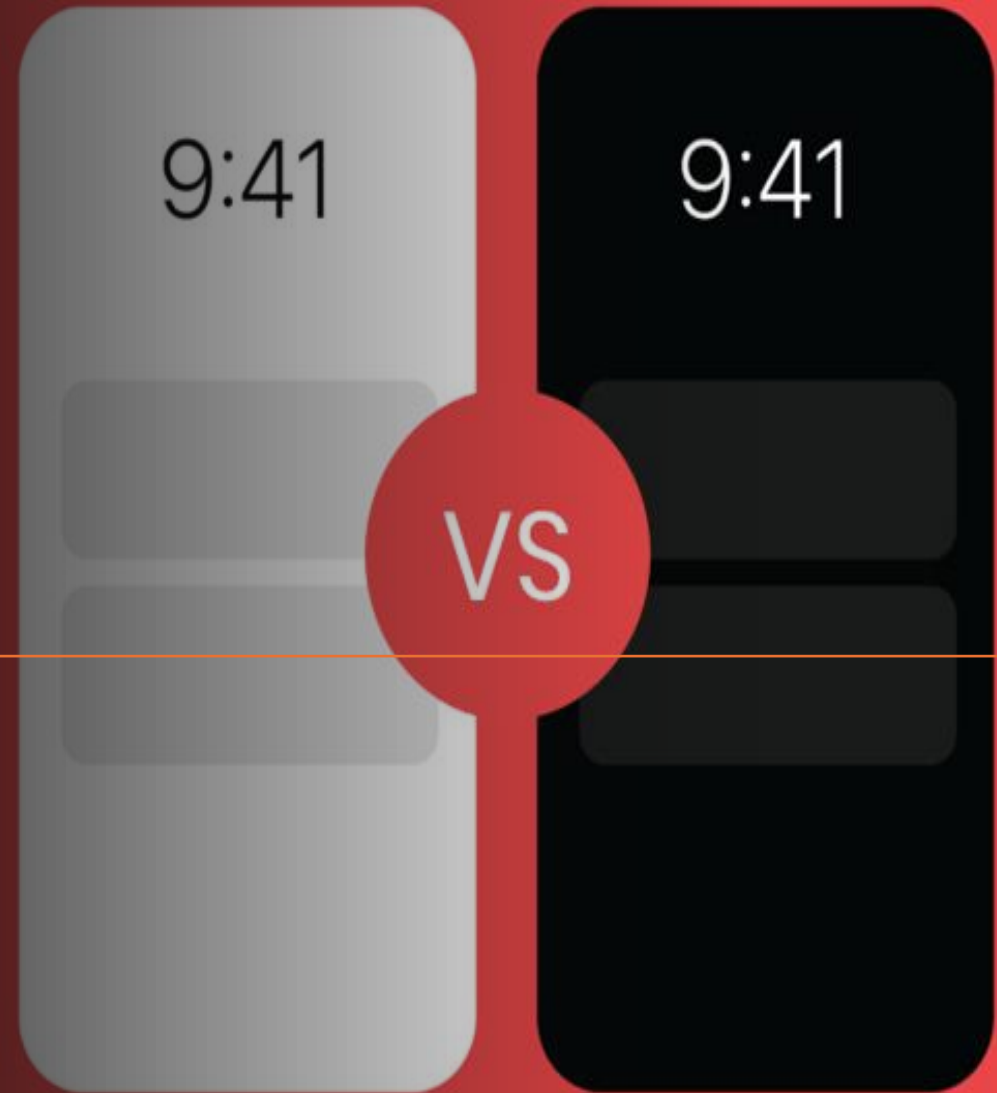


Dark vs. Light Mode on Smartphones: Effects on Eye Fatigue

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Light

Dark

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Introduction

- Most people have access to a smartphone
- Statistics show that the average mobile user spends more than 5 hours staring at the device per day
- The blue light technology used in smart screens is one of the main causes of eye fatigue
- Extended staring at a smartphone screen can cause certain health problems
- Light mode is the oldest and most commonly used



- The dark mode is designed to reduce the amount of light emitted by device screens
- Dark mode has been gaining more popularity over the last two years
- Results on the effect of display polarity on eye fatigue are mixed
- Researchers are currently exploring whether one mode is more beneficial for eye health or if it is simply a matter of personal preference
- Lack of research using mobile phone screens
- We explore how using light or dark modes on smartphones affects eye fatigue in both dim and bright lighting conditions

Method

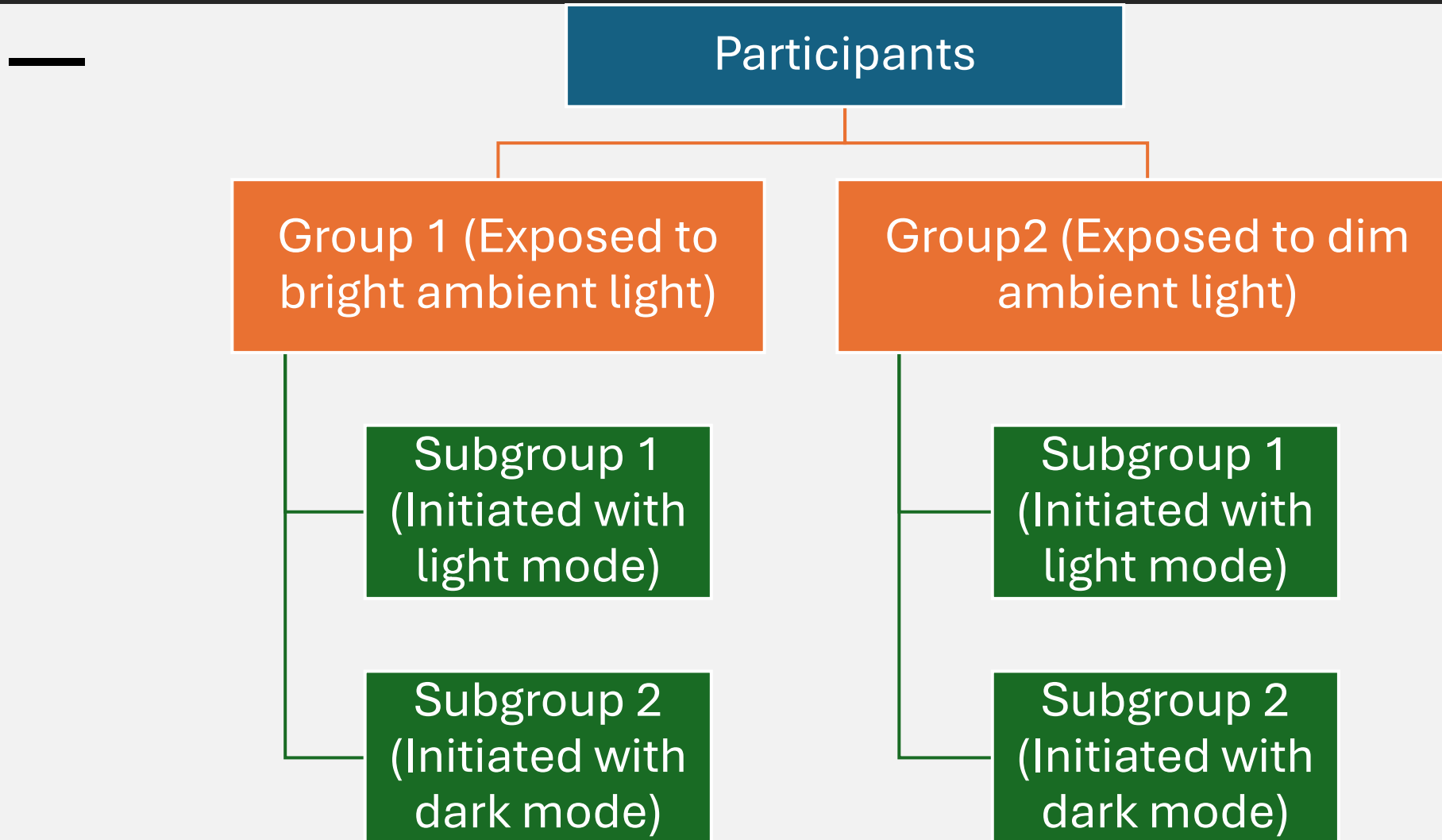
- We designed an experiment to explore the relationship between the smartphone display mode and ambient lighting condition on eye fatigue when using a smartphone.
- **Independent Variables:**
 1. Smartphone display mode (dark and light mode)
 2. Ambient lighting condition (bright and dim light)
- **Dependent Variable:** Eye fatigue
- **Mixed-model Design:**
 1. Ambient lighting (between subjects)
 2. Smartphone display mode (within subjects)

Method

EXPERIMENT

- Samsung Galaxy A53
- The experiment was conducted in a laboratory room without a window.
- The room lights and a small lamp were used to simulate the bright and dim ambient lighting

Method



Method

- **First Part Tasks :**

Task 1: Read the article “6 common sleep myths debunked” on the Microsoft Start app and write a three-sentence summary in the text message app

Task 2: Locate the Reddit app, search for “tips for better sleep,” find three pieces of advice, and create a new post mentioning them

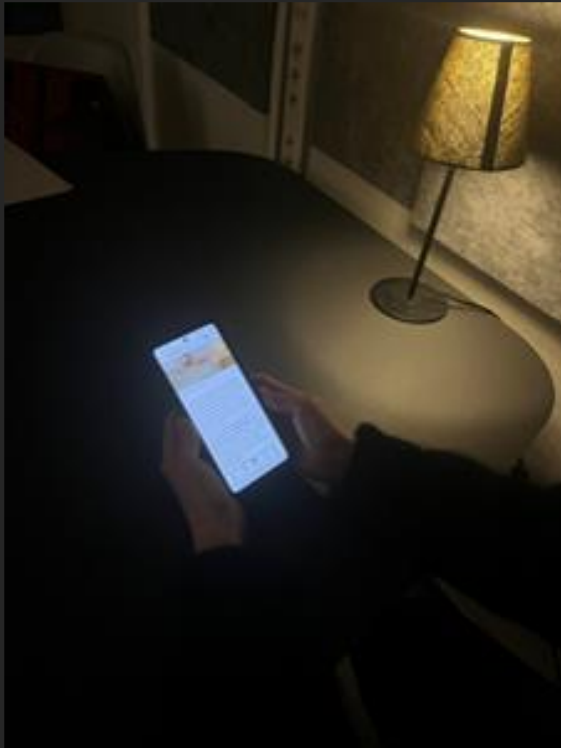
- **Second Part Tasks (Alternative Light Mode):**

Task 1: Read the article “The psychological immune system: four ways to bolster yours” on the Microsoft Start app and write a three-sentence summary in the text message app

Task 2: Use the Quora app instead of Reddit, search for “tips for a better immune system,” find three pieces of advice, and create a new post mentioning them

- Participants filled out a CVS questionnaire to assess eye fatigue after each task group.

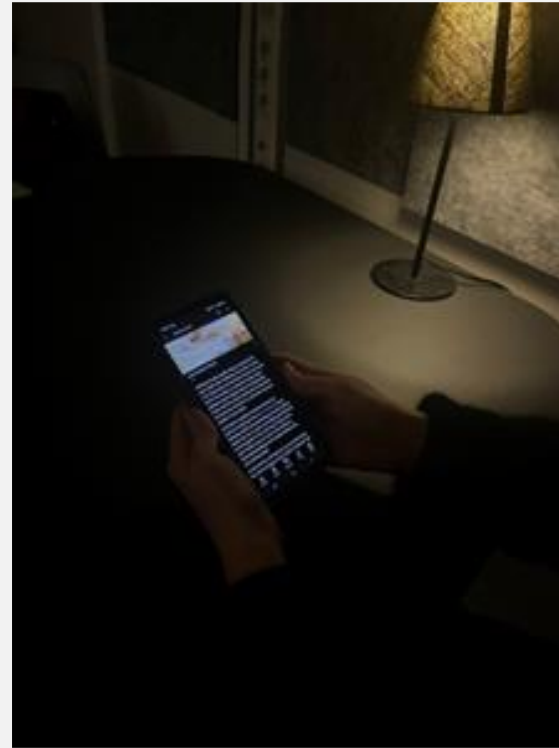
Method



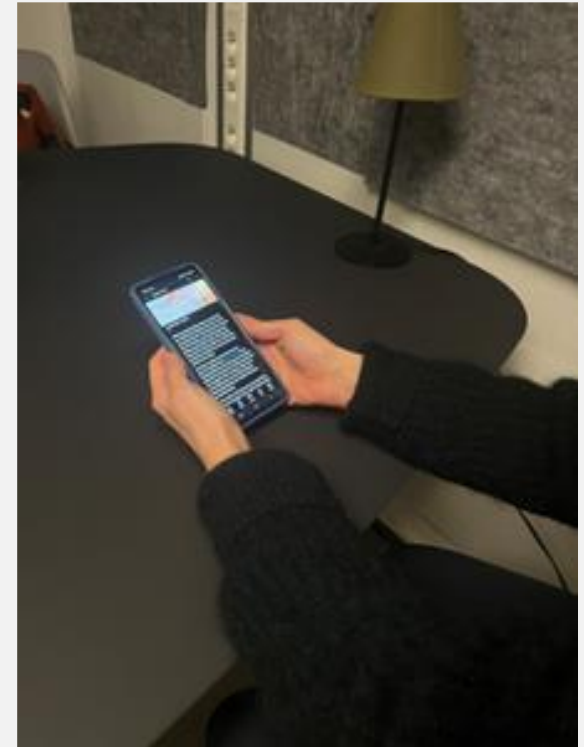
participant exposed to dim ambient light and light display mode



participant exposed to bright ambient light and light display mode



participant exposed to dim ambient light and dark display mode



participant exposed to bright ambient light and dark display mode

Results

- The average duration of mobile phone usage of the participants is 7.94 hours per day
- A two-way mixed model Ambient Lighting x Display Polarity ANOVA was conducted on the results
- The main effect of Ambient lighting and of Display Polarity was not significant
- The Ambient Light x Display Polarity interaction was significant $F(1, 14) = 7.13, p = 0.016$
- Pairwise comparisons were conducted using t-tests
- The Holm adjustment method was applied to control family-wise error rates
- When ambient light was bright, dark mode led to significantly lower eye fatigue compared to light mode ($p = 0.004$).
- This difference was not significant when ambient lighting was dim.
- Eye fatigue did not vary significantly when comparing bright and dim ambient lighting conditions with the positive polarity display mode.



Thank you

