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A comparison of central and peripheral refraction between 4-6 year-old Children user and non-user of smartphones and/or other electronic screens

Seyede Masoumeh Hosseini[1], Ali Mirzajani*[1], Ebrahim Jafarzadehpour[1], Jamileh Abolghasemi[2]

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Abstract

Background: The purpose of the present study is to compare central and peripheral refraction among children of 4-6 year-old user and non-user of smartphones and /or other electronic screens.

Methods: In this cross-sectional study, 106 children aged 4-6 years were enrolled in two groups of user (56 children: 34 boys and 22 girls) and non-user (50 children: 30 girls and 20 boys) of smartphones and /or other electronic screens.

The user group used smartphones and /or other electronic screens for 1-3 hours a day for at least one year and non-user group either did not use these screens or used less than half an hour occasionally and not every day.

All children had visual acuity of at least 20/20 with or without correction and showed no other ocular or systemic diseases. Both groups were evaluated for central refraction and peripheral refraction up to 20° eccentricity in nasal and temporal directions and up to 10° eccentricity in superior direction using the Shin-Nippon K5001 autorefractometer. The outcome measures were compared with SPSS statistical software.

Results: The findings showed no statistically significant difference in terms of central and peripheral refraction in superior, nasal and temporal eccentricities between the user and non-user groups ($p>0.05$).

Conclusion: According to the results of the present study, it concludes that using smartphones and/or other electronic screens for 1-3 hours a day shows no effect on central and peripheral refraction in children with low range of refractive errors.

Keywords: Smartphone, Electronic screens, Peripheral refraction, Central refraction

Conflicts of Interest: None declared
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Introduction

Nowadays, the use of smartphones and/or other electronic screens has increased among all age groups especially children (1). In addition, children spend a lot of time using electronic screens to perform a variety of computer games and educational programs (2). In this regard, one of the main questions of parents when referring to optometry clinics is the adverse effects of using electronic screens as a risk factor for the development and health of the children's eyes.

The children's visual system is evolving gradually according to visual inputs. This evolution is influenced by the eyes visual pathways health, and environmental

Corresponding author: *Dr Ali Mirzajani, mirzajani.a@iums.ac.ir*

1. Department of Optometry, School of Rehabilitation Sciences, Iran University of Medical Sciences, Tehran, Iran
2. Department of Biostatistics, School of Public Health, Iran University of Medical Sciences, Tehran, Iran

↑What is "already known" in this topic:
There is a controversy about refraction in users of smartphones and/or other electronic screens. In some studies, no evidence has been found about a correlation between relative peripheral hyperopic defocus and change in refractive errors.

→What this article adds:
Using smartphones and/or other electronic screens for 1-3 hours per day shows no effect on central and peripheral refraction in children with low range of refractive errors.

conditions (3).

Previous studies (4-5) have shown that the screen's distance (usually smartphones or tablets) from the children's eyes is lower than that of adults, so the children need more convergence and accommodation efforts to use such screens. This excessive convergence and accommodation in some conditions can cause symptoms such as increased blinking, headache, transient diplopia, and dizziness (6). In many studies, the prolonged near work and accommodative performance in this condition are considered as one of the primary environmental risk factors in the development and progression of transient myopia, which can sometimes be permanent and sustained by increasing the axial length of the eye (7-9). However, in some studies, it has been pointed out that prolonged near work has a slight effect on refractive error changes, which can be prevented by interruptions during near work (10).

Another issue that has been reported in relation to near work and the onset and progression of refractive errors, especially myopia is relative peripheral hyperopic defocus during near work so that visual signals from the peripheral retina can have a significant impact on emmetropization at the fovea and possibly the genesis of common refractive errors, especially myopia (3,11,12).

In contrast, in some studies, no evidence has been found about a correlation between relative peripheral hyperopic defocus and change in refractive errors (13-15).

Among previous studies, there was no study on the relationship between peripheral refraction of children and using smartphones and/or other electronic screens. In addition, there is little and contradictory information about the details of the permanent effects of using these screens on the children's eyes.

Therefore, the purpose of this study is to compare the central and peripheral refraction between the children users and non-users of smartphones and/or other electronic screens to provide background information on differences in the central and peripheral refraction between the two groups.

Methods

In this study, children between the ages of four and six were selected by available non-randomized sampling based on the inclusive criteria from some kindergartens. The study was approved by the Ethics Committee of the Iran University of Medical Sciences, Tehran, Iran and followed the tenets of the Declaration of Helsinki. Written informed consent was obtained from at least one parent of the subjects after they received an explanation of the nature of the study.

All subjects underwent a detailed ophthalmic examination, including Slit lamp biomicroscope (Nidek model, Gamagori, Japan) and direct ophthalmoscope (Heine Beta200, Herrsching, Germany) to evaluate the anterior and posterior segments of the eye.

Subjects with best-corrected visual acuity of less than 20/20, media opacity, evidence or history of any ocular diseases, any history of ocular surgery, manifest deviation (tropia), amblyopia and abnormal eye movement including nystagmus, were excluded from the study.

The refraction was done without using cycloplegic agents as suggested in previous reports (16) to find the natural amounts of astigmatism and what the subjects encounter with natural pupil size in everyday life. The spherical equivalent (SE) values were used for comparing refraction between two groups. SE of -0.50 to +0.50 D with visual acuity 20/20 was considered as emmetropic subject as some previous studies applied (15-17).

In addition, since subjects in this study had normal vision with or without correction and selected with no pathological and functional disorders, thus hyperopic subjects were with SE of +0.50 to +2.25 D and myopic subjects with SE of -0.50 to -1.50 D.

These children were divided into two groups according to the duration of using smartphones and/or other electronic screens as a near work (Such as types of tablet or laptop ....) which parents were asked about. The first group consisted of 56 children (with mean age of 5.57±0.16 years) who used smartphones and /or other electronic screens for 1-3 hours per day for at least one year and the second group consisted of 50 children (with a mean age of 5.30±0.10 years) who either did not use these screens or used less than half an hour occasionally and not every day.

First, the uncorrected visual acuity was measured with a Snellen E chart (LED visual chart projector, LC-13, MEDIZ Inc. City, Korea) at a distance of 6 meters. Then, the noncycloplegic central and peripheral refraction measurements of the refractive errors and its type were determined by the NVision-K 5001 autorefractor (Shin-Nippon, Tokyo, Japan) whose reliability was confirmed by a previous study (18). These measurements were performed at the fovea and up to 20° eccentricity in the horizontal (nasal and temporal) and up to 10° eccentricity in the vertical (just superior) meridian according to the environmental targets designed for these measurements. In this way, small LED lamps were placed at a distance of two meters from the apex of the cornea as fixed targets that were illuminated individually. Measurements were repeated five times for reliability, and the average was considered.

Intraclass Correlation Coefficient (ICC) values were calculated separately for central and peripheral refraction and were between 0.89 and 1.00, thus, the reliability of the tests was confirmed.

Statistical analysis

In order to compare the refraction results of the autorefractometer, the values were converted to vector format (19), by representing the sphere (S), cylinder (C), and axis (θ) as the mean spherical equivalent (SE), 180° to 90° astigmatism J_0 and 45° to 135° astigmatism J_{45} components based on the following equations:

$$SE = S + C/2$$
$$J_0 = -C/2 \cos(2\theta)$$
$$J_{45} = -C/2 \sin(2\theta)$$

In addition, the Relative Peripheral Refraction (RPR) component was derived from the relative difference between the spherical equivalent refraction (SE) of the central and peripheral refraction.

Statistical analyses were performed using SPSS 22.0

(SPSS Inc., Chicago, IL, USA) for Microsoft Windows. Independent sample t-test for normally distributed data and nonparametric Mann-Whitney tests were used when the data do not approximate a normal distribution in order to identify significant differences between user and non-user groups. The level of significance was set at $P < 0.05$.

According to the objectives of the study, the sample size was calculated for central and peripheral refraction separately. The larger sample size was related to the central refraction in the user and non-user children that was used as the sample size applying the following formula:

$$n = \frac{\left(Z_{1-\alpha/2} + Z_{1-\beta}\right)^2 \sigma^2}{(\mu_1 - \mu_2)^2}$$

In this formula, the confidence level $(1-\alpha)$ of 95% and the test power $(1-\beta)$ of 80% were considered.

A comprehensive search was carried out in in the literature to obtain values of mean and standard deviation but there was no result. Thus, a pilot study was arranged on 30 children and with these findings and considering 10 percent for data loss, finally, sample size was calculated at least 49 subjects.

Results

In the present study, the central and peripheral refraction of 106 children aged 4-6 years (52 F, 54 M) were analyzed. There was a significant difference in the gender of the children in the two groups, so that from the total number of 52 girls and 54 boys, the number of boys was 34 (60.7%) in the user group and 20 (40.3%) in the non-user group and the number of girls was 22 (39.3%) in the user group and 30 (59.7%) in the non-user group. In other words, boys used electronic screens more than girls.

In this study, there was no significant difference in the central refraction components of spherical power, equivalent sphere, J_0 and J_{45} values between the two user and non-user groups (Table 1).

Also, regarding to peripheral refraction components (spherical power, equivalent sphere, J_0 and J_{45} values), no significant difference was found between the two groups in all three eccentricity directions of temporal, nasal, and superior (Table 2).

Among these subjects, 60 children (33 in the user group and 27 in the non-user group) were emmetropic that had a statistically significant myopic shift in RPR (P<0.05). Of these subjects 33 children (20 children in the user group and 13 children in the non-user group) were hyperopic with a statistically significant myopic shift in RPR (P<0.05) and 13 children (9 in the user group and 4 in the non-user group) with myopic central refraction had a mean statistically significant hyperopic shift in RPR (P<0.05). However, there was no significant difference between the user and non-user groups in the comparison of the peripheral shifts of superior, nasal and temporal eccentricities in all

Table 1. Comparing central refraction components between users and non-users of smartphones and/or other electronic screens (S: spherical power, SE: spherical equivalent, J_0: 180° to 90° astigmatism and J_{45}: 45° to 135° astigmatism)

Components	User (Mean±SD)	Non-user (Mean±SD)	P
S	0.53±0.11	0.58±0.12	0.79
J_0	0.004±0.03	0.001±0.03	0.89
J_{45}	0.06±0.05	0.11±0.04	0.45
SE	0.25±0.10	0.24±0.12	0.97

Table 2. Comparing Peripheral refraction components between users and non-users of smartphones and/or other electronic screens (S: spherical power, SE: spherical equivalent, J_0: 180° to 90° astigmatism and J_{45}: 45° to 135° astigmatism)

Components	Eccentricity	User (Mean±SD)	Non-user (Mean±SD)	P
S	Temporal	0.14±0.097	0.15±0.105	0.97
	Nasal	0.28±0.102	0.30±0.097	0.87
	Superior	0.32±0.116	0.20±0.094	0.43
J_0	Temporal	0.01±0.041	0.06±0.040	0.42
	Nasal	0.05±0.029	0.04±0.039	0.90
	Superior	-0.04±0.038	-0.04±0.037	0.97
J_{45}	Temporal	0.13±0.048	0.07±0.059	0.43
	Nasal	0.07±0.037	0.07±0.044	0.93
	Superior	0.15±0.049	0.05±0.059	0.23
SE	Temporal	-0.29±0.117	-0.28±0.104	0.99
	Nasal	-0.03±0.101	-0.05±0.103	0.89

Table 3. Comparing RPR (Relative peripheral refraction) shifts between users and non-users of smartphones and/or other electronic screens

Refraction	RPR shifts	User Number	User (Mean± SD)	Non-user Number	Non-user (Mean±SD)	P-Value
	Temporal		-0.43±0.53		-0.33±0.56	0.49
	Nasal		-0.21±0.24		-0.28±0.48	0.57
Emmetropia	Superior	27	-0.36±-0.34	33	-0.33±0.55	0.75
	Temporal		-0.76±0.76		-0.96±0.91	0.51
	Nasal		-0.63±0.49		-0.42±0.41	0.52
Hyperopia	Superior	20	-0.47±0.59	13	-0.82±0.69	0.20
	Temporal		0.03±0.42		0.02±0.39	0.42
	Nasal		0.31±0.72		0.06±0.16	0.83
Myopia	Superior	9	0.08±0.57	4	0.04±0.53	1.00

emmetropic, hyperopic and myopic subjects ($0.20<P<1.00$) (Table 3).

Discussion

The present study was designed to compare central and peripheral refraction between two groups of children, namely users and non-users of smartphones and/or other electronic screens. Given the importance of the development of the visual system under the age of 6 years and the lack of a similar study, we hope that the present study can answer some questions in this field and fill the existing gap in the relevant sciences.

As mentioned in the findings, no significant difference was observed in the central refraction (spherical power, equivalent sphere, J_0 and J_{45}) between the two user and non-user groups. Although the number of myopic subjects in the user group was nine (16%) and four (8%) in the non-user group, there was no significant difference in terms of the mean refractive errors between the two groups.

In some studies, near work has been introduced as one of the primary environmental risk factors in the onset or progression of transient myopia, which can sometimes be permanent (7-9). In return, another study has suggested that long-term near work has little effect on refractive error changes, which can be prevented by resting and interrupting the near work (1 0). In addition, some studies concluded individual habits in near work are more effective than accommodation stimulus in the onset and progression of myopia (20, 21). Also in the present study, there was no evidence denoting the use of the smartphones and/or other electronic screens as a near work can cause or increase the myopia in user children.

Another subject that was evaluated in the present study was peripheral refraction (spherical power, equivalent sphere, J_0 and J_{45}) and RPR shifts. The results of the tests showed no statistically significant difference between the two groups in terms of peripheral refraction and RPR shifts in all eccentricities of nasal, temporal and superior. The mean RPR shifts in emmetropic and hyperopic subjects for both user and non-user groups in all three directions (temporal, nasal, and superior) were myopic, whereas, for myopic subjects the mean shifts were hyperopic but was not observed statistically significant difference between the user and non-user groups.

These findings were consistent with previous studies in terms of an association between peripheral refraction, central refraction and the shape of the child's eyes. The previous reports (22, 23) indicate that myopes tend to have relative peripheral hyperopia and prolate ocular shape (a larger axial length compared with equatorial diameter), whereas hyperopes and emmetropes have relative peripheral myopia and an oblate shape (a larger equatorial diameter compared with axial length) but the amount of myopic shift in emmetropes was less than that of hyperopes and show little difference between the central and peripheral spherical equivalent refractive error. In the present study, also, peripheral shifts were like what reported in the related literature, so that myopic subjects showed hyperopic shift and the subjects with emmetropia and hyperopia showed myopic shifts.

The importance of evaluating the peripheral refraction for the users and non-users of electronic screens as a near work was due to previously reported that it has been concluded the peripheral hyperopic defocus to be present before the development of myopia in a school children's population (24). Some studies have concluded that the presence of peripheral hyperopia will promote myopic progression and increase the severity of myopia (11,12,25). So that the eye grew at an accelerated rate as long as hyperopic defocus was present and the elongation would continue until it had compensated for the defocus imposed by the lens and finally causing the eye to become myopic (3).

In contrast to the above studies regarding RPR, in some other studies conducted on children and adults, no evidence has been found to predict refractive error changes through evaluation of peripheral refraction or RPR values (13, 14). Other research has shown that hyperopic defocus due to a high lag of accommodation during near work is a cause of myopia progression in humans during near work (26), whereas other studies suggest that, the lag of accommodation is a concomitant with myopia and not a cause of myopia (27).

As a result, it is reported that long-term accommodation for near work causes the shape of the eye to change from oblate to prolate and to become more hyperopic in the peripheral part. This effect, however, is transient and after a long period of time, the eye decreases its prolate. This is likely to be due to the property of hysteresis of the choroid (28).

In the present study, the findings similarly showed no changes in central and peripheral refraction and RPR due to electronic screens using as a near work activity. Of course, the subjects in the present study were visually normal subjects and the range of refractive states were emmetropic or low amounts of refractive errors ($-1.50< SE< +2.25$).

In addition, considering previous studies, it looks like that more factors such as the state of focus and intervals between near works can interfere with the onset or progression of myopia due to the use of electronic screens at near and calling for further investigation.

As the present study contribution, the long-term evaluations were considered in children who had used these screens for at least one year. The most previous studies (29, 30) which reported increasing myopia due to near work their measurements were done immediately after near work and without enough time to return temporary changes in the eye, whereas in the present study, the measurements were done in children who use electronic screens regularly for at least one year and not exactly after using the device.

The negative outcome in this study is likely to be due to the characteristics of participated children such as refractive state, the state of focus and intervals between near works in this study. It is probably necessary to study the effect of using these devices in subjects with moderate and large amounts of refractive errors and consider the state of focus and intervals between near works.

Conclusion

According to the findings of the present study, using of smartphones and/or other electronic screens for 1-3 hours a day in children with low range of refractive errors causes no change in central and peripheral refraction compared to those who did not use these devices.

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Conflict of Interests

The authors declare that they have no competing interests.

References

1. Lauricella AR, Wartella E, Rideout VJ. Young children's screen time: The complex role of parent and child factors. J Appl Dev Psychol.2015 Jan 1;36:11-7.
2. Hastings EC, Karas TL, Winsler A, Way E, Madigan A, Tyler S. Young children's video/computer game use: relations with school performance and behavior. Issues Ment Health Nurs2009 2009;30(10):638–649.
3. Wallman J, Winawer J. Homeostasis of eye growth and the question of myopia. Neuron. 2004;43(4):447–68.
4. Bababekova Y, Rosenfield M, Hue JE, Huang RR. Font Size and Viewing Distance of Handheld Smart Phones. Optom Vis Sci.2011 Jul;88(7):795
5. Long J, Cheung R, Duong S, Paynter R, Asper L. Viewing distance and eyestrain symptoms with prolonged viewing of smartphones. Clin Exp Optom. 2017;100(2):133–137.
6. Rechichi C, Mojà GD, Aragona P. Video Game Vision Syndrome: A New Clinical Picture in Children? J Pediatr Ophthalmol Strabismus. 2017 Nov 21;54(6):346–55.
7. Ciuffreda KJ, Vasudevan B. Nearwork-induced transient myopia (NITM) and permanent myopia--is there a link? Ophthal Physiol Opt. 2008 Mar;28(2):103–14.
8. Ip JM, Saw S-M, Rose KA, Morgan IG, Kifley A, Wang JJ, et al. Role of near work in myopia: findings in a sample of Australian school children. Invest Ophthalmol Vis Sci. 2008;49(7):2903–2910
9. Huang HM, Chang DST, Wu PC. The Association between Near Work Activities and Myopia in Children-A Systematic Review and Meta-Analysis. PLoS One. 2015;10(10):e0140419.
10. Arunthavaraja M, Vasudevan B, Ciuffreda KJ. Nearwork-induced transient myopia (NITM) following marked and sustained, but interrupted, accommodation at near. Ophthalmic Physiol Opt. 30(6):766–75.
11. Smith EL, Kee C, Ramamirtham R, Qiao-Grider Y, Hung LF. Peripheral vision can influence eye growth and refractive development in infant monkeys. Invest Ophthalmol Vis Sci. 2005;46(11):3965–72.
12. Smith EL, Hung LF, Huang J. Relative peripheral hyperopic defocus alters central refractive development in infant monkeys. Vision Res. 2009 Sep 30;49(19):2386–92.
13. Lee TT, Cho P. Relative peripheral refraction in children: twelve-month changes in eyes with different ametropia s. Ophthalmic Physiol Opt. 2013;33(3):283–93.
14. Mutti DO, Sinnott LT, Mitchell GL, Jones-Jordan LA, Moeschberger ML, Cotter SA, Kleinstein RN, Manny RE, Twelker JD, Zadnik K. Relative peripheral refractive error and the risk of onset and progression of myopia in children. Invest Ophthalmol Vis Sci.2011 Jan 1;52(1):199-205.
15. Hartwig A, Charman WN, Radhakrishnan H. Baseline peripheral refractive error and changes in axial refraction during one year in a young adult population. J Optom . 2016;9(1):32–9.
16. Asharlous A, Hashemi H, Jafarzadehpur E, Mirzajani A, Yekta A, Nabovati P, Khabazkhoob M. Does astigmatism alter with cycloplegia? J Curr Ophthalmol. 2016 Sep 1;28(3):131-6
17. Ehsaei A, Mallen EA, Chisholm CM, Pacey IE. Cross-sectional sample of peripheral refraction in four meridians in myopes and emmetropes. Invest Ophthalmol Vis Sci. 2011 Sep 1;52(10):7574-85.
18. Davies LN, Mallen EAH, Wolffsohn JS, Gilmartin B. Clinical Evaluation of the Shin-Nippon NVision-K 5001/Grand Seiko WR-5100K Autorefractor. Optom Vis Sci. 2003 Apr;80(4):320.
19. Thibos LN, Wheeler W, Horner D. Power vectors: an application of Fourier analysis to the description and statistical analysis of refractive error. Optom Vis Sci. 1997;74(6):367–75.
20. Zylbermann R, Landau D, Berson D. The influence of study habits on myopia in Jewish teenagers. J Pediatr Ophthalmol Strabismus. 1993 Sep 1;30(5):319-22.
21. Pärssinen O, Lyyra AL. Myopia and myopic progression among schoolchildren: a three-year follow-up study. Invest Ophthalmol Vis Sci. 1993 Aug 1;34(9):2794-802.
22. Wang FR, Zhou XD, Zhou SZ. A CT study of the relation between ocular axial biometry and refraction. Zhonghua Yan Ke Za Zhi. 1994 Jan;30(1):39-40.
23. Mutti DO, Sholtz RI, Friedman NE, Zadnik K. Peripheral refraction and ocular shape in children. Invest Ophthalmol Vis Sci. 2000;41(5):1022–30.
24. Mutti DO, Hayes JR, Mitchell GL, Jones LA, Moeschberger ML, Cotter SA, et al. Refractive error, axial length, and relative peripheral refractive error before and after the onset of myopia. Invest Ophthalmol Vis Sci. 2007 Jun 1;48(6):2510-9.
25. Charman WN, Radhakrishnan H. Peripheral refraction and the development of refractive error: a review. Ophthalmic Physiol Opt. 2010;30(4):321–38.
26. Charman WN. Near vision, lags of accommodation and myopia. Ophthalmic Physiol Opt. 1999 Mar;19(2):126-33.
27. Mutti DO, Mitchell GL, Hayes JR, Jones LA, Moeschberger ML, Cotter SA, et al. Accommodative lag before and after the onset of myopia. Invest Ophthalmol Vis Sci2006 Mar 1;47(3):837-46.
28. Walker TW, Mutti DO. The effect of accommodation on ocular shape. Optom Vis Sci. 2002;79(7):424–30.
29. Hung GK, Ciuffreda KJ. Incremental retinal-defocus theory of myopia development—schematic analysis and computer simulation. Comput Biol Med . 2007 Jul 1;37(7):930-46.
30. Kim BH, Han SH, Shin YG, Kim DY, Park JY, Sin WC, et al. Aided distance visual acuity and refractive error changes by using smartphone. J Korean Ophthalmic Opt Soc. 2012;17(3):305-9.

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مقایسه رفرکشن مرکزی و محیطی در کودکان ۴ تا ۶ سال کاربر و غیر کاربر تلفن همراه هوشمند و/یا سایر صفحات الکترونیکی

سیده معصومه حسینی[۱]، علی میرزاجانی[۲*]، ابراهیم جعفر زاده پور[۳]، جمیله ابوالقاسمی[۴]

۱- گروه بینایی سنجی، دانشکده علوم توانبخشی، دانشگاه علوم پزشکی ایران، تهران، ایران

۲- دانشیار، گروه بینایی سنجی، دانشکده علوم توانبخشی، دانشگاه علوم پزشکی ایران، تهران، ایران *mirzajani.a@iums.ac.ir*

۳- استادیار، گروه بینایی سنجی ، دانشکده علوم توانبخشی، دانشگاه علوم پزشکی ایران، تهران، ایران

۴- دانشیار، گروه آمار زیستی، دانشکده بهداشت عمومی، دانشگاه علوم پزشکی ایران، تهران، ایران

چکیده

زمینه و هدف: هدف این مطالعه مقایسه رفرکشن مرکزی و محیطی بین کودکان ۴ تا ۶ سال کاربر و غیرکاربر تلفن همراه هوشمند و/یا سایر صفحات الکترونیکی می باشد.

روش: در این مطالعه ی مقطعی ۱۰۶ کودک در دو گروه کاربر (۵۶ کودک: ۳۴پسر و ۲۲ دختر) و غیر کاربر(۵۰ کودک: ۳۰ دختر و۲۰ پسر) تلفن همراه هوشمند و/یا سایر صفحات الکترونیکی وارد مطالعه شدند. گروه کاربر شامل کودکانی بود که از تلفن همراه هوشمند و/یا سایر صفحات الکترونیکی به مدت‌زمان بیش از یک ساعت در طول روز و حداقل به مدت یک سال استفاده می‌کردند، وگروه غیر کاربر شامل کودکانی با شرایط سلامتی و سنی مشابه با گروه کاربر با عدم استفاده ازاین‌گونه وسایل و یا استفاده‌ی کمتر از نیم ساعت در روز بود. هر دو گروه دارای سلامت کامل عمومی و چشمی و حدت بینایی حداقل ۲۰/۲۰ با یا بدون اصلاح عیوب انکساری و بدون هر گونه بیماری چشم بودند. در هر دو گروه رفرکشن مرکزی و رفرکشن محیطی در ۲۰ درجه نازال، تمپورال و ۱۰ درجه سوپریور (با استفاده از اتورفرکتومتر *Shin-Nippon K5001*) مورد ارزیابی قرار گرفت و نتایج حاصل از معاینات با نرم افزار آماری *SPSS* مورد مقایسه قرار گرفت.

یافته‌ها: مقایسه یافته‌ها ازنظر میانگین رفرکشن مرکزی و محیطی در سه جهت (تمپورال، نازال و سوپریور) بین دو گروه کاربر و غیر کاربر تلفن همراه هوشمند و/یا سایر صفحات الکترونیکی از نظر آماری تفاوت معناداری نشان نداد *(P>۰/۰۵)*.

نتیجه‌گیری: بر اساس نتایج مطالعه حاضر، می توان نتیجه گیری کرد که استفاده از تلفن همراه هوشمند و/یا سایر صفحات الکترونیکی تاثیری بر تغییرات رفرکشن مرکزی و محیطی در کودکان با مقادیر کم عیوب انکساری ندارد.

کلیدواژه‌ها: تلفن همراه هوشمند، صفحات الکترونیکی، رفرکشن محیطی، رفرکشن مرکزی

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