

ORIGINAL ARTICLE



A case study of digital eye strain in a university student population during the 2020 COVID-19 lockdown in South Africa: evidence of an emerging public health issue

Alvin Jeffrey Munsamy^{1*} | Shanice Naidoo¹ | Tasqeen Akoo¹ | Sunayna Jumna¹
| Pavani Nair¹ | Skholiwe Zuma¹ | Sthembile Blose¹

¹Discipline of Optometry, 6th Floor,
E Block, Westville campus,
University of KwaZulu-Natal,
University Rd., Westville, Durban,
South Africa

Abstract

Background. The COVID-19 pandemic resulted in a nationwide lockdown in South Africa, initiating a shift in society's interaction to the online space. Students therefore became reliant on electronic devices for learning.

Objective. The study aimed to investigate the prevalence of digital eye strain (DES) in a university student population during the nationwide COVID-19 lockdown in South Africa.

Methods. Randomly sampled 290 university students were surveyed online about their screen time and DES during lockdown. The survey included a validated screen time questionnaire to measure screen time in hours per day and a validated computer vision syndrome questionnaire (CVS-Q) to measure the frequency and intensity of symptoms during e-device use (s). Descriptive statistics were used to analyze CVS-Q scores and screen time.

Results. The mean (SD) age of the sample was 21.04 ± 2.32 years. Of these, 82.41% used smartphone devices and 55.52% of the participants did not use any optical correction. The prevalence of DES during COVID-19 lockdown in 2020 was 64.24%. Screen time on an average weekday and over the weekend, as a primary activity, had a median of 13 hours per day during lockdown.

Conclusion. The high prevalence of digital eye strain may be a harbinger of a decrease in student performance. Creating awareness of proper visual hygiene amongst students is paramount in decreasing the high prevalence of DES.

Keywords: Vision, eye strain, screen time, COVID, students.

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INTRODUCTION

A nationwide lockdown was necessary as a result of the novel Coronavirus (COVID-19) pandemic that occurred in South Africa in March 2020. This pandemic was declared a national disaster. Since then, social isolation and orders to stay at home have led to fewer opportunities for citizens to engage in productive physical activity, find employment, and further their education. Because of the changes brought about by COVID-19, society now has no choice but to make use of the virtual space.

Because of the stay-in-place orders that were issued to prevent the spread of the coronavirus around the world, approximately 1.5 billion schoolchildren were kept home from school, which meant that restrictions on screen time were no longer necessary.¹ It was inevitable that students would spend more time in front of a screen in all types of educational settings. People were also spending a significant amount of time in front of their LED-screen televisions, either to watch the information-driven news cycles or to unwind and relax.

The amount of time spent staring at screens has unquestionably increased as a direct result of being confined indoors. The use of digital devices has seen a significant rise in recent years across all age groups; as a result, their widespread daily utilization for a variety of purposes, including professional and social, has become the new norm. Digital eye strain can be caused by spending too much time in front of screens for too long (DES). This condition was formerly known as computer vision syndrome (CVS), but as the use of electronic devices (e-devices) has expanded to include mobile phones, tablets, and laptops, the term "computer vision syndrome" has become less common in today's age of the fourth industrial revolution (4IR).

Digital eye strain (DES), also known as computer vision syndrome (CVS), is the term used to describe the physical discomfort experienced after spending two or more consecutive hours within close proximity to a digital device, such as a desktop or laptop computer, tablet device, e-reader, or smart phone.² It is characterized by a wide range of ocular and visual symptoms, including those connected to accommo-

dation, vergence, and refraction. These symptoms include blurred vision at a distance and/or up close, difficulty refocusing between distances, headaches, dry eye, which includes irritated or burning eyes, sensitivity to bright lights, and eye discomfort; dry eye can cause headaches.³ It is possible that as many as half of all people who use electronic devices have DES.³ These symptoms are caused by the prolonged near-work demands that occur when viewing screens. These demands affect the accommodative system as well as the pattern of blinking, which results in decreased blink rates when using electronic devices.⁴

The focus of this study is to investigate whether the special circumstances created during the COVID-19 lockdown in South African (2020) have impacted university students' vision as face-to-face teaching has been replaced by a reliance on electronic media for learning. Specifically, the study looks at the correlation between screen time and the prevalence of digital eye strain. Because of this, it's possible that safe visual hygiene practices could be incorporated into the overall welfare of people who use electronic devices.

Studies⁵⁻⁷ provide evidence that CVS, now termed digital eye strain, was becoming more concerning under pre-COVID-19 circumstances. The necessary use of online engagement to facilitate learning at tertiary institutions during lockdown may have compounded screen time and DES. If students are expected to follow online learning in the same-time approach as face-to-face teaching, then they may experience digital eye strain, which can add a new source of stress to the learning process.

Therefore, this study aimed to document screen time and the prevalence of digital eye strain in a university student population during the nationwide COVID-19 lockdown (2020) in South Africa. This was done

Supplementary information The online version of this article ([Tables/Figures](#)) contains supplementary material, which is available to authorized users.

Corresponding Author: *Alvin Jeffrey Munsamy*
Discipline of Optometry, 6th Floor, E Block, Westville campus, University of KwaZulu-Natal, University Road, Westville, Durban, South Africa
Email: munsamya1@ukzn.ac.za

using an online questionnaire, as circumstances prohibited any clinical evaluations. Using this approach an attempt was made to establish any association between digital eye strain and screen time in a university student population.

MATERIALS AND METHODS

The study was observational and cross-sectional in design. Participants were sourced from the registered student population in the 2020 academic year at a South African university (the University of KwaZulu-Natal) using simple random sampling. Using the single population proportion formula, 290 students were chosen to participate in the study sample. The survey was administered online from 22 May 2020 until 16 June 2020.

Selection criteria

The inclusion criteria stipulated students with an active email account and who were registered for the 2020 academic year at the university. Non-registered students, any registered student who did not use e-devices, as well as those who were visually disabled, were specifically excluded. Students were also excluded if they were aware of any eye disease or had undergone any eye surgery within the previous month, to guard against confounders.

Data collection

A Google Forms questionnaire was administered via a hyperlink to collect data. Four university colleges received daily email notifications from the university notices system. All participants completed the screen time and computer vision syndrome questionnaires. Two sections comprised the survey. One included both COVID-19 questionnaires in South Africa. The participants also completed both questionnaires to compare their pre-lockdown and during lockdown screen time and vision strain (CVS-Q).

Screen time evaluation

The questionnaire used in this study was first used by Vizcaino et al.⁸ who divided it into its key components analysing screen use as both a primary and a background activity. The questionnaire consisted of 18 questions in total. The primary activity was

the main activity the participant was engaged in, rather than using a television or other screens in the background. Background use was the use of a television or another screen nearby while performing other activities.

Primary screen time

Under 'primary activity', five different categories of devices were considered. These included televisions; television-connected devices such as streaming devices and video game consoles; laptops or computers; smartphones and tablet devices. Participants were instructed to estimate total time spent in hours on an average day and an average night using each device. The total time for each screen-based device was quantified in hours.

Background screen time

Under 'background activity', participants were instructed to estimate the number of hours that they were exposed to background screen use on an average day and an average night. The questionnaire analysed screen-use during an average weekday, an average weeknight, and an average weekend-day (Saturday or Sunday) separately.⁸

The screen time of the participants was assessed using six different sub-categories, i.e. the primary screen time during an average weekday, weeknight and weekend-day; and the background screen time during an average weekday, weeknight and weekend-day. The screen time during a weekday was the time spent on digital screens from waking up to sleep time. Screen time on a weeknight was the time spent on digital screens between returning home until sleep. Background screen time on a weekday and weeknight was measured the time they were exposed to digital screens whilst performing other activities such as chores.

Computer vision syndrome e valuation

The CVS-Q tool was used and validated by Segui et al.⁹ The questionnaire measures the frequency of occurrence, as well as the intensity, of 16 symptoms including burning; itching; feeling of a foreign body; tearing; excessive blinking; eye redness; eye pain; heavy eyelids; dryness; blurred vision; double vision; difficulty focusing for near vision; increased sensitivity to light; coloured halos around objects;

feeling that sight is worsening; and headaches. Participants were then asked to indicate whether they experienced any of the above symptoms during the time they used an e-device. To measure the frequency of occurrence, a rating scale of 0-2 points was used.

As shown in Figure 1, once participants had completed the questionnaire, a score for each symptom was calculated using the supplied formula. The scores required recoding for the result of each symptom (frequency x intensity) as described in Figure 1. The overall score was then calculated by summing up the recoded scores of each symptom. If the recoded score was ≥ 6 , the participant had failed the CVS-Q and was considered to suffer from computer vision syndrome, or digital eye strain as we know it today.

The circumstances of lockdown during data collection prohibited a clinical evaluation of the study participants who failed the CVS-Q.

Ethical considerations

Gatekeeper permission for the participation of university students in the study was obtained from the Registrar of Students. Thereafter, ethical clearance was obtained from the Humanities and Social Sciences Research and Ethics Committee of the University of KwaZulu-Natal (ethical clearance reference number: HSSREC/00001347/2020). Informed consent was obtained from the students before they participated in the online survey by accepting the declaration on the first page of the online survey. The names of the participants were not used during data collection and alpha numeric identifiers were allocated to each participant to ensure anonymity.

Data analysis

Data was analysed using the Statistical Package for the Social Science (SPSS), v. 25. Frequencies were used to describe categorical data such as device type; students' college; race; gender; and the use and type of optical correction. The one-sample Kolmogorov-Smirnov test was used to evaluate the normality of the screen time measurements and the CVS-Q scores. Pearson's correlation was applied to assess the correlation between CVS-Q scores and screen time. The Wilcoxon signed ranks test was then applied to compare screen time and CVS-Q scores pre- and during lockdown. In addition, multivariate linear

regression was applied to determine the effects of demographic variables on screen times and CVS-Q scores. All the tests were two-tailed and the criterion for statistical significance was set at a 5% level.

RESULTS

A total of 297 registered university students participated in the study, of which seven participants were excluded based on the selection criteria, resulting in 290 participants who were eligible for analysis. The mean age of the sample was 21.04 ± 2.32 years. Table 1 shows participants' demographics and optical correction history. Figures 2a and 2c show the percentage distribution of participant device choice and optical correction for the whole group; showing that 82.41% (239) used smartphone devices and 55.52% (161) of the participants did not use any optical correction.

Prevalence of digital eye strain

The median failed-CSV-Q scores were 10 and 11 pre- and during lockdown, respectively, as shown in Table 2. There was a prevalence of 63.93% of failed scores pre-lockdown, and 64.24% during lockdown. Figures 2b and 2d show that, of those with failed CSV-Q scores (DES), 84.95% used smartphone devices and 53.23% had no optical correction.

The one-sample Kolmogorov-Smirnov test illustrated that the data was not normally distributed; hence the Wilcoxon signed rank test was used to compare the results. According to the Wilcoxon signed rank test, the median failed-CSV-Q scores for during lockdown were significantly greater than pre-lockdown ($p = 0.002$) scores. The most common symptoms associated with CVS experienced during lockdown for those who failed the CSV-Q were headaches (74.14%); increased sensitivity to light (68.62%) and tearing (64.48%); whilst the least-reported symptoms were coloured haloes around lights (21.03%) and double vision (20.69%).

The distribution of the demographic and clinical variables is presented in Table 1. The prevalence of post CSV-Q failure for female respondents in the sample was significantly larger (68.7%), than that of the male respondents (51.3%). The Chi-

square test also indicated that during lockdown-CVS failure was significantly associated with gender (p -value=0.007). However, no significant associations existed between race; college; year of study; device type; and optical correction and during lockdown-CVS failure.

A multivariate regression analysis also showed that male students were significantly associated with lower CVS-Q scores (β =-2.02; 95%CI: -3.50, 0.54, p = 0.01) and as compared with female students, (β =-2.082; 95%CI: -3.78, -0.38, p = 0.02), pre-lockdown and during lockdown, respectively.

Screen time

Table 2 shows the screen time spent in hours per day for pre- and during lockdown. Primary and background screen time is sub-divided into weekday, weeknight and weekend. Table 2 shows that screen time during an average weekday, spent as a primary activity, had a median of 13.00 (IQR: 9.00; 18.00) hours/day during lockdown; and as a primary activity during the weekend, the median was 13.00 (IQR: 9.00; 18.00) hours/day during lockdown. As shown in Figure 2, the most commonly used e-device was a smartphone.

The one-sample Kolmogorov-Smirnov test showed that the change in screen time use between pre- and during lockdown was not normally distributed. Thus, to compare pre-lockdown and during lockdown results, the Wilcoxon signed rank test was applied. The change in median screen time as a primary activity on an average weekday (p =0.01) and weeknight (p <0.001) during lockdown was significantly (statistically) greater than in pre-lockdown, as shown in Table 2. The median background screen time on an average weekday (p =0.04) and weeknight (p <0.001) during lockdown was significantly greater than in pre-lockdown, as shown in Table 2. Figure 3 shows a complementary box-and-whisker plot to provide graphical comparison between pre-lockdown and during lockdown for screen time in hours per day. These observations were not significantly different for the pre- and during lockdown weekend screen time comparisons.

Association of CVS-Q scores and screen time

According to multivariate regression analysis, screen time was not significantly associated with pre- or

during-lockdown CVS-Q failed scores. However, during lockdown, students who reported high background screen time on an average weekday were significantly associated with lower CVS-Q scores (β = -0.191; 95%CI: -0.246, -0.035, p = 0.017).

DISCUSSION

The focus of the study was to establish the screen time behaviour and the prevalence of digital eye strain in a university student population during the nationwide COVID-19 lockdown in South Africa in 2020. Of the participants, 64.24% suffered from digital eye strain during the lockdown, as established by CVS-Q scores greater than six. The most common symptoms experienced were headaches, increased sensitivity to light and tearing. There was also a statistically significant increase in the prevalence of DES during lockdown when compared to the pre-lockdown estimates provided by the student participants.

Smartphones were the predominant e-device contributing to screen time. The median screen time spent as a primary activity, during an average weekday and over the weekend, was found to be 13 hours per day during lockdown. However, an attempt to establish an association between screen time and the prevalence of digital eye strain yielded results that were not statistically significant.

The considerable prevalence of DES in the student sample may call for more university concern. Although there was no statistical correlation, the screen time of 13 hours per day remains the single driving factor in the significant prevalence of DES. Another related finding of concern was that the majority of the students who failed the CVS-Q did not use an optical correction. This may raise a public eye health issue that we may be overlooking in this era of digital learning. This may apply in other institutions as well; and the implementation of, at least annual, vision screening of students may be considered as a basic public health strategy to help mitigate these findings. The approach may help the confounders of learning, which is moving towards blended learning in a digital space.

Specific Visual Concerns

There is a correlation between the change in the viewing distance of smartphones and the DES symptoms experienced. It was found that participants who used smartphones at a distance closer than approximately 30cm had a larger postural angle when reading; and this may explain the increased eyestrain symptom scores reported.¹⁰ This is noteworthy, as almost 85% of the student participants reported smartphones as their device of choice, in comparison to other e-devices. DES is exacerbated by the fact that digital screens offer blue light. The finding that screen time is 13 hours per day, as a primary activity on an average weekday, cannot be ignored as the behavior driving the high prevalence of DES in this sample. Thus, as convenient and accessible as smartphones may be for students, they should not be the e-device of choice for learning. The ergonomics of smart phones mean they are not conducive for prolonged use.

In the present study, the most common symptom reported was headaches (74.14%), which agrees with Ranasinghe et al.⁶ who reported headache (45.7%) as a leading symptom. Headache was noted as the most prevalent symptom for DES among e-device users in other studies.^{6,11} Continual focussing changes take place frequently when using e-devices for a sustained period, hence leading to eye fatigue and discomfort resulting in headaches. However, our study disagrees with that of Ranasinghe et al.⁶ who reported that office workers wearing spectacles had significantly higher incidences of DES in comparison to those who were not wearing spectacles. However, our sample were students at a university who might have been ignorant about visual disorders because of a lack of access to eye-care services. Low-to-middle-income countries depend on public health care and in South Africa refractive services are not very accessible, in a country where the majority of its population use public health services.

Logaraj et al.⁷ studied engineering and medical students and reported a prevalence of 80.3% of DES and found that males had a greater risk of developing DES with symptoms. This disagrees with our study as we found that the prevalence of lower failed CVS-Q scores (less eye-strain) was more significantly

associated with the male gender during lockdown. Logaraj et al.⁷ noted that students who used ocular correction were at a higher risk of developing headaches. This disagreement with our findings may be due to the reporting of one or more symptoms as a basis of CVS, as compared to our study's pass/fail criteria approach.

The high prevalence of DES found in our study agrees with Iqbal et al. (2018)¹² who found a higher prevalence (at 86%) amongst 100 medical students. In agreement with our study, Iqbal et al.¹² also noted that 88% of the sample reported smartphones to be the most popular e-device used. This is another study that is showing the hazards of students using smartphones as a primary medium of learning. Institutions may want to raise public eye health concerns regarding smartphone use for prolonged periods when studying. There is some evidence of a link between smartphone use and myopia.¹³

Studies^{5,11} found that 3.5 to six hours of daily computer usage was associated with DES. These studies support our findings of 13 hours which serves as a clear indicator for the aetiology of the increased prevalence in our findings. It is still imperative that the lesson to be learned from this observation is that excessive screen time is a reality amongst the student population at institutions of higher learning. However, these institutions may not be aware of this and thus may overlook the consequences thereof, as stated above. The sample may be a microcosm of the broader student community in South Africa, and the lockdown circumstances may have just sensitised us to an emerging public health concern.

Recommendations

These results imply that digital eye strain may have become an impediment to learning. Measures that can be taken to manage digital eye strain include correcting any refractive error; providing other ophthalmic support such as occupational lenses; and treating dry eye with artificial tears.¹⁴ Good visual hygiene practices include blinking more frequently and fully; as well as following the 20-20-20 rule, which recommends taking a screen break every 20 minutes by looking at an object 20 feet (6 m) away for 20 seconds.¹⁴ Students should also take a 15-minute break after every two hours of prolonged

device use.¹⁴ However, one of the most salient observations of this study is to refrain from extended periods of smartphone use for learning.

More broadly, it is important for the university student population to be provided with eye care support as part of their student health services. Collaboration with national departments of health to help screen for manageable refractive errors to help alleviate unwarranted visual strain with e-device use would be productive. Secondly, universities need to recognise DES if they are to migrate to full-time blended learning. Thirdly, universities need to increase their footprint regarding public eye health in a digital era.

LIMITATIONS

The absence of clinical measurements to support the diagnosis of DES represents a potential limitation of this study. In our study, this was not possible because participants and researchers were under lockdown. As the questionnaire was answered during lockdown, there was also the possibility that pre-lockdown findings were susceptible to recall bias. The presentation of two questionnaires each, for both lockdown and pre-lockdown estimates, may have been burdensome to complete, resulting in incomplete responses from some participants. The study was also limited by its inability to account for the concurrent use of multiple devices at any given time. The screen time questionnaire also lacked a pass/fail criterion; based on these findings, the questionnaire's authors may wish to add this element.

CONCLUSIONS

During the COVID-19 pandemic lockdown in RSA, a significant proportion of the university student sample suffered from digital eye strain, according to our study (2020). During lockdown, the prevalence was determined to be 64.24 percent, with an average screen time of 13 hours per day on weekdays and weekends. Smartphones were the most popular e-devices, which may also account for the rise in DES cases. Students' inability to study effectively could be hindered by the prevalence of digital eye strain, which may be an indicator of poor academic performance. Public health eye care strategies may have been neglected during the transition to mandatory online education. These findings in a university population may be indicative of a larger social issue.

INFORMATION

Author contributions. All authors contributed to the analysis, the interpretation of the findings and the finalising of the manuscript.

Funding. None.

Conflicts of interest. None.

Acknowledgements. A Developing Research Innovation, Localisation and Leadership in South Africa (DRILL) grant, NIH D43, (D43TW010131) was awarded to the University of KwaZulu-Natal in 2015 to support a research training and induction programme for early career academics. The content of this study is solely the responsibility of the authors and does not necessarily represent the official views of DRILL or the National Institute of Health.

TABLE 1: Sample characteristics (N=290).

	Demographics	n	%
Gender	Male	214	73.8
	Female	76	26.2
Race	African	131	45.2
	Coloured	8	2.8
	Indian	141	48.6
	White	10	3.4
College	Agriculture, Engineering and Sciences (AES)	62	21.4
	Health Sciences (HS)	153	52.8
	Humanities (HUM)	24	8.3
	Law and Management Studies (LM)	51	17.6
Year of study	1	33	11.4
	2	46	15.9
	3	89	30.7
	4	97	33.4
	5	9	3.1
	6	14	4.8
Optical Correction	Spectacles	97	33.5
	Contact lenses	2	0.7
	Spectacles and/or Contact lenses	30	10.3
	None	161	55.5

TABLE 2: Screen time and CVS-Q scores for pre-lockdown and during lockdown (N=290).

	Failed CVS-Q scores Median (IQR)	Screen time (hrs/day) - Median (IQR)					
		Primary Weekday	Primary Weeknight	Primary Weekend	Background Weekday	Background Weeknight	Background Weekend
Pre- lockdown	10.00 (8.00; 14.00)	12.00 (7.00; 15.00)	7.00 (5.00; 11.00)	13.00 (10.00; 18.00)	3.00 (1.89; 4.00)	2.00 (1.00; 3.00)	3.75 (2.00; 6.00)
During lockdown	11.00 (8.00; 14.00)	13.00 (9.00; 18.00)	9.00 (6.00; 14.00)	13.00 (9.00; 18.00)	3.00 (2.00; 5.00)	2.00 (1.00; 4.00)	3.00 (2.00; 6.00)
Wilcoxon signed rank	0.002	0.01	<0.001	0.29	0.04	<0.001	0.21

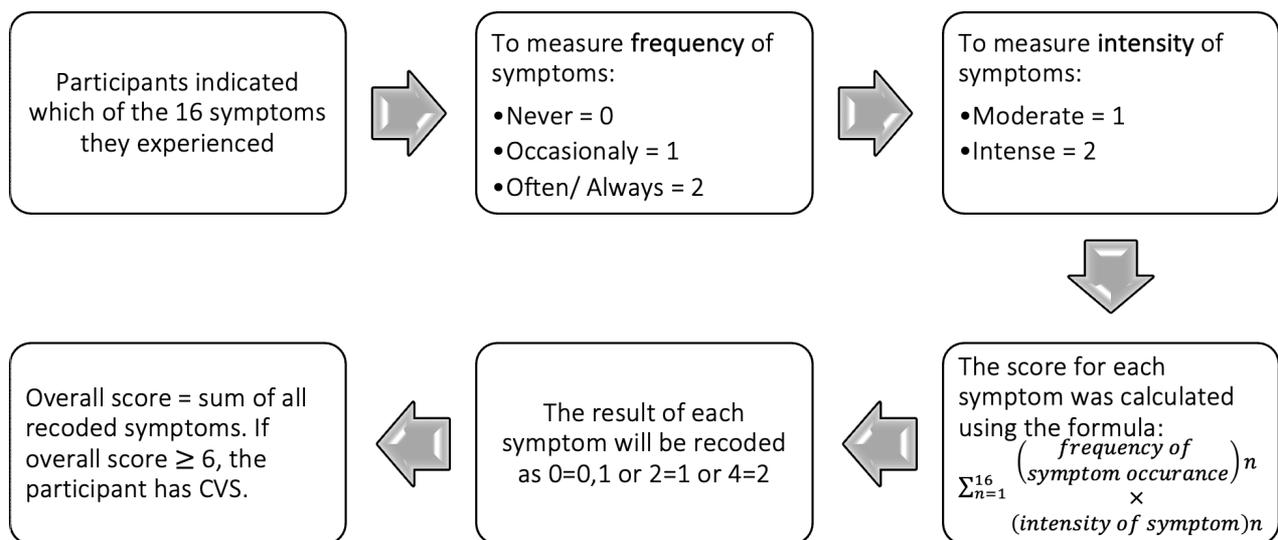


FIGURE 1: The CVS-Q process of scoring.⁹

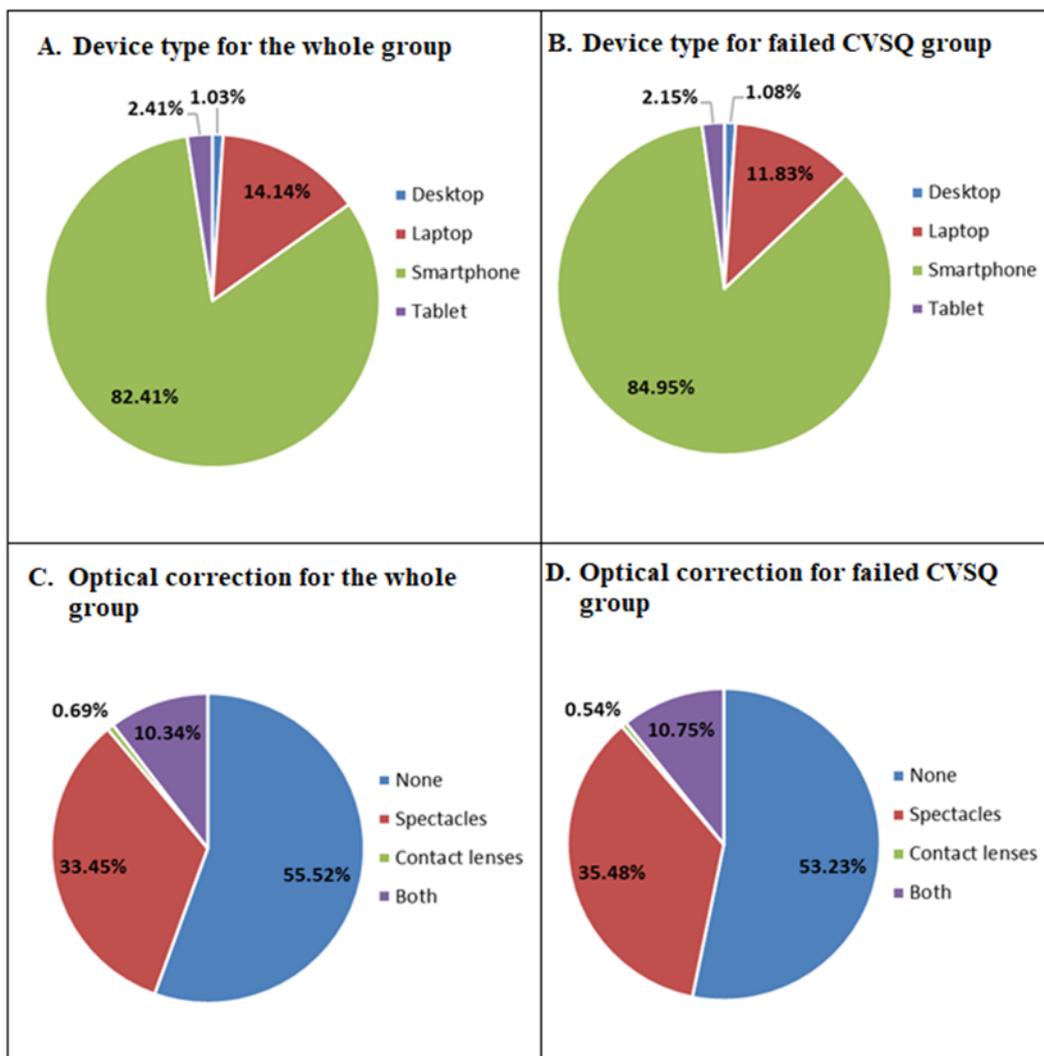


FIGURE 2: Percentage distribution of optical correction and e-device type used by the whole group (N=290) and participants (n=186) with failed CVS-Q scores (>6).

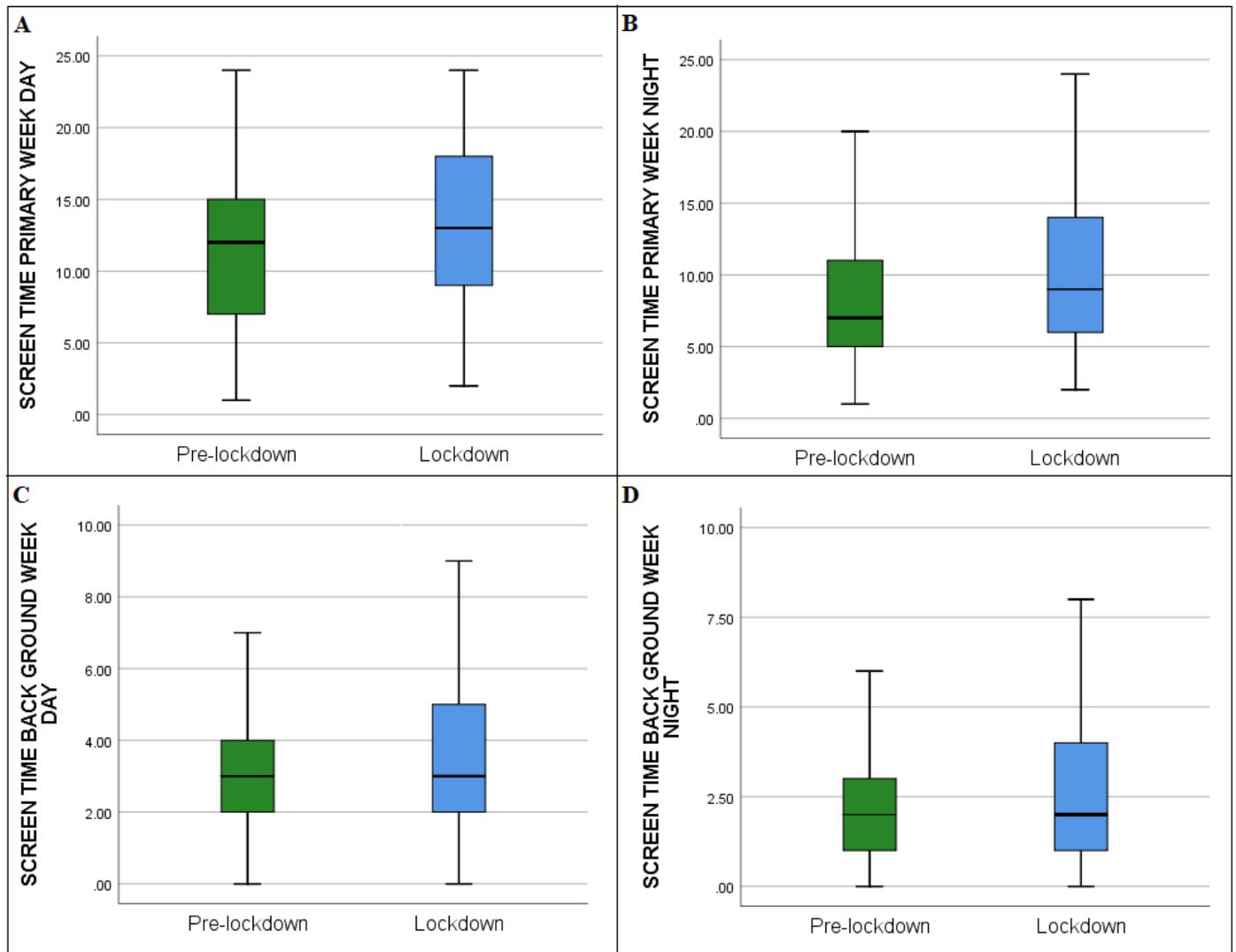


FIGURE 3: Box and whisker plots comparing screen time (hours/day) during and pre-lockdown showing statistically significant differences.

REFERENCES

1. Neitzel J, Vargas M, Aburto N, Aguayo V; 2012. Available from: <http://www.fao.org/2019-ncov/q-and-a/en/>.
2. ; 2020. Available from: <https://yoursightmatters.com/digital-eye-strain-millennial-generation/>.
3. Sheppard AL, Wolffsohn JS. Digital eye strain: Prevalence, measurement and amelioration. *BMJ Open Ophthalmol*. 2018;3(1).
4. Coles-Brennan C, Sulley A, Young G. Management of digital eye strain. *Clin Exp Optom*. 2019;102(1):18–29.
5. Arif KM, Alam MJ. Review Article: Computer Vision Syndrome. *Faridpur Med*. 2015;10(1):33–38.
6. Ranasinghe P, Wathurapatha WS, Perera YS. Computer vision syndrome among computer office workers in a developing country: An evaluation of prevalence and risk factors. *BMC Res Notes*. 2016;9(1):1–9.
7. Logaraj M, Madhupriya V, Hegde S. Computer vision syndrome and associated factors among medical and engineering students in Chennai. *Ann Med Health Sci Res*. 2014;4(2):179–179.
8. Vizcaino M, Buman M, Desroches CT, Wharton C. Reliability of a new measure to assess modern screen time in adults. *BMC Public Health*. 2019;19(1):1–8.
9. Seguí M, Cabrero-García J, Crespo A, Verdú J. A reliable and valid questionnaire was developed to measure computer vision syndrome at the workplace. *J Clin Epidemiol*. 2015;68(6):662–73.
10. Long J, Cheung R, Duong S, Paynter R. Viewing distance and eyestrain symptoms with prolonged viewing of smartphones. *Clin Exp Optom*. 2017;100(2):133–140.
11. Reddy SC, Low CK, Lim YP. Computer vision syndrome: a study of knowledge and practices in university students. *Nepal J Ophthalmol*. 2013;5(2):161–169.
12. Iqbal M, El-Massry A, Elagouz M, Elzembely H. Computer Vision Syndrome Survey among the Medical Students in Sohag University Hospital. *Egypt Ophthalmol Res An Int J*. 2018;8(1):1–8.
13. Mccrann S, Loughman J, Butler JS; 2021. Available from: <https://www.tandfonline.com/doi/abs/10.1111/cxo.13092>.
14. Munsamy AJ, Chetty V. Digital eye syndrome: COVID-19 lockdown side-effect? *South African Med J*. 2020;110(7):21–23.

How to cite this article: Munsamy A.J., Naidoo S., Akoo T., Jumna S., Nair P., Zuma S., Blose S. **A case study of digital eye strain in a university student population during the 2020 COVID-19 lockdown in South Africa: evidence of an emerging public health issue.** *Journal of Public Health in Africa*. 2022;13.2103. <https://doi.org/10.4081/jphia.2022.2103>