhood media violence exposure using a retrospective guided-recall procedure in which we asked participants to think back to when they were in the 2<sup>nd</sup> or 3<sup>rd</sup> grade. After they answered some general questions that required them to think back about what was happening in their lives at that time, we asked them to tell us what their three favorite TV programs were (if they watched TV), what their three favorite video games were (if they played video games), and what their three favorite movies were that they saw in theaters or on TV. If they seemed uncertain about any response, they were asked if they were sure about the response. If they were not or they could not provide a response, no response was recorded.

All the TV programs, video games, and movies named were rated reliably on a common scale for violent content by a cadre of raters who were required to be familiar with any title they rated. Inter-rater reliabilities as indicated by the inter-rater alpha coefficients<sup>24</sup> were high: .99 (television shows and video games) and .98 (films). A score was then computed for the "violence of each participant's favorite childhood media" by computing the average of the violence ratings of all the titles each participant named. More details are given in SI.

*Violent behavior.* Serious violent behavior in this study was defined as slapping or kicking someone, punching or beating someone, choking someone, or cutting or shooting someone or threatening to cut or shoot them.

1) *Serious physical aggression – youth report.* Participants completed the 4-item Severe Physical Aggression Scale<sup>12</sup>. Youth made ratings along a 4-point scale (0 = never... 3 = a lot) to indicate how often they have engaged in serious physically aggressive acts (e.g., "How often since you have been a teenager have you punched or beaten someone?"). The list of items is shown in Table 1. The scale composite is the mean of all 4 items ( $\alpha = .80$ ).

2) *Serious physical aggression – teacher/staff report.* In Study 1 teachers and juvenile justice facility staff answered 5 questions about each participant's behavior, or which 3 represented questions about seriously violent behavior. e.g., "How often has NAME used a weapon against a child or adult?" or "How often has name hit a child or adult?" or "How often has name kicked a child or adult?" Each score was transformed to a 0 to 3 range to match the range of the self-report of violence scales. The scale composite is the mean of all 3 items ( $\alpha = .87$ ).

*Control Covariates.*

1) *Demographics.* In Study 1 the participants reported their gender and age, and their parent who was interviewed reported their family income.

2) *Intellectual/Educational achievement.* To provide a broad index of educational achievement, youth in Study 1 of completed the Arithmetic subtest of the Wide Range Achievement Test, Third edition<sup>27</sup>. This test has high internal consistency reliability with adolescents, i.e.,  $\alpha = 0.85$ .

3) *Parents' income.* In Study 1 the interviewed parents were asked to tell us their total yearly income which was then coded

**Table 4. Predicting whether young adult prisoners are imprisoned for violent or non-violent crimes from their self-reports of violence in their favorite childhood media (TV programs, films, and video games) controlling for other factors**

Predictor (Self Reports)	Odds Ratio	Significance
Sex (0 = female, 1 = male)	1.88	p < 0.035
Ave Violence of Favorite Media in Childhood (Age 7-9) (0 = no visible violence ... 4 = high visible violence)	2.04	p < 0.001
Prisoner's Educational Achievement (1="≤6 <sup>th</sup> grade" ...10="graduated from college.")	1.05	n. s.
Prisoners' Exposure to Neighborhood Viol in Childhood (0 = none ... 4 = all types listed)	1.24	P < .045

on a ten point scale ranging from 1 = \$10,000 to \$19,000 to 9 = \$90,000 or over..

4) *Exposure to Neighborhood Violence.* Participants completed the 4-item neighborhood violence subscale of Attar, Guerra, and Tolan's<sup>28,29</sup> Stressful Urban Life Events scale (see also Guerra, Huesmann, & Spindler, 2003). Similar to the media exposure measures, youth responded to the neighborhood violence items with respect to childhood through a guided recall procedure. Youth indicated (0 = *no*, 1 = *yes*) whether they have been exposed to four specific indicators of neighborhood violence validated by Attar, Guerra, and Tolan<sup>28</sup> (e.g., "Have you seen anyone beaten, shot, or really hurt by someone?"). Scores are sums of the 4 indicators and have modest but acceptable internal consistency ( $\alpha = .58$ ) for a 4-item dichotomous scale.

More details on measures are given in SI.

#### Study 1: Results

Table 1 shows the means and standard deviations for the variables analyzed. Table 1 also shows the bivariate correlations between the mean violence of a youths' favorite media when they were 7 to 8 years old (as reported retrospectively) and the frequency of violent behaviors they committed when they were teenagers as reported by themselves and by the teacher/staff member who was interviewed about the teenager. One can see that the violent content of a youth's favorite media as reported retrospectively is significantly related to every type of seriously violent behavior that was assessed.

A detailed examination of scatter plots suggested that the youth who had the highest childhood media violence scores were particularly prone to teenage violent behavior. Consequently, in Figure 1 we examined the mean differences in the various types of violent behavior of those teenagers who were in the highest quartile on childhood media violence compared to the rest of the teenagers. One can see from the figure that indeed the children in the highest 25% on childhood media violence scored significantly higher on every type of teenage violent behavior we assessed than children who had been in the lower 75%.

The correlations in Table 1 also suggest that some of the control variables (e.g., sex, parents' income, and exposure to neighborhood violence) could possibly account for the correlations between childhood media violence viewing and teenage violent behavior because they are significantly correlated with childhood media violence scores and likely to be related to aggressive behavior. To test whether these control variables could account for the relations, we computed two multiple regressions, one predicting youths' self-reported teenage violent behavior and one predicting youths' teacher-reported teenage violent behavior from the overall violence of their retrospectively reported favorite media in childhood. In both regressions we included the covariates of sex, parental income, teenager's academic performance,

and the neighborhood violence to which they were exposed during childhood. The results are shown in Table 2. One can see that the significant relation of media violence exposure in childhood with teenage violent behavior remains when these other factors are covaried out. Childhood exposure to neighborhood violence does have a larger predictive relation with teenage violent behavior than does childhood exposure to media violence, but it does not account for the relation of childhood media violence with the teenagers' violent behaviors.

#### Study 2: The Indiana Adult Prisoner Study

In Study 2 we interview a sample of young-adult incarcerated prisoners and obtain self-reports about their recent violent behaviors and retrospective self-reports about their childhood exposure to violent media with measures and procedures as similar as possible to those used in Study 1. In addition we obtain justice system records on the crimes for which they have been imprisoned. We use these data to examine the relation between young adult violent behavior and retrospectively reported childhood exposure to media violence with analyses similar to those used in Study 1.

#### Study 2: Methods

##### Participants.

The participants for this study were 149 prisoners in an Indiana state prison for males and 184 prisoners in an Indiana state prison for females (F = 55.3%). The prisons were the first ones that volunteered to participate when we contacted them. The prisoners who participated in each prison were the ones who gave written consent.

##### Procedures.

All the prisoners were interviewed one-on-one by trained staff on using procedures mostly identical to those used with the incarcerated delinquents in Study 1. They were interviewed alone in a room at the facility in which they were incarcerated. All participants gave written informed consent and were given small compensations. We also collected data from the prison on the crime for which the prisoner was incarcerated. All procedures (including recruitment procedures) were approved by the institutional review boards (IRB) of the investigators universities, the state agency overseeing the state detention facilities, the federal Office of Human Research Protections, the IRB of the Centers for Disease Control, and the directors of the detention facilities involved. See SI for more information.

##### Measures.

*Violent media consumption.* Violent childhood media consumption was assessed identically as in Study 1 with guided retrospective recall of favorite media. See SI for more information.

*Violent behavior.* Serious violent behavior in this study was defined identically to Study 1 as slapping or kicking someone, punching or beating someone, choking someone, or cutting or shooting someone or threatening to cut or shoot them.

681 1) *Serious violent behavior – self report.* This was assessed with  
682 the same 4 questions and scale as in Study 1. However, the time  
683 frame for the questions was altered; so they were reporting on  
684 how often they had committed each act during the year before  
685 they were incarcerated. The scale score was computed as the  
686 mean of all 4 items ( $\alpha = .80$ ) shown in Table 3.

687 2) *Convictions for violent crimes – prison records.* Of the 333  
688 prisoners who participated, we were able to determine from  
689 facility records whether they were imprisoned for a violent crime  
690 or a non-violent crime for 321 of them. We found that 158 were  
691 imprisoned for a violent crime ( $F = 39.9\%$ ) and 163 were impris-  
692 oned for a non-violent crime ( $F = 68.1\%$ ). The criminally violent  
693 behaviors for which the prisoners were convicted included murder,  
694 voluntary manslaughter, robbery resulting in serious bodily  
695 injury, kidnapping, rape, battery, battery to a child resulting in  
696 death, carjacking, and child molestation. The criminal convictions  
697 classified as non-violent included drug offenses, forgery, and  
698 burglary. More information on the exact crimes is given in SI.

#### 699 *Control Covariates.*

700 1) *Demographics.* In Study 2 the gender of the participant  
701 was obtained from the prison to which they had been assigned,  
702 but their age was not available.

703 2) *Intellectual/Educational achievement.* It was not possible  
704 to give WRAT test used in Study 1 to the prisoners in Study 2.  
705 Instead, we asked them how far they went in school and coded  
706 their responses on a ten point scale ranging from 1="6<sup>th</sup> grade or  
707 less" to 10="graduated from college."

708 3) *Parents' income.* In Study 2 valid reports of the participants'  
709 parents' income could not be obtained.

710 4) *Exposure to Neighborhood Violence.* As in Study 1 partic-  
711 ipants in Study 2 completed the 4-item neighborhood violence  
712 subscale of Attar, Guerra, and Tolan's<sup>27, 28</sup> Stressful Urban Life  
713 Events scale.

714 More details on measures are given in SI.

#### 715 **Study 2: Results**

716 Table 3 shows the means and standard deviations for the  
717 variables analyzed in this results section. Table 3 also shows the  
718 bivariate correlations between the mean violence of a youths' fa-  
719 vorite media when they were 7 to 8 years old and the self-reported  
720 frequency of violent behaviors they committed in the year before  
721 they were imprisoned as well as the type of crime for which they  
722 were imprisoned. One can see that the violent content of their  
723 retrospectively-reported favorite media is significantly positively  
724 correlated with the frequency of most types of seriously violent  
725 behavior that were assessed and positively predicts whether they  
726 were imprisoned for a violent crime or a non-violent one. Higher  
727 media violence scores in childhood were significantly correlated  
728 with committing more violent acts before being imprisoned and  
729 significantly predictive of, if imprisoned, being imprisoned for a  
730 violent crime.

731 The correlations in Table 3 also suggest that some of the  
732 control variables (e.g., sex and exposure to neighborhood vio-  
733 lence) could possibly account for the positive correlation between  
734 childhood media violence and being imprisoned for a violent  
735 crime because they are significantly correlated with childhood  
736 media violence scores and are likely to be related to violent  
737 behavior. To test whether these control variables could account  
738 for the relation between childhood exposure to media violence  
739 and being imprisoned for a violent crime, we computed a logistic  
740 regression predicting whether the participant, if imprisoned, was  
741 imprisoned for a violent or non-violent crime from the overall  
742 violence of their retrospectively-reported favorite media in child-  
743 hood with the covariates of their sex, educational achievement,  
744 and the neighborhood violence to which they were exposed during  
745 childhood in the equation. The results are shown in Table 4.  
746 One can see that the significant positive relation of childhood  
747 media violence with being imprisoned for a violent crime remains  
748

when these other factors are covaried out. A one-unit increase in  
the average violence of the prisoner's favorite childhood media  
on the scale of 0 = "no visible violence" to 4 = "high visible  
violence" doubles the odds of the prisoner being imprisoned for  
a violent crime rather than a non-violent crime (Odds-ratio =  
2.04). Exposure to neighborhood violence when a child also has  
a significant positive association with the odds that the prisoner  
will be imprisoned for a violent crime (Odds ratio = 1.24), but it is  
smaller and does not account for the relation between childhood  
media violence exposure and imprisonment.

#### 759 **Discussion**

760 The results of the two studies reported here show that the violence  
761 of children's favorite media titles (TV programs, Movies, Video  
762 Games) when they were 7 to 9 years old as retrospectively self-  
763 reported years later is a significant predictor of their seriously  
764 violent behavior as a teenager and young adult and for being  
765 imprisoned for a violent crime as opposed to a non-violent one.  
766 If we assume that the retrospective reports of favorite media in  
767 childhood are reasonably valid and that children use their favorite  
768 media more than any other, then we can view the results as a  
769 confirmation that habitual exposure to media violence in child-  
770 hood is correlated with behaving seriously violently and criminally  
771 violently as a teenager and young adult.

772 Although a child's sex and exposure to neighborhood vio-  
773 lence in childhood have significant relations to their exposure  
774 to media violence in childhood and likely to their later violent  
775 behavior and chances of being imprisoned for a violent crime,  
776 our regression analyses showed that the associations of childhood  
777 media-violence-exposure with teenage violent behavior and adult  
778 criminal violence cannot be accounted for by the youth's sex or  
779 exposure to neighborhood violence, or by their family income,  
780 or educational achievement. This conclusion from the regression  
781 analyses is enhanced by the fact that the scale covariates (aca-  
782 demic skills, parents' income) were measured with high reliability,  
783 and the neighborhood violence variable, which is not a scale but  
784 an index, significantly predicted both adolescent violent behavior  
785 and being imprisoned for a violent crime.

786 It is admittedly possible that the obtained associations could  
787 be due to the retrospective reports of favorite media being invalid  
788 because they were influenced by the participants' current self-  
789 perceptions or self-identity. We think this is unlikely for several  
790 reasons. First, prior studies have shown that retrospective guided-  
791 recall reports of childhood media use<sup>17, 18</sup> have some validity.  
792 Second, the guided recall procedure we used is likely to make the  
793 participants really think about the time frame of interest and not  
794 provide a response if they are not sure. Third, the participants are  
795 not asked about whether they were exposed to "violent media"  
796 in childhood, but rather asked what were their favorite media;  
797 so they would have to know what media during their childhood  
798 were violent in order for cognitive consistency with a violent  
799 identity to bias their responses. Finally, the consistency of the  
800 results with the correlations found in prospective longitudinal  
801 studies<sup>10, 11, 12, 13, 14, 15</sup> of mild aggression adds credibility to the  
802 validity of these results about serious and criminally violent be-  
803 havior.

804 What is the probable cause of the significant associations  
805 between childhood media violence exposure and adult criminally  
806 violent behavior? Even if, as we argue, the retrospective assess-  
807 ments of media violence exposure are valid, the cross-sectional  
808 design of this study does not permit us to draw a firm conclusion  
809 about the causal direction of the association. Nevertheless, when  
810 we place this retrospective field study of high risk samples within  
811 the context of the many laboratory studies that show that expo-  
812 sure to media violence causes aggressive behavior in the short run  
813 (see Anderson, et al.<sup>1</sup> for a review), and within the context of the  
814 several prospective longitudinal field studies<sup>11, 12, 14, 15</sup> that show it  
815  
816

is more plausible that habitual early exposure to media violence causes later aggression (and sometimes criminal behavior) than that early aggression causes exposure to media violence, the results of this study take on added import. We suggest that the most plausible explanation of the associations between early exposure to media violence and later violent behavior found in this study is that exposure to media violence in childhood causes an increased likelihood of the observer behaving not just more aggressively but also more violently later in life.

What processes would produce such an effect? Much has been written about this question<sup>19</sup> since Bandura<sup>20</sup> first offered the process of "observational learning" as a major reason why exposure to media violence (as well as other forms of violence in the social environment) would cause an increased risk for aggression. The current consensus is that exposure to violence in the mass media or in real life (community violence, neighborhood violence, family violence, and peer violence) changes the viewers' social cognitions, i.e., their attributional biases about others' intent<sup>21</sup>, their scripts for social problem solving<sup>22, 23</sup>, and their normative beliefs about what social behaviors are appropriate<sup>24</sup>. These social cognitions, once encoded in the brain, last a long time and influence social behavior even years later. The effects due to this process should not depend on the source of the violence to which one is exposed – media or neighborhood.

The fact that both studies reported here also showed significant relations between childhood exposure to neighborhood violence and later violent behavior is consistent with the theory. As written above, this study alone -- like any cross-sectional study that uses retrospective reports of childhood behaviors – cannot prove the causal theory that exposure to violence causes later violent behavior. However, the studies rely on sufficient sample

sizes and statistical power that a failure to find the predicted relations would have been taken as evidence against the theory.

In conclusion, the results of these two studies show with acceptable scientific probability that greater habitual exposure to media violence in childhood – based on retrospective reports of favorite media -- is positively associated with increased commission of serious violent and criminally violent behavior later in life regardless of the youth's sex, family income, educational achievement, or exposure to neighborhood violence when a child. These cross-sectional studies alone do not provide information about the causal direction of the association. However, when these results are coupled with the results of prior experiments and prior prospective longitudinal studies on media violence and aggression, and with current knowledge about the observational learning process, the most plausible conclusion would seem to be that childhood exposure to media violence is a likely risk factor not only for later everyday aggression but also for seriously violent behavior including criminal behavior.

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