

# A Research on the Relationship between Electronic Devices Usage Time and Degree of myopia Among General High School Students

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## PROPOSAL

### 1. Research Question

What is the correlation between electronic devices usage time and the degree of myopia among ordinary high school students in Beijing\*? This research question aims to investigate the association between the extent of electronic devices usage and the degree of myopia among regular high school students in Beijing. Parents always hold a common belief that excessive use of electronic devices negatively affects eyesight, which triggers our skepticism about the magnitude of this effect.

\*Ordinary high schools are schools (both national and international departments) that exclude vocational high schools, adult high schools, technical schools.

### 2. Background Research

Association between electronics and eyesight is a heavily studied topic. In 2021, a group led by Joshua Foreman analyzed over 3000 articles about smart devices' effects on children's and young men's eyesight, and the result supported the claim that exposure to electronics is related to increasing risk of myopia. Such association was also observed by another study that tested university students' eyesight and compared the result with their electronic devices using history, in which 40% of the electronics-relied student had eye problems. Symptoms of the use of electronics are summarized to a new syndrome called digital eye strain (DES), also known as computer vision syndrome, which is reported to present in over half of the computer users. Digital eye strain can cause dry eyes, blurred vision, and headache.



3. Sampling and Experimental Design

Variables: The electronic devices usage time and the degree of myopia.

Type of study: The study is an observational study since there is no any treatment for each group.

We only use questionnaire to the sample to collect data.

Data collection: Data are collected through the posted questionnaire designed by the group.

Scope of inference: The regular high school students in Beijing.

4. Exploratory Data Analysis

From an observational sample, we received a total of 14 valid questionnaires.(Male: 12, Female 2).

Figure 1 and Figure 2 shows the tables of our data. This proved that our sampling is feasible and valid data can be obtained.

序号	答案文本
19	10
20	6h
21	7
22	7
23	14
24	9
25	3
26	6
27	13
28	7
29	9h
30	13
31	8
32	10

Figure 1

序号	答案文本
19	250
20	625
21	250
22	300
23	400
24	150
25	600
26	500
27	400
28	0
29	500
30	800
31	500
32	300

Figure 2

Data source: Valid questionnaires

Figure 1: average time to use electronic devices

Figure 2: present eyesight



By dividing the data above into different level, two bar graphs are produced as Figure 3 and figure 4 shown below.

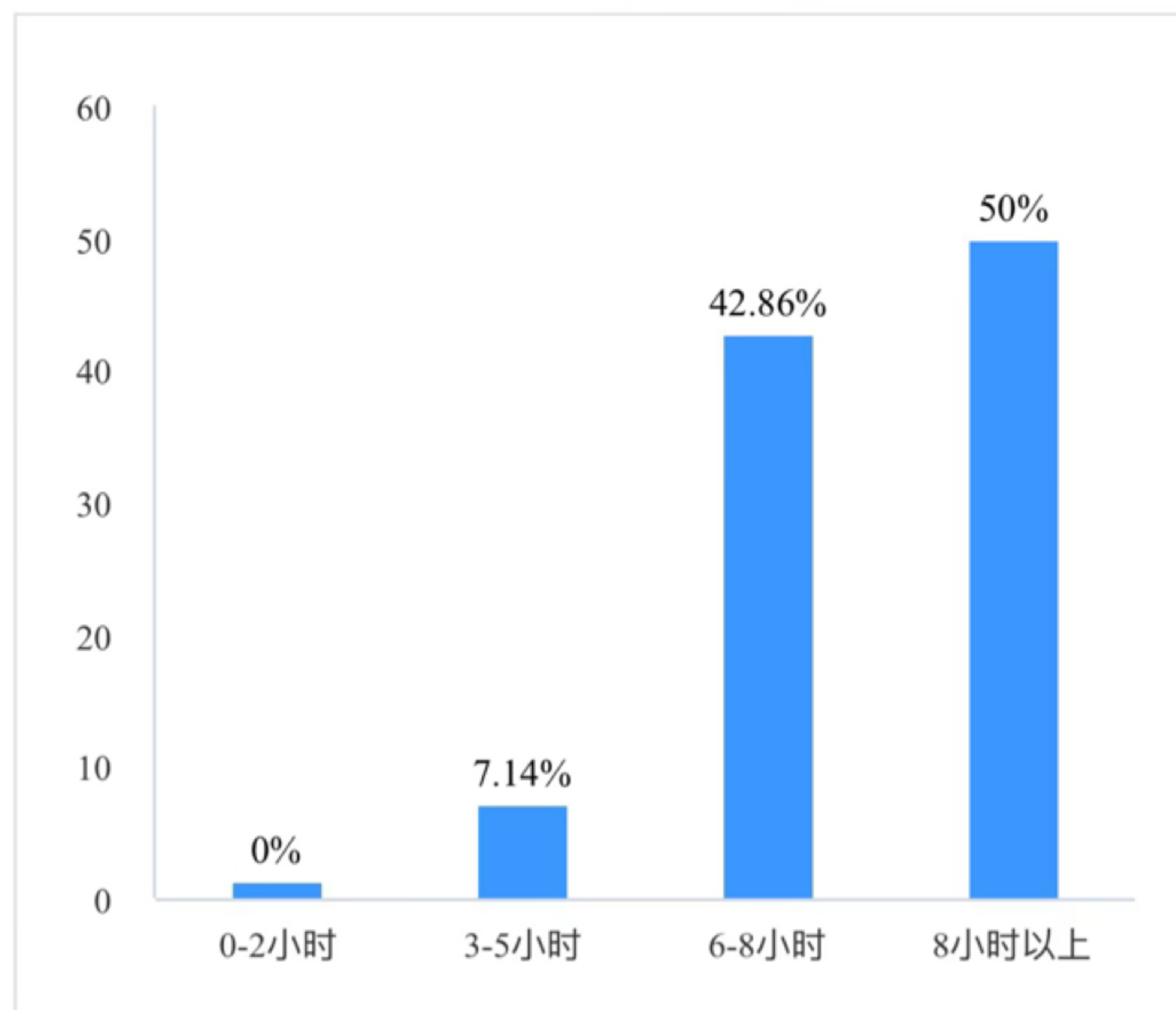


Figure 3

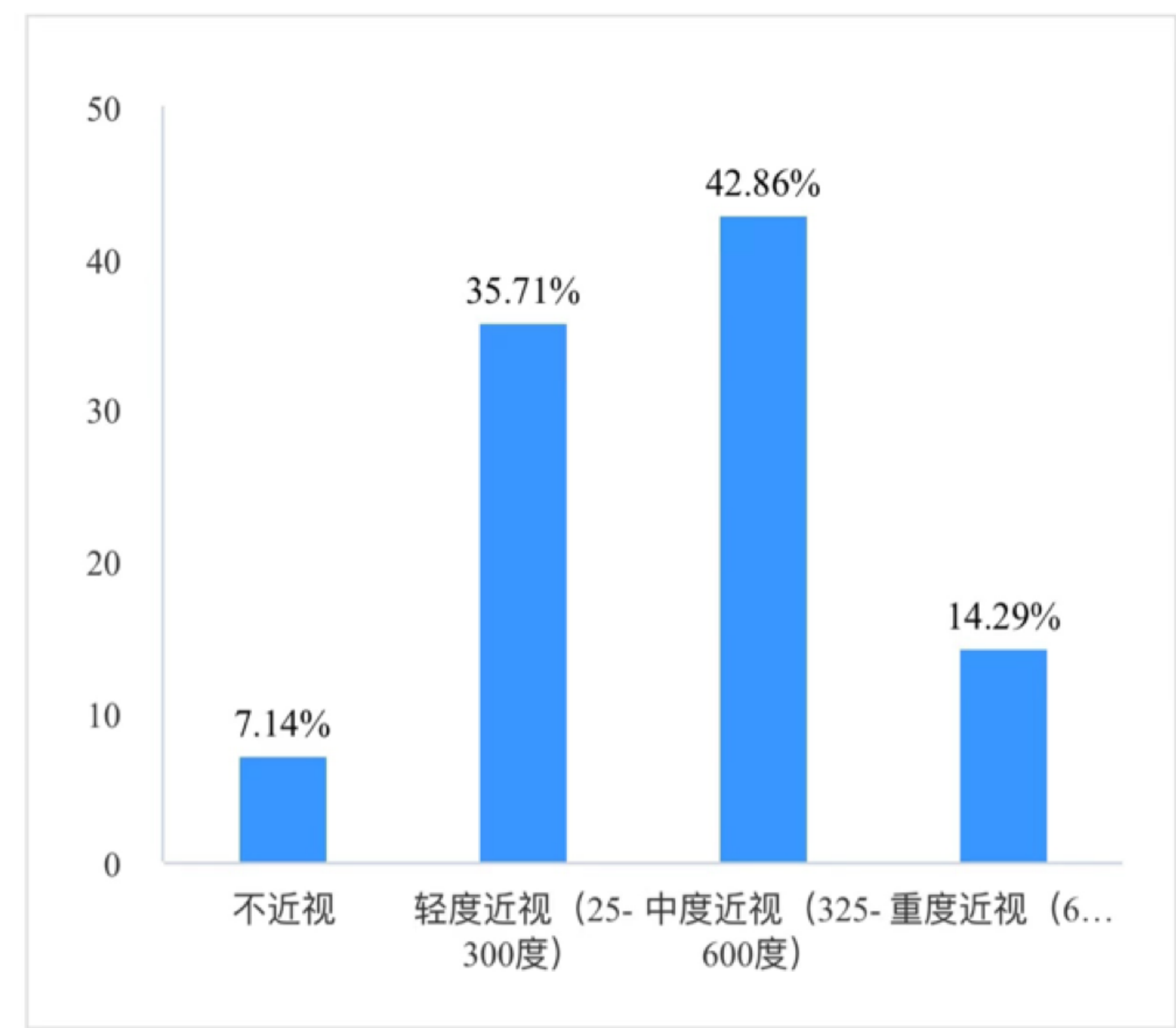


Figure 4

By using these data, we will conduct a chi-square test of independence for each time interval and find out whether there is a relationship between the electronic devices usage time and degree of myopia or not. We will also construct a linear regression model for usage time and degree of myopia by using precise data. The participants should be random selected and each case should be independent from each other. A large sample size should be considered (expected value greater than 5).

## 5. Group Task Assignments and Timeline

In the project, Lucas is responsible for introduction, procedure and conclusion. Derek works for data collection, analyzing data and problems and suggestion in the project. Raymond is responsible for background research and method. We will do the research together. The proposal would be done by May 17th. The preparation for the research will be finished by May 21st. We will collect all the data before May 22nd and complete rest of the research by May 25. The presentation will be done in class on May 26th.



6. Data

Figure 5 represents the original data we got by questionnaire.

3. 你平均每天使用电子设备的时间（包括手机电脑，电子大屏等一切电子设备）请写出你的眼镜度数（按两眼最高度数填写）			
8小时以上	10	轻度近视（25-300度）	250
6-8小时	6h	重度近视（600度以上）	625
6-8小时	7	轻度近视（25-300度）	250
6-8小时	7	轻度近视（25-300度）	300
8小时以上	14	中度近视（325-600度）	400
8小时以上	9	轻度近视（25-300度）	150
3-5小时	3	中度近视（325-600度）	600
6-8小时	6	中度近视（325-600度）	500
8小时以上	13	中度近视（325-600度）	400
6-8小时	7	不近视	0
8小时以上	9h	中度近视（325-600度）	500
8小时以上	13	重度近视（600度以上）	800
6-8小时	8	中度近视（325-600度）	500
8小时以上	10	轻度近视（25-300度）	300

Figure 5

The questionnaire has three components: the first question is about the average time the participant use for electronic devices (recorded by screen time software and precise to hours); the second question is to ask the degree of myopia of the participants. We will get the data from several different general school and ask the participants to answer their gender and grades in order to avoid convenience bias and response bias as much as possible. We will drop off the data containing average usage time that is not recorded by the screen time software to make sure the dataset is reliable and in a subsequent investigation with a larger sample size, We will conduct a stratified sampling method to separate the sample of international department and national department to avoid this confounding variable. We will use SRS to randomly select schools and then stratified sampling to randomly select the sample.

7. References

1. Foreman, J.; et al. The Lancet Digital Health. 2021, 10.1016/S2589-7500(21)00135-7

2. Mahar Sandra Ali Qasim; et al. Annals of Medical and health Sciences Research 2021, 10.54608.annals medical.2021.1

3. Sheppard, A.; Wolffsohn, J. BMJ Open Ophthalmol.2018, 10.1136/bmjophth-2018-000146

4. American Optometric Association Computer vision syndrome.  
<https://www.aoa.org/healthy-eyes/eye-and-vision-conditions/computer-vision-syndrome?sso=y>