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# Childhood and Adolescent Television Viewing and Antisocial Behavior in Early Adulthood

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## KEY WORDS

television, antisocial behavior, media violence, longitudinal studies

## ABBREVIATION

SES—socioeconomic status

Ms Robertson, and Drs McAnally, and Hancox conceptualized and designed this research, analyzed and interpreted the data, drafted the article, revised it critically for important intellectual content, and approved the final version.

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**WHAT IS KNOWN ON THIS SUBJECT:** Many studies have identified an association between television viewing and antisocial behavior, although very few have been able to demonstrate a cause-and-effect sequence. The issue of whether excessive television viewing contributes to antisocial behavior remains controversial.



**WHAT THIS STUDY ADDS:** Excessive television viewing during childhood and adolescence was associated with objective and subjective measures of antisocial behavior in adulthood. These associations were not explained by preexisting antisocial tendencies or other potential confounders. Excessive television appears to have long-term psychosocial consequences.

## abstract



**OBJECTIVE:** To investigate whether excessive television viewing throughout childhood and adolescence is associated with increased antisocial behavior in early adulthood.

**METHODS:** We assessed a birth cohort of 1037 individuals born in Dunedin, New Zealand, in 1972–1973, at regular intervals from birth to age 26 years. We used regression analysis to investigate the associations between television viewing hours from ages 5 to 15 years and criminal convictions, violent convictions, diagnosis of antisocial personality disorder, and aggressive personality traits in early adulthood.

**RESULTS:** Young adults who had spent more time watching television during childhood and adolescence were significantly more likely to have a criminal conviction, a diagnosis of antisocial personality disorder, and more aggressive personality traits compared with those who viewed less television. The associations were statistically significant after controlling for sex IQ, socioeconomic status, previous antisocial behavior, and parental control. The associations were similar for both sexes, indicating that the relationship between television viewing and antisocial behavior is similar for male and female viewers.

**CONCLUSIONS:** Excessive television viewing in childhood and adolescence is associated with increased antisocial behavior in early adulthood. The findings are consistent with a causal association and support the American Academy of Pediatrics recommendation that children should watch no more than 1 to 2 hours of television each day. *Pediatrics* 2013;131:439–446

Children spend a lot of their time watching television and a great deal of what they see portrays violence.<sup>1</sup> In many countries, including New Zealand, violence features prominently on television, with an average of 8 incidents per hour.<sup>2</sup> Rates of television violence are even higher in children's programming and in trailers for upcoming programs<sup>2</sup>; therefore, viewing any type of programming likely results in exposure to television violence.

There have been longstanding concerns that excessive exposure to television violence throughout childhood could lead to antisocial behavior. However, despite 5 decades of research,<sup>3</sup> the issue remains controversial.<sup>3–8</sup> One of the reasons for the continuing uncertainty is the nature of the evidence. Most of the observational research is cross-sectional and unable to distinguish whether children develop behavioral problems because they watch people behaving violently on television or whether children with antisocial tendencies prefer to watch violent programs. The experimental evidence mostly consists of short-term observations of children after watching films of aggressive behavior and has questionable relevance to real-life behavioral problems. It has also been argued that many of the studies of media violence and aggression have used unreliable statistical analyses and inflated effect sizes.<sup>5</sup>

Few longitudinal studies have examined the relationship between childhood television viewing and subsequent antisocial behavior. Time spent watching television during preschool years has been found to predict antisocial behavior at ages 6 to 11 years,<sup>9</sup> and viewing time in adolescence and early adulthood has been shown to be associated with subsequent aggression.<sup>10</sup> Longitudinal studies focusing specifically on violent television content have had mixed results: Exposure

to television violence during preschool years has been found to predict antisocial behavior among 7- to 10-year-olds,<sup>11</sup> and watching violent television among 8- to 9-year-olds has been found to be associated with aggression in early adulthood.<sup>4,12</sup> By contrast, 2 large longitudinal studies found no meaningful associations between television violence and later antisocial behavior.<sup>13,14</sup>

These longitudinal studies have a number of weaknesses. Estimates of television viewing have been based on only 1 or 2 ages and may not represent viewing throughout childhood.<sup>4,9,12,13</sup> The validity of peer-nominated aggression, an outcome measure used in 2 studies,<sup>12,13</sup> has been criticized.<sup>5</sup> Only 1 study used criminal conviction records to provide an objective measure of antisocial behavior,<sup>4</sup> and none used standardized diagnoses of psychopathology. With regard to confounding, either data have not been available for potential confounding factors such as early antisocial behavior<sup>10</sup> or these have typically been measured at a single point in time. One study, sponsored by the television industry, excluded a large number of participants from the analysis for reasons that are unclear.<sup>14</sup> The uncertainty over the association between television viewing and antisocial behavior is only likely to be resolved by evidence from longitudinal studies with sufficient data to address these concerns.

The question of whether children's television viewing leads to antisocial behavior remains highly relevant. Despite the numerous forms of media now available, children and adolescents still use television the most.<sup>15</sup> New technologies such as on-demand television and digital recording devices offer children and adolescents more opportunities to watch inappropriate programs without supervision from their parents.

Using data from the Dunedin Multidisciplinary Health and Development Study, a longitudinal study of health and behavior in a population-based birth cohort, we tested the hypothesis that the time spent watching television during childhood and adolescence is associated with antisocial behavior in early adulthood. The study has multiple estimates of television viewing time in childhood, a range of measures of antisocial behavior, and detailed information on potential confounding factors to enable a more robust investigation than has been possible in previous studies.

## METHODS

Study members were born in Dunedin, New Zealand, between April 1972 and March 1973.<sup>16</sup> Children who still resided in Otago province were invited to participate in the first follow-up assessment at age 3 years. There were 1037 children (91% of eligible births; 535 [52%] boys) who attended the initial follow-up, constituting the base sample for the study. Additional follow-up assessments were undertaken at ages 5 ( $n = 991$ ), 7 ( $n = 954$ ), 9 ( $n = 955$ ), 11 ( $n = 925$ ), 13 ( $n = 850$ ), 15 ( $n = 976$ ), 18 ( $n = 993$ ), 21 ( $n = 992$ ), and 26 ( $n = 980$ ) years. Cohort families represented the full range of socioeconomic status (SES) in the South Island, New Zealand, and were mostly of New Zealand–European ethnicity. At age 26 years, 73 (7.4%) Study members identified themselves as Maori, and 15 (1.5%) as Pacific Islanders. Written informed consent was obtained for each assessment. The study was approved by the Otago Ethics Committee.

## Television Viewing

At ages 5, 7, 9, and 11 years, parents were asked how much time Study members spent watching weekday television. At ages 13 and 15, Study members themselves were asked how

long they usually watched television on weekdays and at weekends. Our summary variable was a composite of child and adolescent viewing calculated as the mean viewing hours per weekday between ages 5 and 15 years as previously described.<sup>16</sup>

### Outcome Measures

Criminal convictions data were obtained by searching the computer system of the New Zealand Police for conviction records from every court in New Zealand and Australia for Study members who provided informed consent ( $n = 985$ ; 95% of cohort). The Children's and Young Persons' Court records were the data source for convictions between 13 to 16 years, and the adult Criminal Court records were the data source for convictions between 17 to 26 years.<sup>17</sup> Convictions were coded according to whether they were violent in nature. Violent convictions included aggravated robbery, manslaughter, assault with intent to injure, rape, using an attack dog on a person, and disorderly behavior likely to cause violence.<sup>17</sup>

Antisocial personality disorder was assessed at ages 21 and 26 years by using the Diagnostic Interview Schedule,<sup>18</sup> which was modified in the following ways: (1) questions were limited to the assessment of *Diagnostic and Statistical Manual of Mental Disorders Third Edition-Revised* criteria only; (2) only symptoms occurring in the previous 12 months were assessed; (3) only the most commonly occurring disorders were assessed; and (4) response options were limited to "0 = no," "1 = yes, sometimes," or "2 = yes, definitely." Only responses receiving a "2 = yes definitely" were counted toward diagnostic criteria.  $\kappa$  coefficients for interrater reliability of diagnoses were above .85.<sup>18</sup>

Personality traits were assessed at ages 18 and 26 years by using the Multidimensional Personality Questionnaire.<sup>19</sup> We were primarily in-

terested in the Aggression personality scale and the Negative Emotionality and Positive Emotionality superfactors. Negative emotionality comprises the Aggression, Alienation, and Stress Reaction personality scales: a high scorer has a low threshold for the experience of negative emotions and a tendency to be involved in antagonistic relationships.<sup>20</sup> Individuals scoring highly on Aggression tend to hurt others for their own advantage and frighten and cause discomfort for others. High scorers on Positive Emotionality have a low threshold for the experience of positive emotions and a tendency to view life as essentially a pleasurable experience.<sup>20</sup> Good internal consistency for each of the Multidimensional Personality Questionnaire scales has been reported previously.<sup>20</sup> Personality data at ages 18 and 26 years were age- and sex-standardized by using SD ( $z$ ) scores for each sex and age, and the mean  $z$  scores across both ages were calculated.

### Covariates

Early antisocial behavior measures included information on Study members' temperament at age 3 years as assessed by the observations of trained interviewers.<sup>20</sup> Children categorized as undercontrolled at age 3 typically manifested high irritability and distractibility, difficulty sitting still, rough and uncontrolled behavior, and labile emotional responses. These Study members tended to score higher on the Aggression personality scale at age 18 than other children.<sup>20</sup> Antisocial behavior at age 5 was assessed by asking both the parents and teachers of Study members to complete the Rutter Child Scale.<sup>21</sup> Six items on the scale probe antisocial behavior and refer to fighting, disobedience, destructiveness, bullying, and not being liked. These scales have been shown to be reliable and valid in the Dunedin Study.<sup>22</sup> Scores were summed to pro-

vide 2 continuous variables of parent-rated and teacher-rated antisocial behavior.

Childhood IQ was measured at ages 7, 9, 11, and 13 years by using the Wechsler Intelligence Scale for Children—Revised. A composite measure of childhood IQ was obtained by calculating the mean IQ across these ages.<sup>23</sup>

SES of the Study members' families was measured by using parental self-reported occupational status assessed from birth to 15 years of age. Each parent was assigned an occupational code (from 1 [professional] to 6 [unskilled laborer]) based on the educational level and income associated with that occupation in the New Zealand census. SES scores were obtained by taking the highest score of either parent and calculating the mean of these scores from birth to age 15.<sup>24</sup>

Parental control was measured at ages 7 and 9 years by using mothers' scores on the control subscale from the Family Environment Scale.<sup>25</sup> The subscale assesses the extent to which rules and procedures are used to run family life and includes items such as, "There is a strong emphasis on following rules in our family" and "You can't get away with much in our family." Scores ranged from 0 (low parental control) to 9 (high parental control). The mean of the summed scores from ages 7 and 9 years was used.

### Statistical Analyses

Logistic regression was used to test associations between childhood and adolescent television viewing and subsequent convictions and antisocial personality disorder in early adulthood. Linear regression was used to examine the relationship between childhood and adolescent television viewing and Aggression, Negative Emotionality, and Positive Emotionality in early adulthood. We checked linear regression models by visual inspection of the

residuals to ensure that they were randomly scattered versus the fitted values. Analyses using the total sample were adjusted for sex. Additional analyses were adjusted for childhood SES, childhood IQ, undercontrolled temperament at age 3 years, parent and teacher ratings of antisocial behavior at age 5 years, and parental control. A test for a sex  $\times$  television viewing interaction was carried out for each outcome. Initial analyses used mean weeknight television viewing time as a continuous variable. Additional analyses divided the viewing time into categories of  $<2$  hours, 2 to 3 hours, and  $>3$  hours.

## RESULTS

Boys spent more time watching television than did girls and were more likely to have any type of conviction, a violent conviction, or a diagnosis of antisocial personality disorder in early adulthood (Table 1). Men also scored higher on the Aggression personality scale and the Negative Emotionality superfactor but lower on Positive Emotionality.

Time spent watching television during childhood and adolescence was significantly associated with having a criminal conviction, a violent conviction, and a diagnosis of antisocial personality disorder by early adulthood (Table 2). After controlling for addi-

tional covariates, associations between viewing time and criminal conviction and antisocial personality disorder remained statistically significant, although the association between television viewing and violent convictions did not. None of the sex  $\times$  television interaction terms were significant, indicating that observed associations were not significantly different in male and female viewers.

Higher television viewing time also predicted higher Negative Emotionality ( $r = 0.16$ ,  $P < .01$ ), higher Aggression ( $r = 0.18$ ,  $P < .01$ ), and lower Positive Emotionality ( $r = -0.12$ ,  $P < .01$ ) scores. These associations remained statistically significant after controlling for childhood SES, IQ, undercontrolled temperament at age 3, parent- and teacher-rated antisocial behavior at age 5, and parental control (Table 3). When analyzed by categories of television viewing, the findings were consistent with a dose-response effect of television viewing on antisocial behavior and on aggressive personality in early adulthood (Figs 1, 2, and 3).

## DISCUSSION

We found that young adults who had spent more time watching television during childhood and adolescence were more likely to manifest antisocial behaviors and personality than those

who had watched less television. These associations were consistent across 3 different measures: criminal convictions, antisocial personality disorder, and personality traits. Children who spent more time watching television also had lower Positive Emotionality as adults. These associations persisted after controlling for sex, SES, IQ, early antisocial behavior, and parental control. The associations between television viewing and subsequent antisocial behavior were similar for boys and girls, even though antisocial outcomes were less common in women. To our knowledge, this is the first longitudinal study to demonstrate long-term associations between television viewing and a broad range of antisocial behavior, including psychopathology, criminal convictions, and personality traits.

Our findings are consistent with other longitudinal studies that found that the amount of television viewing in childhood or adolescence predicted subsequent antisocial behavior.<sup>9,10</sup> As noted earlier, 2 longitudinal studies did not find an association between violent television viewing and antisocial behavior.<sup>13,14</sup> However, one of these studies, sponsored by the US National Broadcasting Corporation, excluded up to 30% of participants categorized as "less valid reporters." These

**TABLE 1** Television Viewing, Antisocial Behavior, and Aggressive Personality Scores Among Dunedin Study Members

Variable	Total Sample		Male		Female		<i>p</i>
	<i>N</i>	Mean (SD)	<i>N</i>	Mean (SD)	<i>N</i>	Mean (SD)	
Television viewing 5–15 y, weekday hours	1018	2.33 (0.88)	523	2.42 (0.86)	495	2.24 (0.88)	.002 <sup>a</sup>
Aggression, MPQ score at 18 and 26 y	992	28.72 (19.38)	509	37.42 (19.90)	483	19.55 (13.82)	$<.001^a$
Negative Emotionality, MPQ score at 18 and 26 y	992	89.36 (46.17)	509	98.39 (49.21)	483	83.01 (41.85)	$<.001^a$
Positive Emotionality, MPQ score at 18 and 26 y	992	377.08 (74.60)	509	382.10 (78.57)	483	371.79 (69.86)	.029 <sup>a</sup>
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>p</i>
Any criminal conviction by 26 y ( <i>n</i> = 504 men <i>n</i> = 481 women)	169	17.16	133	26.39	36	7.48	$<.001^b$
Violent conviction by 26 y, ( <i>n</i> = 498 men <i>n</i> = 479 women)	116	11.87	97	19.48	19	3.97	$<.001^b$
Antisocial personality disorder at 21 or 26 y ( <i>n</i> = 505 men <i>n</i> = 481 women)	60	6.09	56	11.09	4	0.83	$<.001^b$

MPQ, Multidimensional Personality Questionnaire.

<sup>a</sup> *P* value indicates results of *t* test comparing men with women.

<sup>b</sup> *P* value indicates results of  $\chi^2$  test comparing men with women.

**TABLE 2** Logistic Regression Predicting Antisocial Behavior in Early Adulthood From Television Viewing Between 5 and 15 y Old

Outcome Variable	Study Group	Unadjusted Odds Ratio <sup>a</sup> (95% Confidence Interval)	Multiaadjusted Odds Ratio <sup>b</sup> (95% Confidence Interval)
Any criminal conviction by age 26 y	Total sample <sup>b</sup>	1.55 (1.26–1.89)**	1.27 (1.00–1.61)*
	Males	1.42 (1.12–1.79)**	1.24 (0.93–1.64)
	Females	1.92 (1.32–2.79)**	1.46 (0.93–2.31)
Any violent conviction by age 26 y	Total sample <sup>b</sup>	1.34 (1.07–1.70)*	1.25 (0.95–1.66)
	Males	1.43 (1.10–1.86)**	1.29 (0.93–1.77)
	Females	1.07 (0.64–1.79)	1.10 (0.59–2.06)
Diagnosis of antisocial personality disorder at either age 21 or 26 y	Total sample <sup>b</sup>	1.70 (1.24–2.34)**	1.61 (1.10–2.36)*
	Males	1.69 (1.21–2.36)**	1.62 (1.08–2.43)*
	Females	—	—

Odds ratios indicate the increase in the odds for the outcome associated with a 1-h increase in mean weekday television viewing. Significant at \* $P < .05$ , \*\* $P < .01$ . —, Too few cases to analyze ( $n = 4$ ).

<sup>a</sup> Odds ratios are unadjusted for male and female subgroups but adjusted for sex for the total sample.

<sup>b</sup> Adjusted for sex, childhood SES, childhood IQ, undercontrolled temperament at age 3 y, parent- and teacher-rated antisocial behavior at age 5 y, and parental control at ages 7 and 9 y.

participants tended to view more television violence and were more aggressive than the remaining participants, and their exclusion may have lead to an underestimation of the associations.<sup>12</sup> The other study found no relationship between viewing violence by primary school children during the first 2 years of the study and aggression in the third year, but the 1-year follow-up was too short to investigate long-term effects.<sup>13</sup>

There are a number of plausible mechanisms that could explain a long-term effect of television viewing on antisocial behavior. These include observational learning theory (whereby what is seen is imitated and internalized), emotional desensitization, and the development of aggressive

normative beliefs and cognitive biases in response to repeated exposure to violence.<sup>3,4</sup> A limitation of our study is that we do not know what programs were viewed and therefore cannot be certain that it is viewing violence that contributes to antisocial behavior. Although violence is common on television,<sup>2</sup> the content of the programs may not be the most important factor: it is plausible that excessive television viewing contributes to antisocial behavior in ways unrelated to violent content. These mechanisms could include reduced social interaction with peers and parents, poorer educational achievement, and increased risk of unemployment, all of which have been found to be associated with higher television viewing time in this cohort.<sup>23,26–28</sup>

**TABLE 3** Linear Regression Predicting Personality Traits in Early Adulthood From Television Viewing Between 5 and 15 y Old

Outcome Variable	Study Group	Unadjusted Coefficient <sup>a</sup> (95% Confidence Interval)	Multiaadjusted Coefficient <sup>b</sup> (95% Confidence Interval)
Aggression	Total sample <sup>b</sup>	0.21 (0.14 to 0.28)**	0.19 (0.11 to 0.27)**
	Boys	0.25 (0.15 to 0.35)**	0.20 (0.08 to 0.31)**
	Girls	0.17 (0.07 to 0.27)**	0.18 (0.06 to 0.30)**
Negative Emotionality	Total sample <sup>b</sup>	0.19 (0.12 to 0.26)**	0.13 (0.05 to 0.21)**
	Boys	0.24 (0.14 to 0.34)**	0.17 (0.05 to 0.27)**
	Girls	0.14 (0.03 to 0.24)**	0.10 (–0.02 to 0.21)
Positive Emotionality	Total sample <sup>b</sup>	–0.14 (–0.21 to –0.07)**	–0.10 (–0.19 to –0.02)*
	Boys	–0.15 (–0.25 to –0.04)**	–0.14 (–0.26 to –0.02)*
	Girls	–0.13 (–0.23 to –0.03)**	–0.07 (–0.19 to 0.05)

Coefficients represent the increase in age- and sex-adjusted SD score for MPQ personality data associated with a 1-h increase in weekday television viewing. Significant at \* $P < .05$ , \*\* $P < .01$ .

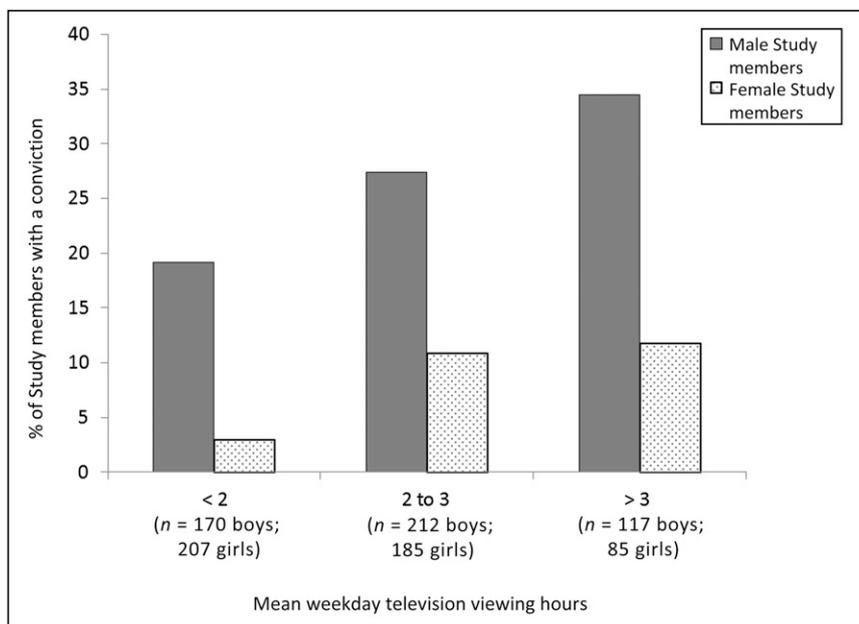
<sup>a</sup> Analyses unadjusted for male and female subgroups but adjusted for sex for total sample.

<sup>b</sup> Adjusted for childhood SES, childhood IQ, undercontrolled temperament at age 3 y, parent- and teacher-rated antisocial behavior at age 5 y, and parental control at ages 7 and 9 y.

Another limitation is that the media landscape has changed since the Study members were children, particularly with regard to the advent of new media. Further research on media exposure and antisocial behavior should take these changes into account.

An important strength of this research is the low rate of attrition throughout the study. With the exception of age 13, which had an 82% follow-up rate (higher than any of the previous longitudinal studies on television viewing), at least 90% of the cohort has been assessed at each follow-up. Another strength is that the exposure, outcome, and covariate measures were assessed at multiple intervals over a 26-year period; thus, we were able to control for potential confounding factors such as childhood SES, IQ, and previous antisocial behavior using composite measures from multiple assessments. Our outcome measures included an objective record of criminal convictions from court reports, standardized diagnoses of antisocial personality disorder, as well as assessments of antisocial personality based on self-reported data. Our ability to adjust for childhood IQ addresses a criticism of some of the earlier longitudinal research,<sup>15</sup> which controlled for academic achievement instead of IQ,<sup>4,12</sup> despite the facts that academic achievement may itself be affected by the amount of television a child watches<sup>23</sup> and that antisocial behavior is associated with poor academic achievement.<sup>29</sup>

It is notable that television viewing remained a significant predictor of having a criminal conviction, whereas the association with violent convictions was not significant after controlling for potential confounding factors. This suggests that the relationship between television viewing and negative outcomes may be more complicated than a simple violence-begets-violence model and may reflect the fact that there



**FIGURE 1**

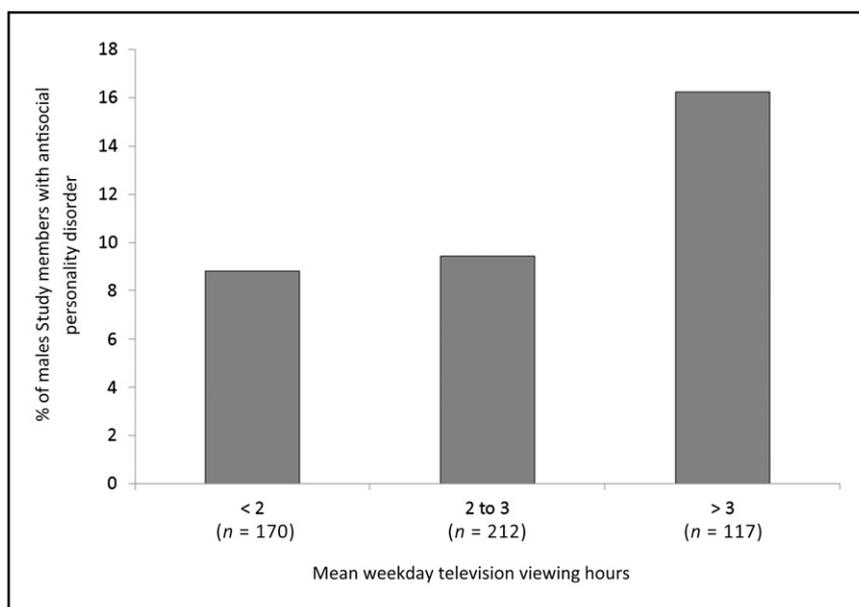
Proportion of male and female Study members with a criminal conviction by age 26, by mean weekday television viewing between ages 5 and 15 years.

are other mechanisms involved, which could include the development of a worldview that is antisocial (though not necessarily violent) in nature. This finding is also in keeping with the criticism that the association between violent crime and television viewing is weak.<sup>5</sup> However, the fact that our findings show that television viewing is associated

with poorer socioemotional outcomes, as well as having a criminal conviction, indicates that excessive television viewing is still an important concern.

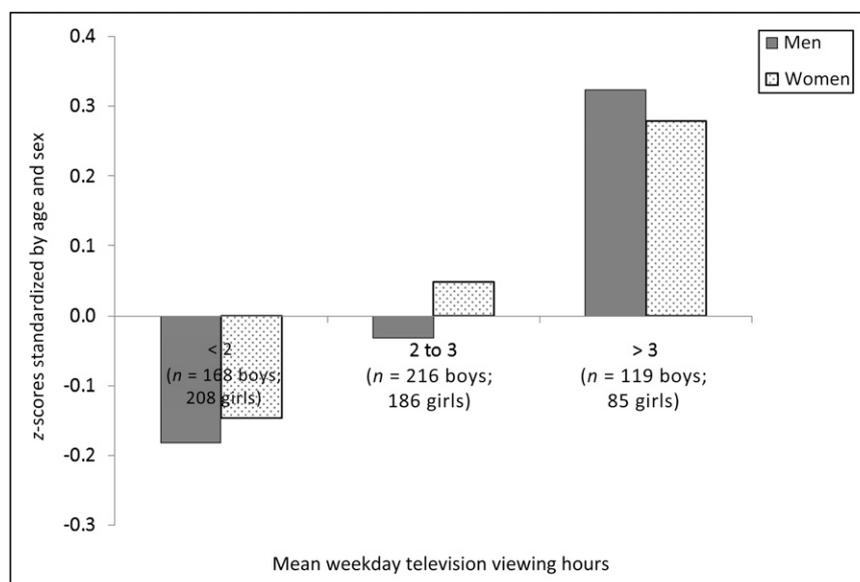
As with any observational research, we cannot prove that television viewing causes antisocial behavior, but the study has a number of features that enable us to make causal inferences.

The findings are consistent with most of the other high-quality longitudinal studies<sup>4,8–11</sup> and are internally consistent with evidence of dose-response relationships across a range of antisocial outcomes. There are also a number of plausible mechanisms for the association. It remains possible that reverse causation (the possibility



**FIGURE 2**

Proportion of male Study members diagnosed with antisocial personality disorder by age 26, by mean weekday television viewing between ages 5 and 15 years.



**FIGURE 3**

Early adulthood Aggression Multidimensional Personality Questionnaire SD scores, by level of television viewing between ages 5 and 15 years.

that antisocial personality leads to more television viewing) causes the association between television viewing and antisocial behavior, although we have attempted to control for this by adjusting for early antisocial tendencies. Although we have also controlled for parental control and childhood SES, it is also possible that other unmeasured factors associated with the milieu in which television viewing occurs may explain the observed relationship.

The American Academy of Pediatrics recommends that parents limit children's total entertainment media time to no more than 1 to 2 hours of quality programming per day.<sup>30</sup> Our findings provide support for this recommendation: we found that each additional hour of weekday television viewing increased the odds for antisocial outcomes. For example, even after adjusting for confounders, the risk of

having a criminal conviction by age 26 was about 30% higher for each additional hour of viewing per weeknight. The effect sizes for television viewing and aggression that we have found are similar those from previous reports, which ranged from ~0.20 to ~0.30.<sup>4,12,31,32</sup> While these may be considered modest by some researchers,<sup>33</sup> associations of this magnitude have important implications at a population level.

Previous research has demonstrated that excessive television use in childhood and adolescence may have long-lasting effects on a wide range of adverse health and behavioral outcomes.<sup>15</sup> Our findings suggest that antisocial behavior should be included among these effects.

## CONCLUSIONS

More time spent watching television in childhood and adolescence is as-

sociated with antisocial behavior in early adulthood. These associations were not explained by preexisting antisocial behavioral problems, lack of parental control, socioeconomic background, or IQ. We believe that identifying ways to reduce children's and adolescents' television viewing should be considered a priority for public health.

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## REFERENCES

1. Strasburger VC, Wilson BJ, Jordan AB. *Children, Adolescents and the Media*. 2nd ed. Thousand Oaks, CA: Sage; 2009
2. Television Violence Project Working Group. *Towards a Precautionary Risk Management of TV Violence in New Zealand: The Report to the Minister of Broadcasting of the Working Group: TV Violence Project*. Wellington, New Zealand: Television Violence Project Working Group; 2004

3. Anderson CA, Berkowitz L, Donnerstein E, et al. The influence of media violence on youth. *Psychol Sci Public Interest*. 2003;4(3):81–110
4. Huesmann LR, Moise-Titus J, Podolski CL, Eron LD. Longitudinal relations between children's exposure to TV violence and their aggressive and violent behavior in young adulthood: 1977–1992. *Dev Psychol*. 2003;39(2):201–221
5. Ferguson CJ, Savage J. Have recent studies addressed methodological issues raised by five decades of television violence research? A critical review. *Aggress Violent Behav*. 2012;17(2):129–139
6. Grimes T, Bergen L. The epistemological argument against a causal relationship between media violence and sociopathic behavior among psychologically well viewers. *Am Behav Sci*. 2008;51(8):1137–1154
7. Gunter B. Media violence: is there a case for causality? *Am Behav Sci*. 2008;51(8):1061–1122
8. Savage J. The role of exposure to media violence in the etiology of violent behavior: a criminologist weighs in. *Am Behav Sci*. 2008;51(8):1123–1136
9. Zimmerman FJ, Glew GM, Christakis DA, Katon W. Early cognitive stimulation, emotional support, and television watching as predictors of subsequent bullying among grade-school children. *Arch Pediatr Adolesc Med*. 2005;159(4):384–388
10. Johnson JG, Cohen P, Smailes EM, Kasen S, Brook JS. Television viewing and aggressive behavior during adolescence and adulthood. *Science*. 2002;295(5564):2468–2471
11. Christakis DA, Zimmerman FJ. Violent television viewing during preschool is associated with antisocial behavior during school age. *Pediatrics*. 2007;120(5):993–999
12. Eron LD, Huesmann LR, Lefkowitz MM, Walder LO. Does television violence cause aggression? *Am Psychol*. 1972;27(4):253–263
13. Wiegman O, Kuttschreuter M, Baarda B. A longitudinal study of the effects of television viewing on aggressive and prosocial behaviours. *Br J Soc Psychol*. 1992;31(Pt 2):147–164
14. Milavsky JR, Kessler R, Stipp H, Rubens WS. *Television and Aggression: A Panel Study*. New York, NY: Academic Press; 1982
15. Strasburger VC, Jordan AB, Donnerstein E. Health effects of media on children and adolescents. *Pediatrics*. 2010;125(4):756–767
16. Hancox RJ, Milne BJ, Poulton R. Association between child and adolescent television viewing and adult health: a longitudinal birth cohort study. *Lancet*. 2004;364(9430):257–262
17. Moffitt TE, Caspi A, Rutter M, Silva P. *Sex Differences in Antisocial Behavior: Conduct Disorder, Delinquency and Violence in the Dunedin Longitudinal Study*. Cambridge, UK: Cambridge University Press; 2001
18. Newman DL, Moffitt TE, Caspi A, Magdol L, Silva PA, Stanton WR. Psychiatric disorder in a birth cohort of young adults: prevalence, comorbidity, clinical significance, and new case incidence from ages 11 to 21. *J Consult Clin Psychol*. 1996;64(3):552–562
19. Tellegen A. *Brief Manual for the Multidimensional Personality Questionnaire*. Minneapolis, MN: University of Minnesota; 1982
20. Caspi A, Silva PA. Temperamental qualities at age three predict personality traits in young adulthood: longitudinal evidence from a birth cohort. *Child Dev*. 1995;66(2):486–498
21. Rutter M, Tizard J, Whitmore K. *Health, Education and Behavior*. London, UK: Longman; 1970
22. McGee R, Williams SM, Bradshaw J, Chapel JL, Robins A, Silva PA. The Rutter scale for completion by teachers: factor structure and relationships with cognitive abilities and family adversity for a sample of New Zealand children. *J Child Psychol Psychiatry*. 1985;26(5):727–739
23. Hancox RJ, Milne BJ, Poulton R. Association of television viewing during childhood with poor educational achievement. *Arch Pediatr Adolesc Med*. 2005;159(7):614–618
24. Poulton R, Caspi A, Milne BJ, et al. Association between children's experience of socioeconomic disadvantage and adult health: a life-course study. *Lancet*. 2002;360(9346):1640–1645
25. Moos R, Moos B. *Family Environment Scale Manual*. Palo Alto, CA: Consulting Psychologists Press; 1981
26. Richards R, McGee R, Williams SM, Welch D, Hancox RJ. Adolescent screen time and attachment to parents and peers. *Arch Pediatr Adolesc Med*. 2010;164(3):258–262
27. Landhuis CE, Poulton R, Welch D, Hancox RJ. Does childhood television viewing lead to attention problems in adolescence? Results from a prospective longitudinal study. *Pediatrics*. 2007;120(3):532–537
28. Landhuis CE, Perry DK, Hancox RJ. Association between childhood and adolescent television viewing and unemployment in adulthood. *Prev Med*. 2012;54(2):168–173
29. Trzesniewski KH, Moffitt TE, Caspi A, Taylor A, Maughan B. Revisiting the association between reading achievement and antisocial behavior: new evidence of an environmental explanation from a twin study. *Child Dev*. 2006;77(1):72–88
30. American Academy of Pediatrics. Committee on Public Education. American Academy of Pediatrics: Children, adolescents, and television. *Pediatrics*. 2001;107(2):423–426
31. Paik H, Comstock G. The effects of television violence on antisocial behavior: a meta-analysis. *Communic Res*. 1994;21(4):516–546
32. Bushman BJ, Anderson CA. Media violence and the American public. Scientific facts versus media misinformation. *Am Psychol*. 2001;56(6-7):477–489
33. Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. Hillsdale, NJ: Erlbaum; 1988

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