Consequences of Electronic Device Overuse on Children's Health
Alexandra Talaber OD
Vision Rehabilitation Service, University Eye Center, State University of New York College of Optometry

33 West 42nd Street
New York, NY 10036

Abstract
Electronic device use is a large part of the daily routine in children and adult life. Device use affects behavior and health, specifically sleep habits, mood, physical activity, and weight. This paper reviews literature exploring the relationship between the frequency and length of electronic device use, sleep habits, and body mass of children ages 4-18. Television viewing, computer and mobile phone use, and video games play a critical role in the reduced sleep duration in children and adolescents. Increased time spent on devices correlates with higher body mass index in children.

Keywords: children; circadian rhythm; electronic devices; screen time; sleep

Introduction
Children spend more time with electronic devices including televisions, computers, mobile phones, and tablets now more than in years past. The average adolescent spends 7 hours and 36 minutes per day using electronic devices.1 The average child under 5 spends an hour and 10 minutes per day on electronic devices.3 There was a 1 and 10 minute increase in time with devices from 1999 to 2009 in adolescents.1 Furthermore, today's children are sleeping less than previous generations.4

Light affects circadian rhythm, sleep patterns, attentional and alertness.5 Light is detected by rods and cones in the outer retina layers, and by intrinsically photosensitive, melanopsin receptors in the retina.6 The pRGCs project to the suprachiasmatic nuclei of the anterior hypothalamus, which functions as the body's master clock, regulating clock gene expression and melatonin production and release via the pineal gland.7 The melatonin hormone prepares the body for sleep.7

The peak sensitivity of pRGCs is 484 nanometers wavelength of light.8 Shorter wavelengths of light, following the peak sensitivity of pRGCs, are projected to the suprachiasmatic nuclei of the anterior hypothalamus, which functions as the body's master clock, regulating clock gene expression and melatonin production and release via the pineal gland.7 The melatonin hormone prepares the body for sleep.7

Methods
A literature search was performed using the Ebiolit B. Stephens (ESCCO), PubMed, Wiley Library, and Journal of Pediatric databases with search terms including: children and sleep, screen time and children, sleep habits in children. Inclusion criteria were articles that studied children from 4-18 years old and major use of television, computer, mobile phone, or tablet. Eighteen articles were found in the category of electronic device use and sleep patterns or device use and other health consequences in children.

Summary
More time spent watching television, using the computer, and video gaming contributed to lower sleep quality and shorter sleep times in young people. Children who are overweight spend more time in front of screens and experience higher rates of depression. The presence of media in the bedroom substantially increases the risk of sleep disruption and reduced sleep duration. Obesity rates were higher in children who watched more television and owned more electronic devices. Teenage girls who spend more time with their devices reported higher rates of depression and decreased social support. Few studies explore the relationship between screen time and physical activity or sedentary behavior.

Conclusion
Light-emitting screens are contributing to physiological mechanisms controlling circadian rhythm and attention pathways. Electronic devices are likely keeping users awake for longer at night. Device use, social interactions, and parental roles also contribute to the time spent with electronic devices, sleep quality, physical activity, and sedentary behaviors. These studies offer correlation, but not necessarily causation. More research is needed in order to make recommendations to young parents to promote healthy development.

American Pediatric Association recommends that children spend less than 2 hours per day with electronic devices of any type. There are no device guidelines in place for babies or infants.

References