

Television Viewing Increases Risk of Type 2 Diabetes, Cardiovascular Disease, and Mortality

Reviewed by Arlene Chung, MD, MHA, and Michael Pignone, MD, MPH

STUDY

Grontved A, Hu, FB: Television viewing and risk of type 2 diabetes, cardiovascular disease, and all-cause mortality. *JAMA* 305:2448–2455, 2011

SUMMARY

Design. A meta-analysis of prospective observational studies.

Subjects. The meta-analysis included eight prospective observational studies. (Four studies examined type 2 diabetes; four studies examined fatal or nonfatal cardiovascular disease [CVD]; and three studies examined all-cause mortality.) The four studies addressing type 2 diabetes included 175,938 participants; the four studies examining fatal or nonfatal CVD had a total of 34,253 participants; and the three studies that examined all-cause mortality included 26,509 participants. Mean follow-up duration was 8.5 years for studies examining type 2 diabetes, 10 years for those examining fatal or nonfatal CVD, and 7 years for those addressing all-cause mortality. Each of the study populations was healthy at baseline.

Methods. The goal of the meta-analysis was to determine the association between TV viewing and the risk of type 2 diabetes, fatal or nonfatal CVD, and all-cause mortality. Random effects models were used to pool relative risk (RR) estimates, and heterogeneity among studies was examined by I^2 statistics. Sensitivity analyses evaluated whether meta-analysis results could have been affected by a single study.

Results. The pooled RR of developing type 2 diabetes per every 2 hours of TV watching per day was 1.20 (95% CI 1.14–1.27). The risk of fatal or nonfatal cardiovascular events was 1.15 (95% CI 1.05–1.23), and risk for all-cause mortality was 1.13 (95% CI 1.07–1.18). Risk of all-cause mortality appeared to increase at a threshold of > 3 hours of television watching per day, but both type 2 diabetes and CVD had linear increases in risk with each additional 2 hours per day of TV watching. Data were not available to fully assess the degree to which dietary intake and physical inactivity explain the negative effects of TV viewing on outcomes.

Conclusion. TV viewing was associated with increased risk of type 2 diabetes, cardiovascular events, and all-cause mortality in a dose-dependent manner.

COMMENTARY

American adults watch an average of 5 hours of television daily, and TV watching time seems to increase with age.¹ TV viewing time varies across other Western countries, with those in European countries watching an average of 2–3 hours per day.² In an era in which television watching is the predominant sedentary activity, this meta-analysis by Grontved et al. provides valuable information about the health risks associated with television watching.

It is well known that sedentary behaviors, including television

watching, place one at risk for obesity,^{3–5} and one study showed that adults gain an average of 0.3 lb per hour of TV watching.⁴ Other studies have shown that television watching is associated with increased blood pressure, LDL cholesterol, and triglyceride levels and lower HDL cholesterol levels.^{6–9}

This is the first meta-analysis to directly quantify the effects of TV viewing on health outcomes. TV watching is a sedentary activity and is also associated with higher caloric intake and snacking.^{10,11} The authors explored the extent to which the relationships between TV watching and adverse health outcomes are explained by physical inactivity and adverse dietary patterns by examining how adjustment for reported diet and BMI affected the risks associated with TV viewing.

The risk of developing type 2 diabetes per 2 hours of TV viewing time each day was only slightly attenuated after adjustment for available dietary factors (pooled RR 1.18, 95% CI 1.12–1.25). After adjustment for BMI, the pooled estimate of risk was reduced to 1.13 (95% CI 1.08–1.18). For fatal or nonfatal CVD and all-cause mortality, adjustment for dietary intake and BMI did not substantially change the point estimates for the relative risks.

Although this meta-analysis provides important information on the associations between TV viewing and the risk of developing chronic disease and death, its limitations

include pooling of only a small number of studies for each outcome, the use of self-reported TV viewing time, and the inability to account for other types of screen time such as computer or videogame time. Because there were small numbers of studies, the analysis could not determine whether heterogeneity in summary estimates resulted from differences in the quality of the studies or whether certain populations may be more vulnerable to increased risk from TV viewing.

Additionally, the meta-analysis is limited by the inability to adequately determine the extent of the influences of physical activity and dietary intake on TV viewing for chronic disease outcomes and all-cause mortality. For example, some people watch TV while exercising, and their risk may be lower than those who are sedentary while watching TV. Because the dietary intake data were not robust, the researchers could not assess whether television viewing is associated with unhealthy eating behaviors, increased total caloric intake, and intake of unhealthy foods, although other studies do suggest that this is the case.^{10,11}

Undesirable eating behaviors and physical inactivity may be associated with TV watching and are likely mediators of the risk for developing chronic disease.

Despite these limitations, this meta-analysis had a number of strengths, including large sample sizes for each study outcome and long follow-up periods. Following participants over time for incident disease makes it less likely that chronic disease is what is making them more likely to watch TV.

This meta-analysis provides supporting evidence that time spent watching television is associated with long-term health risks of type 2 diabetes, CVD, and all-cause mortality. Future studies should examine

the influences of objectively measured physical activity, measured BMI (baseline and follow-up), poverty and socioeconomic status, and detailed dietary factors (total caloric intake, categorization of foods into healthy and unhealthy foods, and the quantity of food and beverage intake during screen time) on the association between TV viewing and risk of incident diabetes, CVD, and mortality. To better quantify the risk of total screen time, future studies should also take into consideration all types of screen time, including computer, videogames (sedentary vs. physically interactive), and other handheld devices.

It is reasonable that decreasing TV time may lead to health benefits, especially if that time is replaced by physical activity. There is some evidence that the snacking that occurs during television viewing increases both daily total caloric intake and dietary fat intake.¹¹ Decreasing screen time may also reduce total caloric intake and consumption of unhealthy foods such as fast foods and sugar-sweetened beverages and thereby lead to reduction in BMI over time.

Although there have been promising results for interventions focused on reducing TV time in children, few studies have been conducted in adults.^{12–17} In one study, children in the treatment group that aimed to reduce sedentary behaviors, including TV time, lost more weight than those in the group that focused on increasing physical activity.¹⁸ Other studies in children have shown that interventions to reduce TV time, associated snacking and eating behaviors, and time spent watching TV while eating, as well as those involving removing TVs from bedrooms, are promising.^{12,13,15–18}

Further studies in adults are needed to examine whether decreasing TV time can decrease the risk

for or prevent the development of chronic disease and mortality. Although many studies have targeted eating behaviors and physical activity, interventions aimed at reducing TV time, replacing screen time with physical activity, and reducing unhealthy eating behaviors during TV viewing may be particularly useful.

REFERENCES

- ¹Neilsen Company: State of the media: TV usage trends: Q3 and Q4 2010 [article online]. Available from <http://www.nielsen.com/us/en/insights/reports-downloads/2011/state-of-the-media-tv-usage-trends-q3-and-q4-2010.html>. Accessed 3 July 2011
- ²Vereecken CA, Todd J, Roberts C, Mulvihill C, Maes L: Television viewing behavior and associations with food habits in different countries. *Public Health Nutr* 9:244–250, 2006
- ³Banks E, Jorm L, Rogers K, Clements M, Bauman A: Screen-time, obesity, aging and disability: findings from 91,266 participants in the 45 and Up Study. *Public Health Nutr* 14:34–43, 2011
- ⁴Mozaffarian D, Hao T, Rimm EB, Willett WC, Hu FB: Changes in diet and lifestyle and long-term weight gain in women and men. *N Engl J Med* 364:2392–2404, 2011
- ⁵Hu FB: Sedentary lifestyle and risk of obesity and type 2 diabetes. *Lipids* 38:103–108, 2003
- ⁶Bo S, Ciccone G, Durazzo M, Ghinamo L, Villosio P, Canil S, Gambino R, Cassader M, Gentile L, Cavallo-Perin P: Contributors to the obesity and hyperglycemia epidemics: a prospective study in a population-based cohort [article online]. *Int J Obes (Lond)* Available from <http://www.nature.com/ijo/journal/vaop/ncurrent/full/ijo20115a.html>. Accessed 5 July 2011
- ⁷Wijndaele K, Healy GN, Dunstan DW, Barnett AG, Salmon J, Shaw JE, Zimmet PZ, Owen N: Increased cardiometabolic risk is associated with increased TV viewing time. *Med Sci Sports Exerc* 42:1511–1518, 2010
- ⁸Fung TT, Hu FB, Yu J, Chu NF, Spiegelman D, Tofler GH, Willett WC, Rimm EB: Leisure-time physical activity, television watching, and plasma biomarkers of obesity and cardiovascular disease risk. *Am J Epidemiol* 152:1171–1178, 2000
- ⁹Kronenberg F, Pereira MA, Schmitz MK, Arnett DK, Evenson KR, Crapo RO, Jensen RL, Burke GL, Sholinsky P, Ellison RC, Hunt SC: Influence of leisure time physical activity and television watching on atherosclerosis risk factors in the NHLBI Family Heart Study. *Atherosclerosis* 153:433–443, 2000
- ¹⁰Bowman SA: Television-viewing characteristics of adults: correlations to eating

practices and overweight and health status. *Prev Chronic Dis* 3:A38, 2006

¹¹Gore SA, Foster JA, DiLillo VG, Kirk K, Smith West D: Television viewing and snacking. *Eat Behav* 4:399–405, 2003

¹²Stahl CE, Necheles JW, Mayefsky JH, Wright LK, Rankin KM: 5-4-3-2-1 go! Coordinating pediatric resident education and community health promotion to address the obesity epidemic in children and youth. *Clin Pediatr (Phila)* 50:215–224, 2011

¹³Whaley SE, McGregor S, Jiang L, Gomez J, Harrison G, Jenks E: A WIC-based intervention to prevent early childhood overweight. *J Nutr Educ Behav* 42 (Suppl. 3):S47–S51, 2010

¹⁴Foster JA, Gore SA, West DS: Altering TV viewing habits: an unexplored strategy

for adult obesity intervention? *Am J Health Behav* 30:3–14, 2006

¹⁵Maniccia DM, Davison KK, Marshall SJ, Manganello JA, Dennison BA: A meta-analysis of interventions that target children's screen time for reduction. *Pediatrics* 128:e193–e210, 2011

¹⁶Gortmaker SL, Peterson K, Wiecha J, Dixit S, Fox MK, Laird N: Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Arch Pediatr Adolesc Med* 153:409–418, 1999

¹⁷Escobar-Chaves SL, Markham CM, Addy RC, Greisinger A, Murray NG, Brehm B: The Fun Families Study: intervention to reduce children's TV viewing. *Obesity (Silver Spring)* 18 (Suppl. 1):S99–S101, 2010

¹⁸Epstein LH, Valoski AM, Vara LS, McCurley J, Wisniewski L, Kalarchian MA, Klein KR, Shrager LR: Effects of decreasing sedentary behavior and increasing activity

on weight change in obese children. *Health Psychol* 14:109–115, 1995

Arlene Chung, MD, MHA, is a clinical instructor of medicine and pediatrics in the Department of Medicine and the Department of Pediatrics and a National Research Service Award primary care research fellow at the University of North Carolina School of Medicine in Chapel Hill. Michael Pignone, MD, MPH, is a professor of medicine in the Department of Medicine at the same institution. He is also an associate editor of Clinical Diabetes.