

Journal Highlights

NEW FINDINGS FROM THE PEER-REVIEWED LITERATURE

Ophthalmology

Edited by Stephen D. McLeod, MD

Excessive Smartphone Use and Myopia in Teens

December 2021

How much of a relationship is there between smartphone use and myopia prevalence? **Enthoven et al.** studied the use of smartphones among teenagers and found that refractive errors were more common when smartphone sessions lasted 20 minutes or longer, particularly for those teens who spent less time outdoors.

For this cross-sectional study, teens (12-16 years) were recruited from six Dutch secondary schools and from the Generation R study. A myopia app was installed on their phones; the app calculated phone time in hours per day and face-to-screen distance for a five-week period. On-screen episodes lasting 20 minutes without a break were documented and were deemed “continuous use.” Twice weekly, the app prompted participants to log the time they had spent outdoors. Ocular biometry was performed, and cycloplegic refractive error was measured. Linear mixed models were applied, with overall smartphone use, continuous use, and face-to-screen distance as determinants, and spherical equivalent of refraction (SER) and the ratio of axial length to corneal radius (AL:CR) as outcome measures. Findings were stratified by the level of outdoor exposure.

Valid smartphone data and eye measurements were available for 272

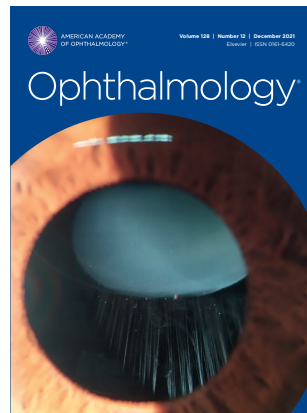
enrollees (average age, 13.7 years). The overall myopia prevalence was 18.9%. On school days, mean daily smartphone use (\pm standard deviation) was 3.71 ± 1.70 hours. The association with AL:CR was minimally significant, but the association with SER was not. The mean number of continuous-use sessions (20 minutes without a break) per day was 6.42 ± 4.36 , which correlated significantly with SER and AL:CR. When stratified by time spent outdoors, continuous use was significant for those teens with low outdoor exposure. Face-to-screen distance and smartphone use on weekends had no significant relationship to SER or AL:CR.

The findings suggest that the teens in this study spend nearly four hours a day on their smartphones and that uninterrupted 20-minute sessions increase the risk of myopia.

Shingrix Protects Against Herpes Zoster Ophthalmicus

December 2021

The FDA approved the recombinant herpes zoster vaccine (Shingrix) in 2017. Although evidence has shown that it is more effective than its predecessor in preventing herpes zoster, data for either vaccine's effect on herpes



zoster ophthalmicus (HZO) are limited. To learn more, **Lu et al.** evaluated Shingrix's ability to prevent HZO in the general U.S. population. Although the vaccination rate was relatively low in their study, results showed that the vaccine was 89.1% effective against HZO.

For this study, the authors collected details from the OptumLabs Data Warehouse for patients 50 years or older who were eligible to receive Shingrix in 2018 or 2019. Patients were eligible for inclusion if they had at least 365 days of continuous enrollment in the data bank and excluded if they had a diagnosis of herpes zoster or any immune-compromising condition within a year before the study period. Shingrix vaccination was determined by CPT codes, and the diagnosis of HZO was established by ICD-10 codes. Cox proportional regression models were applied to estimate hazard ratios, and control of confounding factors was achieved by probability weighting. Main outcome measures were vaccine effectiveness and the comparative incidence of HZO person-time in vaccinated versus unvaccinated participants.

Among nearly 5 million eligible individuals, 177,289 (3.7%) received two valid doses of Shingrix. The median age was 72 years and 64 years in the vaccinated and unvaccinated cohort, respectively. The incidence rate of HZO per 100,000 person years was 25.5 cases in the vaccinated group, versus 76.7 cases

in the unvaccinated group. The overall adjusted effectiveness of Shingrix for prevention of HZO was 89.1%.

Although these results are promising, the low vaccination rate highlights the public health need to boost vaccine uptake, the authors said.

MicroShunt or Trabeculectomy for POAG

December 2021

Baker et al. described interim findings of a two-year randomized study of the MicroShunt versus trabeculectomy in the treatment of primary open-angle glaucoma (POAG). By year 1, trabeculectomy had achieved greater reductions in IOP.

This ongoing study includes adults with mild to severe POAG that is not adequately controlled by maximum-tolerated medical treatment (age range, 40-85 years; IOP range, 15 to 40 mm Hg). Patients were assigned randomly (1:3) to undergo trabeculectomy or implantation of the MicroShunt. All received adjunctive mitomycin C (0.2 mg/mL for two minutes).

Surgical success was the primary effectiveness measure and was defined as reduction of at least 20% in mean diurnal IOP from baseline (no medication washout) to year 1, with no increase in the number of glaucoma medications. Additional endpoints were mean change in IOP from baseline, need for post-op intervention, number of glaucoma medications, and adverse events.

Altogether, 132 patients underwent trabeculectomy, and 395 received the MicroShunt. Results at year 1 were as follows:

- Surgical success was less common in the MicroShunt group than in the trabeculectomy cohort (53.9% vs. 72.7%; $p < .01$).
- Mean IOP in the MicroShunt group declined from 21.1 mm Hg at baseline to 14.3 mm Hg at one year. In comparison, mean IOP decreased from 21.1 mm Hg at baseline to 11.1 mm Hg at one year in those who underwent trabeculectomy ($p < .01$ for both).
- The mean number of glaucoma medications decreased from 3.1 at baseline to 0.6 by one year in the

MicroShunt cohort and from 3.0 at baseline to 0.3 by one year in the trabeculectomy group ($p < .01$ for both).

- Postoperative interventions, including laser suture lysis, were reported for 40.8% of the MicroShunt group and 67.4% of the trabeculectomy group. Transient hypotony was more common with trabeculectomy (49.6% vs. 28.9%; $p < .01$). Vision-threatening complications were rare with both procedures.

—Summaries by Lynda Seminara

Ophthalmology Glaucoma

Selected by Henry D. Jampel, MD, MHS

At-Home Tonometry Identifies At-Risk Patients

November/December 2021

McGlumphy et al. compared at-home and in-clinic tonometry in patients with glaucoma. They found that self-tonometry can identify a subset of at-risk glaucoma patients who experience clinically significant fluctuations in IOP that are not identified by in-clinic tonometry alone.

For this retrospective cross-sectional study, the researchers evaluated data from 61 patients (107 eyes) who took at-home IOP readings with the iCare Home tonometer. The patients' mean age was 63.2 years (standard deviation [SD], 14 years), and 59% were women. Measurements taken at home were compared with in-clinic readings taken during five visits that occurred before the home tonometry trials. Main outcome measures included in-clinic and at-home IOP measurements (mean, maximum, minimum, range, standard deviation, and coefficient of variation). The mean daily maximum and mean daily range of IOP were calculated to describe recurrent IOP spiking.

The results showed that mean IOP was 14.5 mm Hg (SD, 4.7 mm Hg) in the clinic, versus 13.6 mm Hg (SD, 5.1 mm Hg) at home. Self-tonometry identified significantly higher maximum IOP, lower minimum IOP, and greater IOP range than did in-clinic testing ($p < .001$). Mean daily maximum IOP exceeded maximum clinic IOP in 44% of patients and exceeded target IOP by

3 mm Hg, 5 mm Hg, or 10 mm Hg in 31%, 15%, and 6% of patients, respectively. In addition, maximum daily IOP occurred outside of clinic hours on 50% of days assessed and occurred between 4:30 a.m. and 8:00 a.m. on 24% of days.

In multivariable analysis, patient characteristics that predicted deviations between mean daily maximum and mean clinic IOP or target IOP were younger age, male gender, and absence of prior filtering surgery.

Additional prospective studies are needed, the authors said. In the interim, these findings indicate that self-tonometry can identify at-risk glaucoma patients who are experiencing large IOP deviations outside of standard office hours.

—Summary by Jean Shaw

Ophthalmology Retina

Selected by Andrew P. Schachar, MD

Use of iOCT to Guide ERM Peeling

December 2021

Tuifua et al. compared outcomes of intraoperative OCT (iOCT)-guided epiretinal membrane (ERM) peeling with those achieved with the conventional approach (pars plana vitrectomy plus ERM peel). They found that the two procedures produced similar visual acuity (VA) and anatomic results.

For this retrospective case-control study, the authors assessed 262 eyes. Of these, 151 were in the iOCT cohort, and 111 underwent conventional surgery. Main outcome measures were VA and ERM recurrence. In addition, central subfield thickness (CST) and reoperation rates were assessed. Of note, those who underwent iOCT-guided peeling had participated in a separate prospective study that evaluated the use of microscope-integrated iOCT in ocular surgery.

Results were as follows:

- VA. Pre-op VA was 20/55 (mean \pm standard deviation, 62.8 ± 12.1 letters) in the iOCT group and 20/50 (64.9 ± 9.9 letters) in the conventional group. At 12 months after surgery, VA had improved by 11.9 letters in the iOCT cohort and by 12.1 letters in those who underwent conventional surgery.
- CST. Mean CST decreased from

466.8 ± 7.9 μm at baseline to 367.3 ± 6.0 μm at 12 months in the iOCT group. Those in the conventional group experienced a similar reduction, with baseline CST of 454.2 ± 10.3 μm decreasing to 360.9 ± 6.3 μm at 12 months.

- **ERM recurrence.** No visually significant foveal ERMs recurred in either cohort. When both the parafoveal and foveal areas were assessed, ERM recurrence or persistence was visible in 63 eyes (42%) in the iOCT group and in 30 eyes (27%) in the conventional group. In using iOCT, the surgeons were able to identify those eyes that required additional peeling for residual membranes (n = 29). Moreover, in 15 eyes, although the surgeon initially thought that the peel was not complete, iOCT was able to confirm that it was successful. As a result, these eyes were spared any further use of dyes for additional peeling and tissue manipulation.

- **Reoperations.** No patients in either group required reoperation related to ERM peeling. However, cataract surgery was needed in four patients, three of whom were in the iOCT group, as cataract progression was noted.

These findings warrant randomized, prospective studies with longer follow-up to fully assess the role of iOCT in ERM surgery, the authors said.

—Summary by Jean Shaw

American Journal of Ophthalmology

Selected by Richard K. Parrish II, MD

Botox for Blepharospasm: Role of Injection Site

December 2021

Although the cause of benign essential blepharospasm is unknown and there is no cure, some symptoms may be alleviated with periocular injection of botulinum toxin type A (BTX-A). Previous studies have found that the efficacy of BTX-A varies according to whether it is delivered by preseptal or pretarsal injection. **Sanguandikul et al.** set out to evaluate the rate of complications by injection site. They found that although lagophthalmos was more common after pretarsal injection, there

was little difference in the degree of lagophthalmos between the preseptal or pretarsal groups.

For this double-masked comparison study, the authors recruited 24 adults (mean age, 63.6 years) with blepharospasm from a hospital in Bangkok, Thailand. Each patient received a preseptal injection of BTX-A into one eye (chosen randomly) and a pretarsal injection into the fellow eye. At baseline and one and three months postinjection, the patients were interviewed and examined to assess tearing, lagophthalmos, ptosis, diplopia, margin-to-reflex distance, ocular motility, and presence of ectropion and entropion.

In addition, tear film breakup time was determined, Schirmer testing was performed, and the ocular surface was stained (Oxford scheme). The Jankovic rating scale was used to grade the frequency and severity of blepharospasm. The main outcome measurement was the incidence of complications following the injections.

Before injection, no patient in either group exhibited lagophthalmos, ectropion, entropion, or impaired ocular motility. One month after BTX-A injection, one patient was lost to follow-up. For the remaining 23 patients, the rate of self-reported lagophthalmos was higher in pretarsal eyes (n = 12; 52.17%) than in preseptal eyes (n = 7; 30.43%) (p = .024). At this time, the estimated degree of lagophthalmos also was significantly higher for the pretarsal group (0.59 mm vs. 0.26 mm; Bonferroni-corrected p = .001). There were no significant differences between the groups in complications related to blepharospasm.

Features of ONH Prelaminar Schisis in Advanced Glaucoma

December 2021

Spectral-domain OCT allows detailed visualization of the optic nerve head (ONH) and commonly detects prelaminar schisis, which often presents as splitting of the superficial prelaminar tissue and floating of retinal vessels. Although the schisis may result from complex interactions between mechanical forces induced by glaucomatous

cupping and glial cell-induced physiologic disturbances in prelaminar tissue, the precise mechanisms by which it develops are unknown. **Sung et al.** analyzed cross-sectional scans of the ONH in eyes with advanced glaucoma with the aim of identifying features of ONH prelaminar schisis and factors related to it. They found associations with thin and deep lamina cribrosa (LC), short axial length, and thick macula.

For this retrospective study, the researchers included 116 patients (116 eyes) with advanced glaucoma who underwent comprehensive ophthalmic examinations, including SD-OCT. ONH prelaminar schisis was identified independently by two evaluators, and consensus was required to deem it present. Also documented were Bruch membrane opening–minimum rim width (BMO-MRW), thickness and depth of the LC, and thickness of the peripapillary retinal nerve fiber layer (RNFL) and the macula (total retinal thickness, RNFL, ganglion cell layer, inner plexiform layer). Peripapillary and subfoveal choroidal thickness was noted. Findings were compared for patients with and without ONH prelaminar schisis.

The investigators found ONH prelaminar schisis in 48 eyes (41.4%). It was more common in those patients who were older (p < .001) or had a shorter axial length (p < .001) or a thinner or deeper LC (p = .004 and .014, respectively). It also was linked to greater thickness of the macular ganglion cell layer (p = .001), the inner plexiform layer (p = .001), and the macula overall (p < .001). With ONH prelaminar schisis, macular structural parameters tended to coincide better with functional parameters than did BMO-MRW and peripapillary RNFL thickness.

Such findings may have implications for managing advanced glaucoma with or without ONH prelaminar schisis, the authors said. They recommend similar explorations in mild and moderate glaucoma, as well as research to determine the temporal relationship between ONH prelaminar schisis and key parameters.

—Summaries by Lynda Seminara

JAMA Ophthalmology

Selected and reviewed by Neil M. Bressler, MD, and Deputy Editors

Health Care Disparities and Telemedicine During COVID

November 2021

Aziz et al. assessed whether health care disparities were involved in the delivery of ophthalmic telemedicine during the first year of the COVID pandemic. They found that historically marginalized populations were less likely to receive telemedical care during this time.

For this retrospective cross-sectional study, the researchers analyzed clinical visits at Massachusetts Eye and Ear (MEE) from Jan. 1 to Dec. 31, 2020. Primary outcomes included the demographic characteristics of patients who received telemedical care during the year. Secondary outcomes included visit type (telemedicine or in-clinic), diagnosis, and patient type (new or established). Multivariate logistic regression analysis was used to assess the data. And because access to video technology can be a barrier to using telemedicine, the researchers further compared telephone-based to video-based telemedical visits.

All told, 155,131 ophthalmic clinical visits took place at MEE during 2020. Of these, 2,262 were telemedicine encounters that involved 1,911 patients. The median age of patients seen via telemedicine was 61 years (range, 43-72), and the majority were White (76.14%) and female (61.7%). In addition, those who received telemedical care were more likely to speak English as their primary language and to have a higher educational level (college or postgraduate education). Those who were male, identified as Black, had an educational level of high school or less, and did not speak English as a primary language were less likely to receive telemedical care during the year.

When the researchers compared telephone-based to video-based care, they found a similar pattern, with older, less educated, and poorer patients less likely to use video-based care.

The study has several limitations, the researchers acknowledge, including

its retrospective design. Nonetheless, they said, the “potential exacerbation of health inequalities through the use of ophthalmic telemedicine” points to an ongoing need to prioritize equitable health care delivery throughout all of ophthalmology, including telemedical visits. (*Also see related commentary by Brian L. VanderBeek, MD, MPH, MSCE, in the same issue.*)

Price Transparency Still Lacking at Academic Institutions

November 2021

The Hospital Price Transparency rule, which requires hospitals to publish online their pricing information for all services and payers, went into effect on Jan. 1, 2021. **Berkowitz et al.** evaluated the availability, usability, and variability of standard reported prices for two common cataract procedures at academic hospitals. They found substantial noncompliance with the rule, suggesting that most patients were still unable to find the information they need on current standard charges.

For this economic evaluation, the researchers assessed 247 academic hospitals. (Veterans Affairs facilities, children’s hospitals, and large multi-hospital networks were not included in this analysis.) Of these, 238 provided machine-readable files of standard charges, and 191 provided consumer-friendly price estimators or online tools.

A routine search engine query was used to emulate an average consumer’s approach to finding pricing information. If available, the gross charge, discounted cash price, and de-identified minimum and maximum prices were documented for CPT codes 66821 (*Dissection of secondary membranous cataract*) and 66984 (*Extracapsular cataract removal with insertion of intraocular lens prosthesis*). Specific components of each price (e.g., hospital, physician, anesthesiologist, supplies) were recorded, if available. In addition, consumer-friendly metrics—such as how long it typically took to get an answer to a query—were recorded.

Only 29 hospitals (15.2%) provided full pricing data. The majority of hospitals (155; 81.2%) provided a gross

charge for CPT code 66984, with 102 hospitals (53.4%) also providing cash pricing for this procedure. The prices for CPT code 66821 were less frequently available, with 101 hospitals (52.9%) and 71 institutions (37.2%) providing gross and cash price information, respectively. In addition, the amounts quoted varied 27-fold among hospitals for CPT code 66821 and 51-fold for CPT code 66984.

Finally, usability issues were noted for 36 hospitals (18.8%); these included requirements for personal information and web page navigability barriers.

Given these problems, the researchers said, a centralized database and additional legislation may be necessary. In particular, they noted, uninsured patients who need to compare cash pricing between institutions need genuine pricing transparency. (*Also see related commentary by Michael X. Repka, MD, MBA, in the same issue.*)

Using Social Media to Educate Parents About Myopia Risks

November 2021

Can social media play a role in raising parents’ awareness of the risks of myopia among children? **Li et al.** evaluated the effectiveness of school-based family health education delivered via WeChat. They found that weekly messages to parents, sent via WeChat, resulted in a small decrease in the two-year cumulative incidence of myopia.

The researchers recruited grade 1 students from 12 primary schools in Guangzhou, China, and randomized them into intervention (n = 688) and control (n = 752) groups. Parents of the children in the intervention group received weekly educational messages, such as reminders to limit their children’s electronic screen time and to encourage them to play outside. Eye examinations were performed by optometrists and ophthalmologists who were blinded to the group randomization.

The primary outcome was the two-year cumulative incidence rate of myopia; secondary outcomes included changes in axial length and spherical equivalent (SE) refractive error as well as changes in the children’s behavior.

All told, 1,244 children completed the study, with 544 in the intervention group. The cumulative incidence rate of myopia differed by 4.9% between the two groups (19.5% in the intervention group and 24.4% of controls). The mean myopic shift in SE refraction was less than .25 D between the two groups and was not accompanied by any differences in axial length.

The researchers noted that it remains to be determined whether these results can be extrapolated to other populations outside China. In addition, they said, the long-term impact that such efforts might have on myopia control are unknown. (Also see related commentary by Clair A. Enthoven, PhD, Ivonne P.M. Derks, PhD, and Jan Roelof Polling, BSc, in the same issue.)

—Summaries by Jean Shaw

OTHER JOURNALS

Selected by Prem S. Subramanian, MD, PhD

Thyroid Eye Disease and Gaze-Evoked ONH Deformations

British Journal of Ophthalmology
Published online Jan. 19, 2021

Fisher et al. questioned whether gaze-evoked deformations of the optic nerve head (ONH) are, in turn, aggravated by thyroid eye disease (TED). Based on their computational models and OCT images, TED appeared to amplify these distortions. The authors emphasized that larger studies would be needed to confirm the findings.

For this exploration, the authors built three finite-element models (one healthy eye, one eye with proptosis, one eye with extraocular tissue stiffening) and two hypothetical models (softening and lack of extraocular tissue). Horizontal eye movements were simulated in the orbits, and each deformation of the ONH was evaluated. For verification, OCT images of the ONH were obtained from 10 healthy volunteers and a patient with TED while the participants' eyes were in primary gaze, adduction, and abduction.

The effects of TED on ONH mechanics were assessed by measuring the tilt angle (i.e., relative anteroposterior

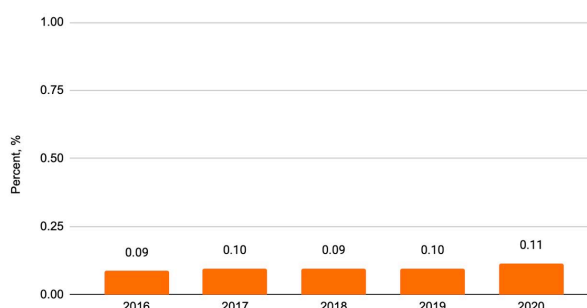
Ischemic Optic Neuropathy Following Cataract Surgery

Analyzing de-identified electronic health record (EHR) data from the IRIS Registry, Verana Health determined the number of patients seen for a diagnosis of ischemic optic neuropathy within 90 days after cataract surgery from 2016 through 2020.

The study found 6,152,870 cataract surgeries among 3,745,487 unique patients with at least 90 days of follow-up. The number of cataract surgeries performed stayed relatively stable across 2016-2019 and declined in 2020, in keeping with a previous study on ophthalmology-related patient visits during the COVID-19 pandemic.¹ Ischemic optic neuropathy was reported within 90 days post-op in 5,915 patient eyes during the study period; the percentage of cases reporting ischemic optic neuropathy within 90 days postoperatively stayed consistent across these five years.

"There are conflicting data on whether cataract surgery is a risk factor for ischemic optic neuropathy based on previous single-center studies with small case numbers.² This finding demonstrates the potential for much larger sample sizes using real-world data," said Heather Moss, MD, PhD, at Stanford University in Palo Alto, California.

Percentage of Cataract Surgeries With Reported Ischemic Optic Neuropathy Within 90 Days Post-Op in IRIS Registry, 2016-2020



1 Leng T et al. *Ophthalmology*. Published online June 16, 2021.

2 McCulley TJ et al. *J Neuro-Ophthalmol*. 2021;41(1):119-125.

Note: The Academy has partnered with Verana Health (www.veranahealth.com) to curate and analyze IRIS Registry data.

displacement of Bruch membrane opening) in the models and the human participants. Negative tilt angles indicated that the nasal side of the opening moved posteriorly relative to the temporal side, and vice versa.

The authors found that gaze-evoked deformations were greater in eyes with proptosis and with stiffer extraocular tissue than in the healthy eye. In contrast, deformations were less pronounced in the models with soft or no extraocular tissue, in both adduction and abduction. The mean tilt angle for healthy volunteers was 1.46 ± 0.25 degrees in adduction and -0.42 ± 0.12 degrees in abduction. The volunteer with TED had the largest tilt angles: 5.37 degrees in adduction and

-2.21 degrees in abduction.

Although gaze-evoked ONH deformations often are ascribed to optic nerve traction, the authors suggested that the distortions observed in their finite-element models may relate to the presence and stiffness of orbital fat. Moreover, fat obstruction may explain why ONH deformations were more severe in the patient with TED than in healthy eyes, they said. To validate these findings, they recommended exploring gaze-evoked deformations in a large series of patients with TED.

—Summary by Lynda Seminara

MORE ONLINE. For an additional study, see this article online at aao.org/eyenet.