

Association of Television Viewing During Childhood With Poor Educational Achievement

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Background: Excessive television viewing in childhood has been associated with adverse effects on health and behavior. A common concern is that watching too much television may also have a negative impact on education. However, no long-term studies have measured childhood viewing and educational achievement.

Objective: To explore these associations in a birth cohort followed up to adulthood.

Design: Prospective birth cohort study.

Setting: Dunedin, New Zealand.

Participants: Approximately 1000 unselected individuals born between April 1, 1972, and March 31, 1973. Ninety-six percent of the living cohort participated at 26 years of age.

Main Outcome Measures: Educational achievement by 26 years of age.

Results: The mean time spent watching television during childhood and adolescence was significantly associ-

ated with leaving school without qualifications and negatively associated with attaining a university degree. Risk ratios for each hour of television viewing per week-night, adjusted for IQ and sex, were 1.43 (95% confidence interval [CI], 1.24-1.65) and 0.75 (95% CI, 0.67-0.85), respectively (both, $P < .001$). The findings were similar in men and women and persisted after further adjustment for socioeconomic status and early childhood behavioral problems. Television viewing during childhood (ages 5-11 years) and adolescence (ages 13 and 15 years) had adverse associations with later educational achievement. However, adolescent viewing was a stronger predictor of leaving school without qualifications, whereas childhood viewing was a stronger predictor of nonattainment of a university degree.

Conclusions: Television viewing in childhood and adolescence is associated with poor educational achievement by 26 years of age. Excessive television viewing in childhood may have long-lasting adverse consequences for educational achievement and subsequent socioeconomic status and well-being.

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THERE IS INCREASING CONCERN about the amount of time that children spend watching television.^{1,2} Excessive viewing has been linked to a range of adverse health and behavioral outcomes. Another concern is the effect that television viewing may have on education. This concern is not new. In New Zealand, there was controversy about the educational value of television before television was introduced.³ On the one hand, television is an extremely effective form of communication that has the potential to introduce children to a much wider range of experiences and ideas than would otherwise be possible. On the other hand, much of the content of children's television programming is entertainment and probably of low educational value. Time spent viewing these programs may displace more edu-

cational activities such as homework, reading, or creative play.⁴

Numerous cross-sectional surveys of television viewing and educational achievement have been undertaken. In general these indicate a small negative associa-

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tion.⁵⁻⁷ However, the apparent association tends to disappear or is minimal in studies that adjust for confounding factors such as intelligence and socioeconomic status.⁸ The issue is complicated by findings that suggest that the adverse or beneficial effects of television on education may be more pronounced in certain groups according to social advantage, intelligence, and sex.^{5,7,9} Furthermore, there

are indications that although excessive television viewing may impair school performance, a limited amount (≤ 10 h/wk) may be beneficial.^{5,10} Short-term follow-up studies of students for 2 to 4 years also suggest that apparent negative associations between television viewing time and measures of school achievement become insignificant after adjusting for baseline performance.¹¹⁻¹³ Follow-up studies of preschool children indicate that watching educational television programs may enhance school readiness and school performance in adolescence.^{9,14} However, these benefits appear to be related to watching specific educational programs rather than total viewing time. Although these studies of specific television content suggest that watching television can be educational, they do not address the more important question of whether the television that children normally watch is educational.

Thus, despite several decades of research, there is little consensus on whether childhood television viewing has beneficial, harmful, or negligible effects on educational achievement.¹⁰ This uncertainty is at least partly due to a lack of long-term follow-up data, particularly for school-age children. We have recently reported on the associations between child and adolescent television viewing and adult health in a birth cohort of approximately 1000 individuals.¹⁵ We now report on the associations between television viewing and educational attainment in the same cohort.

METHODS

PARTICIPANTS

Study members were born in Dunedin, New Zealand, between April 1, 1972, and March 31, 1973.¹⁶ All children still living in the province of Otago were invited to participate in the first follow-up assessment at 3 years of age. One thousand thirty-seven children (91% of eligible births; 52% male) attended, constituting the base sample for the remainder of the study. Follow-up visits have been performed at 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, most recently, 26 years of age. At the age 26 follow-up, we assessed 980 (96%) of the 1019 Study members still alive. Cohort families represent the full range of socioeconomic strata in the South Island of New Zealand and are mostly of New Zealand European ethnicity. Written informed consent was obtained for each assessment. The study was approved by the Otago Ethics Committee.

TELEVISION VIEWING

Information on television viewing was collected at 5, 7, 9, 11, 13, and 15 years of age. From 5 to 11 years of age, parents were asked how much time the Study members watched television on weekdays. At 13 and 15 years of age, the Study members were asked how long they usually watched television on weekdays and weekends. Our summary variable was a composite of child and adolescent viewing that was calculated as the mean viewing hours per weekday between 5 and 15 years of age. Additional analyses examined the associations between television viewing in the following 2 developmental epochs: childhood television viewing was calculated as the mean viewing hours per weekday reported at 5 to 11 years of age; adolescent viewing was calculated as the mean viewing hours per weekday reported at 13 and 15 years of age.

MEASUREMENT OF EDUCATIONAL ACHIEVEMENT

At 26 years of age, the highest level of educational attainment was scored using a 4-point scale in which 1 indicates no qualifications; 2, any school certificate pass (the most basic New Zealand qualification); 3, higher-level school qualification (eg, sixth form certificate) or postschool qualification (eg, trade certificate or diploma); and 4, bachelor's degree or higher.

COVARIATE MEASUREMENTS

Covariate measures for this analysis were obtained at several ages. The socioeconomic status of the Study members' families was measured according to the highest parental occupation on a 6-point scale, based on the educational level and income associated with that occupation in the New Zealand census (6 indicates unskilled laborer and 1, professional).¹⁷ Childhood socioeconomic status was taken as the mean of the assessments from birth to 15 years of age. At 7, 9, 11, and 13 years of age, intelligence was measured using the Wechsler Intelligence Scale for Children-Revised.¹⁸ Childhood IQ was taken as the mean of the full-scale IQ measurements across these ages. At the assessment at 5 years of age, the Study member's parent and teacher were asked to complete the Rutter Child Scales.¹⁹ These questionnaires consist of 18 items for parents (scale A) and 26 for teachers (scale B) regarding the child's behavior, which are answered "doesn't apply," "applies somewhat," or "certainly applies" and are scored 0, 1, and 2, respectively. Items used to create an antisocial subscale included fighting, bullying, irritability, not liked, disobedience, and destructiveness (eg, "frequently fights or is extremely quarrelsome with other children"; and "irritable, quick to fly off the handle"). The hyperactivity subscale included restlessness, squirminess, poor concentration, cannot settle (eg, "very restless, has difficulty staying seated for long"; and "squirmy, fidgety child"). The reliability and validity of these scales in the Dunedin Study have been described by McGee et al.^{20,21}

STATISTICAL ANALYSIS

We examined the associations between the mean hours of television viewing per weeknight and failure to attain an educational qualification by 26 years of age and between television viewing and attainment of a university degree by 26 years of age using logistic regression analyses adjusted for sex and IQ. Risk ratios (RRs) and 95% confidence intervals (CIs) were estimated for each outcome using log-binomial regression models.²² Further regression models examined the association between television viewing and educational outcomes, with additional adjustment for childhood socioeconomic status and childhood behavioral problems. Additional analyses tested for sex \times television, IQ \times television, and socioeconomic status \times television interactions. Three Study members with severe intellectual disability were excluded from the analyses, which were performed using Stata 8.0 software (Stata Corp, College Station, Tex).

RESULTS

The Study members watched television for a mean of 2.06 hours (SD, 0.82 hour) on weekdays between 5 and 11 years of age, and 3.13 hours (SD, 1.43 hours) per weekday at 13 and 15 years of age. Overall, the mean weeknight viewing times between 5 and 15 years of age were 2.43 hours (SD, 0.85 hours) for boys and 2.24 hours (SD, 0.89 hour) for girls. Increased childhood and adoles-

Table 1. Highest Qualification Achieved by 26 Years of Age and Television Viewing Time During Childhood and Adolescence According to Educational Outcome

Qualifications	% of Study Members		Mean (SD) Television Viewing*
	Women (n = 477)	Men (n = 490)	
None	11.5	18.0	2.76 (0.93)
School certificate	16.4	15.9	2.52 (0.75)
Postschool	47.2	47.1	2.34 (0.86)
University degree	25.0	19.0	1.95 (0.77)

*Measured in mean television viewing hours per weeknight reported between 5 and 15 years of age. $P < .001$ for trend across groups.

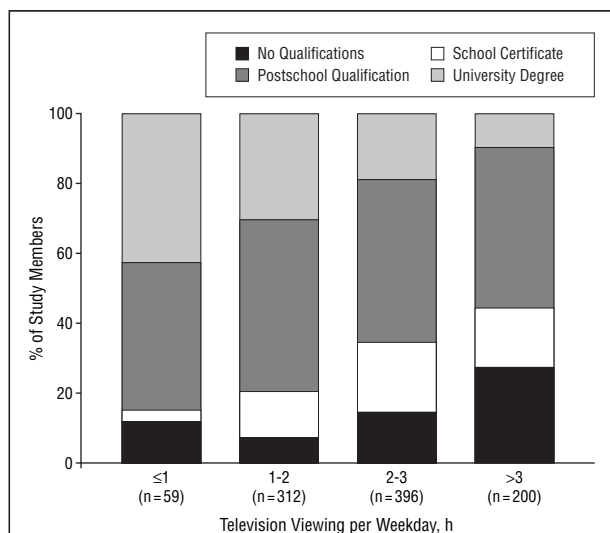


Figure. Child and adolescent television viewing and educational achievement by 26 years of age. Television viewing is measured as unadjusted mean hours per weekday between 5 and 15 years of age. The percentages of Study members in each viewing group were 6.1% (≤ 1 hour), 32.3% (1-2 hours), 41.0% (2-3 hours), and 20.7% (> 3 hours). (Because of rounding, percentages do not total 100.)

cent television viewing time was associated with a higher chance of having no formal qualifications and a lower chance of having obtained a university degree by 26 years of age (**Table 1** and **Figure**).

There were significant associations between the covariate measures and both television viewing and educational achievement. Higher IQ and socioeconomic status were associated with better educational outcomes (more Study members with degrees and fewer without any qualifications), whereas parent and teacher ratings of antisocial and hyperactive behavioral problems at 5 years of age were associated with poorer outcomes ($P \leq .001$). Television viewing between 5 and 15 years of age was associated with lower childhood socioeconomic status ($P < .001$), lower IQ ($P < .001$), and each of the parent and teacher ratings of antisocial and hyperactive behavior at 5 years of age ($P < .05$). However, the associations between child and adolescent television viewing and educational outcomes persisted after adjusting for IQ, socioeconomic status, and childhood behavioral problems (**Table 2**).

There were no significant interactions between sex and television viewing or between socioeconomic status and television viewing for either educational outcome. There was an interaction between television viewing hours and IQ for attaining a university degree that was of borderline statistical significance ($P = .08$). The association between television viewing and attaining a degree was therefore examined further by splitting the cohort into 3 groups on the basis of IQ. The strongest effect of television viewing was seen for children in the middle IQ group (RR per hour of television viewing, 0.46 [$P < .001$]), with similar effects in the lowest (RR, 0.68 [$P = .12$]) and highest (RR, 0.78 [$P = .003$]) IQ groups.

Analyses of the association between weekday television viewing during childhood (ages 5-11 years) and adolescence (ages 13 and 15 years) and adult educational achievement provided similar results (Table 2). Analysis of educational achievement using both childhood and adolescent viewing as independent variables found that mean weekday viewing hours at 13 and 15 years of age were a stronger predictor of leaving school without qualifications. By contrast, lower mean television viewing hours between 5 and 11 years of age were a stronger predictor of achieving a university degree. The use of mean total viewing hours at 13 and 15 years of age (including weekends) instead of mean weekday viewing hours provided similar results in the partially and fully adjusted logistic regression analyses of educational outcomes (data not shown).

COMMENT

The results of this study indicate that increased time spent watching television during childhood and adolescence was associated with a lower level of educational attainment by early adulthood. These effects were independent of intelligence, family socioeconomic status, and childhood behavioral problems.

These findings indicate that excessive television viewing is likely to have a negative impact on educational achievement. This is likely to have far-reaching consequences for an individual's socioeconomic status and well-being in adult life.²³ Although we cannot prove that watching television is causally related to poor educational achievement, the associations between viewing time and educational outcomes were strong and independent of the known confounding influences of intelligence, socioeconomic status, and childhood behavioral problems. Furthermore, this study fulfills many of the other criteria often used to infer causality in an observational study, including temporal sequence, dose-response relationship, and biological plausibility. However, we cannot rule out the possibility of reverse causation. This is likely to be at least part of the explanation for the strong association between television viewing during adolescence and leaving school without any qualifications. By adolescence, some individuals will be poorly motivated toward schoolwork and may, for example, fill their time by watching television instead of doing homework. This is less likely to be the explanation for the strong inverse association between television viewing in childhood and

Table 2. Risk Ratios From Regression of Educational Outcomes Against Childhood and Adolescent Television Viewing*

Adjusted Television Viewing	No. of Study Members	RR (95% CI)	
		No Qualifications	University Degree
Adjusted for sex and IQ			
Childhood and adolescent viewing	947	1.43 (1.24-1.65)	0.75 (0.67-0.85)
Childhood viewing	947	1.37 (1.18-1.59)	0.74 (0.65-0.85)
Adolescent viewing	835	1.37 (1.21-1.55)	0.85 (0.78-0.94)
Adjusted for sex, IQ, socioeconomic status, and behavioral problems at 5 years of age			
Childhood and adolescent viewing	900	1.34 (1.10-1.62)	0.85 (0.75-0.98)
Childhood viewing	900	1.22 (1.04-1.45)	0.84 (0.72-0.98)
Adolescent viewing	803	1.33 (1.16-1.54)	0.92 (0.83-1.01)

Abbreviations: CI, confidence interval; RR, risk ratio.

*Childhood viewing was measured from 5 to 11 years of age; adolescent viewing, at 13 and 15 years of age.

attainment of a university degree. The finding that childhood viewing was a better predictor than adolescent viewing of not obtaining a university degree makes reverse causation unlikely and indicates that excessive childhood television viewing has a long-lasting association with poor educational outcomes.

High rates of television viewing could be associated with poor educational achievement through several mechanisms. Perhaps the most obvious of these is by displacement of learning activities. For example, time spent watching television among sixth- and seventh-grade students in the United States has been found to be inversely correlated with reading and homework.⁴ Television viewing in young children has also been associated with attention and behavioral problems, which in turn are likely to have an adverse impact on school performance.^{7,24} Whether or not excessive television viewing is a direct cause of poor educational achievement, the findings indicate that the majority of television viewing is unlikely to have an educational benefit. Unfortunately, we do not have information on what programs the Study members watched and cannot determine whether there were some programs with a positive educational effect. Indeed, some evidence suggests that specific programs may have a beneficial effect on education.⁹ However, the results suggest that the overall educational value of New Zealand television viewing was low. At the time that these children were growing up, there were 2 television channels in New Zealand, both of which were publicly run and funded by a combination of advertising and license fees. Thus, television had a mixed public-service and commercial role and was intended to inform and educate as well as entertain.³ Then, as now, children's television programs in New Zealand were mostly American or British in origin, with few locally made programs.³ The television content seen by the Study members was therefore likely to be similar to that seen in other developed societies.

These findings offer little support for the hypothesis that a small amount of television is beneficial, whereas a lot is harmful. Razel²⁵ suggests that the optimum viewing time for educational benefit decreases with age, with an average of 1 h/d across childhood. Few children (6%) in this study watched less than this. Although slightly

more of these children left school without qualifications compared with those who watched an average of 1 to 2 h/d, children who watched television less than 1 h/d were the most likely to obtain postschool qualifications, including university degrees (Figure).

We did not find that television viewing had significantly different effects according to sex or socioeconomic status. There was some evidence that the greatest impact on attaining a university degree was in children of average intelligence. This is biologically plausible, because the chance of higher educational achievement in these children may be most vulnerable to harmful influences. Children who have a low IQ are unlikely to obtain a degree, whereas those with a high IQ are likely to achieve their academic goals regardless of the amount of television they watch.

This study has some other limitations. We do not have estimates of viewing hours from early childhood. Thus, we are unable to address the issue of preschool television viewing on later educational achievement. Some research suggests that educational programs designed for preschool children have long-lasting benefits.⁹ However, in our study, even the viewing estimates obtained at 5 years of age were associated with trends toward poor educational outcomes (RR for no qualifications, 1.11 [$P=.02$]; RR for university degree, 0.94 [$P=.24$] [adjusted for sex and IQ]). This is the age at which most New Zealand children start school, and it seems likely that television viewing at 5 years of age would correlate with preschool viewing. We also have no way to assess the accuracy of the viewing estimates. These relied on parental report (for 5, 7, 9, and 11 years of age) and self-report (for 13 and 15 years of age). However, we averaged the viewing estimates from several ages and believe that the associations between child and adolescent television viewing and education achievement are unlikely to be due to measurement error. Measurement error could only explain the associations if there was a systematic bias, such that children who are destined to do well at school (and their parents) overestimated their viewing, whereas those who are destined to do poorly underestimated their viewing hours. Such a "social desirability" bias seems unlikely, given that the associations were independent of family socioeconomic status.

As far as we are aware, this is the first prospective study to examine the association between television viewing and educational achievement from childhood through to adulthood. Time spent watching television in childhood and adolescence was associated with poor educational achievement by young adulthood. These associations cannot be explained by the Study member's IQ, socioeconomic status, or childhood behavioral problems. Although it is possible that the associations are due to unidentified confounding factors, the findings suggest that the overall effect of television viewing is not beneficial and is likely to be harmful in terms of educational achievement. The mechanisms of these effects are yet to be determined, but the findings add further support to the advice of the American Academy of Pediatrics that parents limit their children's television viewing to 1 to 2 h/d.¹

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