

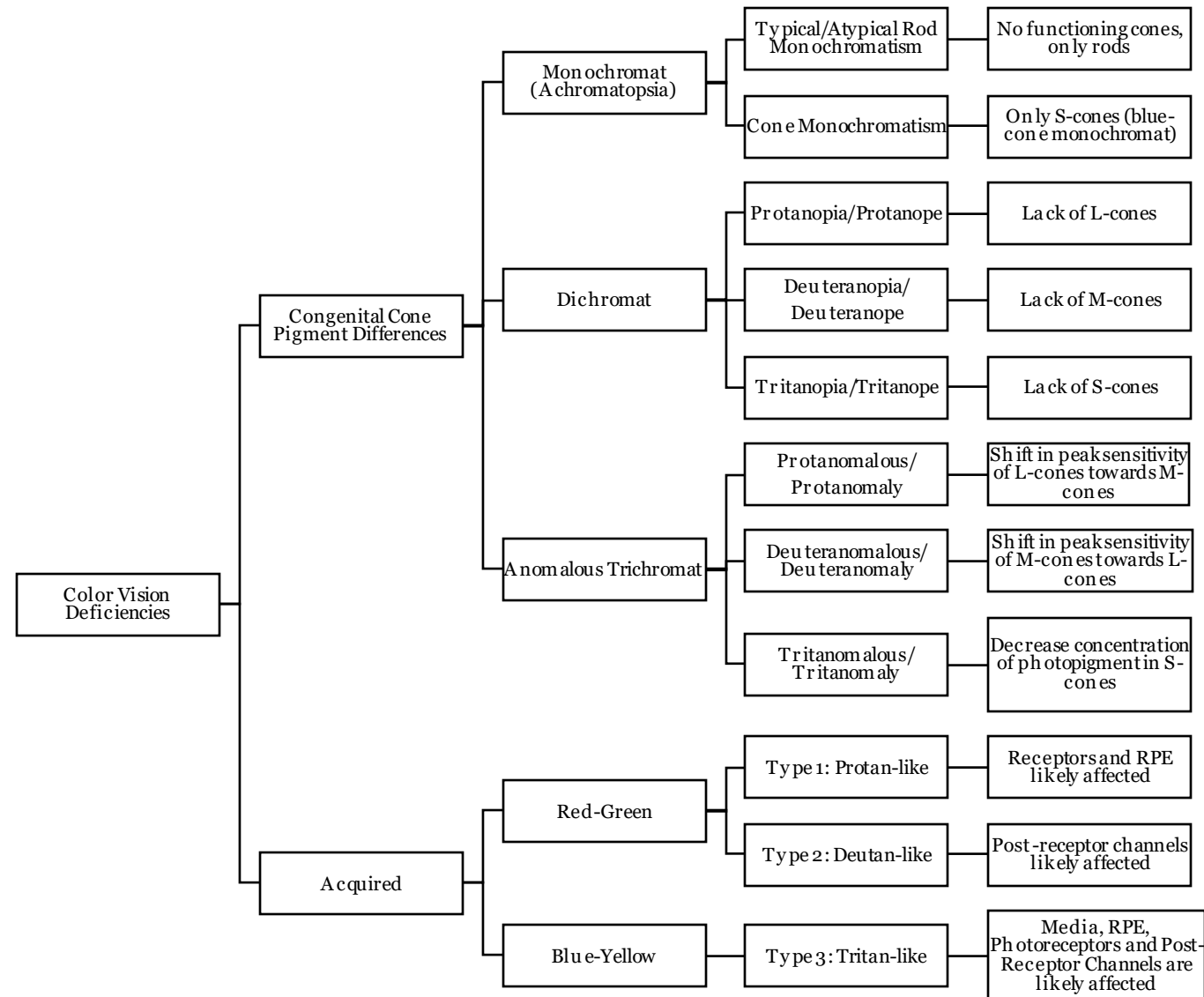
Do Working Individuals with Color Vision Deficiencies Experience Challenges in the Digital Age?

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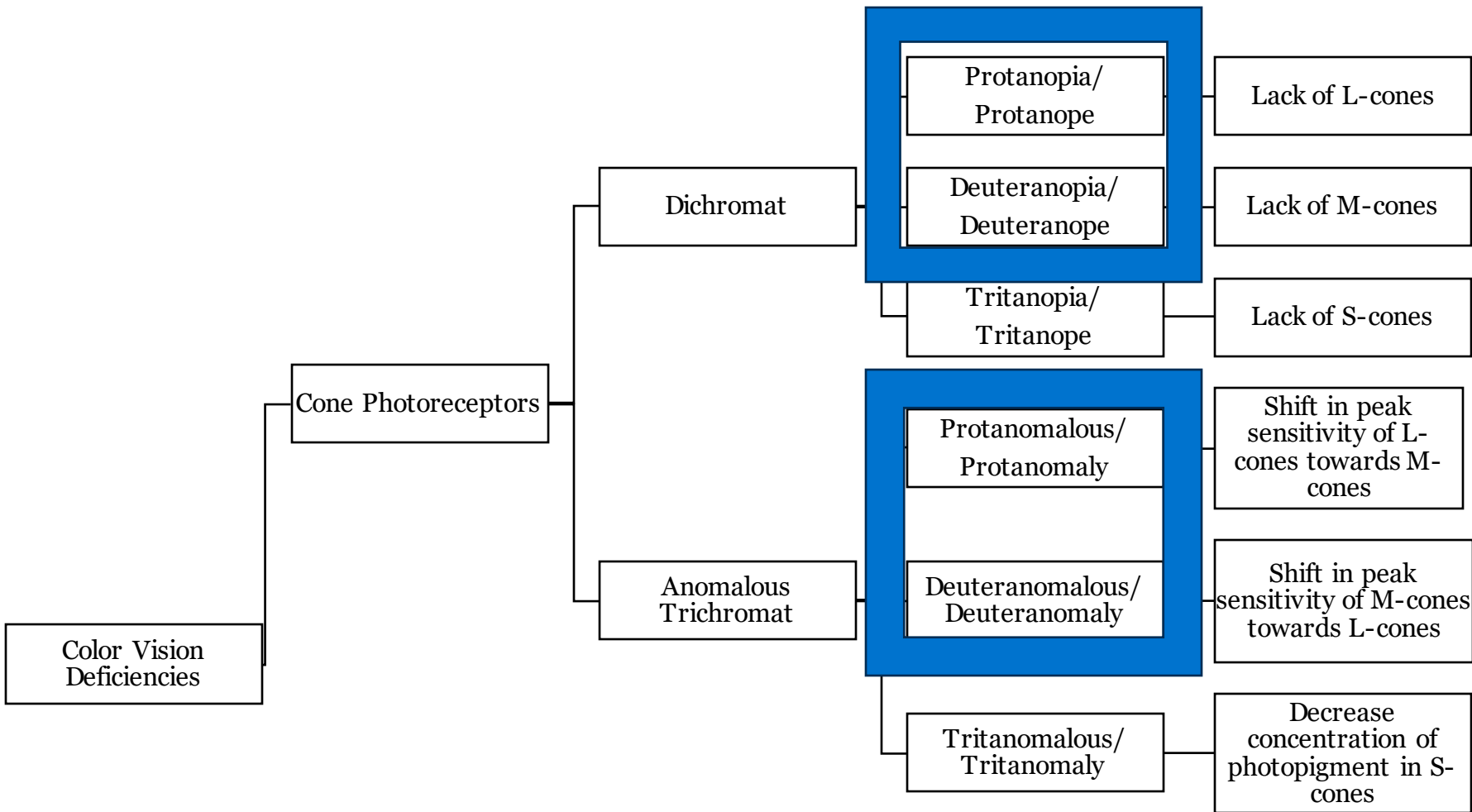
School of Optometry & Vision Science
University of Waterloo
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Color Vision Deficiencies (CVD)

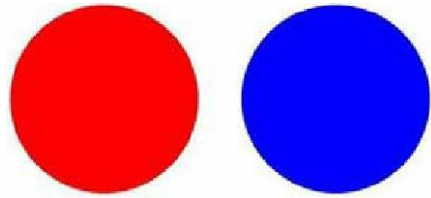


Color Vision Deficiencies (CVD)

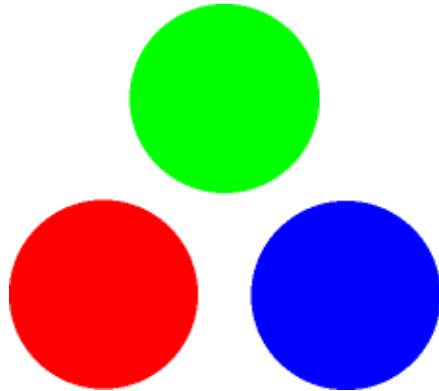


**Normal Color Vision vs
Congenital Red-Green
CVD**

Daily Challenges for Individuals with CVD



Dichromats

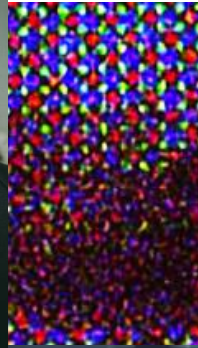


Anomalous Trichromats



https://www.researchgate.net/figure/Three-fundamental-colors-Red-Green-and-Blue_fig5_228982069
<https://www.nutraingredients.com/Article/2022/02/21/Study-linking-raw-veg-intake-to-CVD-not-to-be-taken-as-verbatim-say-experts>
<https://stock.adobe.com/images/clothing-selection-shop-for-clothing-clothes-shop-clothes-shop-costume-dress-fashion-store-style-concept/247375535>
<https://medium.com/@kenan.r.alkiek/https-medium-com-kenan-r-alkiek-traffic-light-recognition-505d6ab913b1>

Color Vision and Digital Displays



https://www.google.com/search?client=safari&sca_esv=573057508&rls=en&sxsrf=AM9HkKnXSEQJ-kOpjIquckPXoXLYA1DzVA:1697161858575&q=immersive+system+at+work&tbm=isch&source=lnms&sa=X&ved=2ahUKewjIpdPN9PGBAxWcj4kEHbolCIEQopQJegQIDRAB&biw=887&bih=732&dp=2#imgre=vHSmw4ca2pNGPM
<https://www.prometheanworld.com/gb/resource-centre/blogs/office-interactive-whiteboards-guide/>
<https://elearningindustry.com/small-medium-size-retailers-invest-immersive-learning-and-vr>
<https://www.exploratorium.edu/snacks/pixels-pictures-phones>
<https://prometheus.med.utah.edu/~bwjones/tag/color-blindness/>

Objective

To investigate how CVD individuals in the USA and Canada are impacted by this condition in terms of their interaction with digital displays in their daily lives.



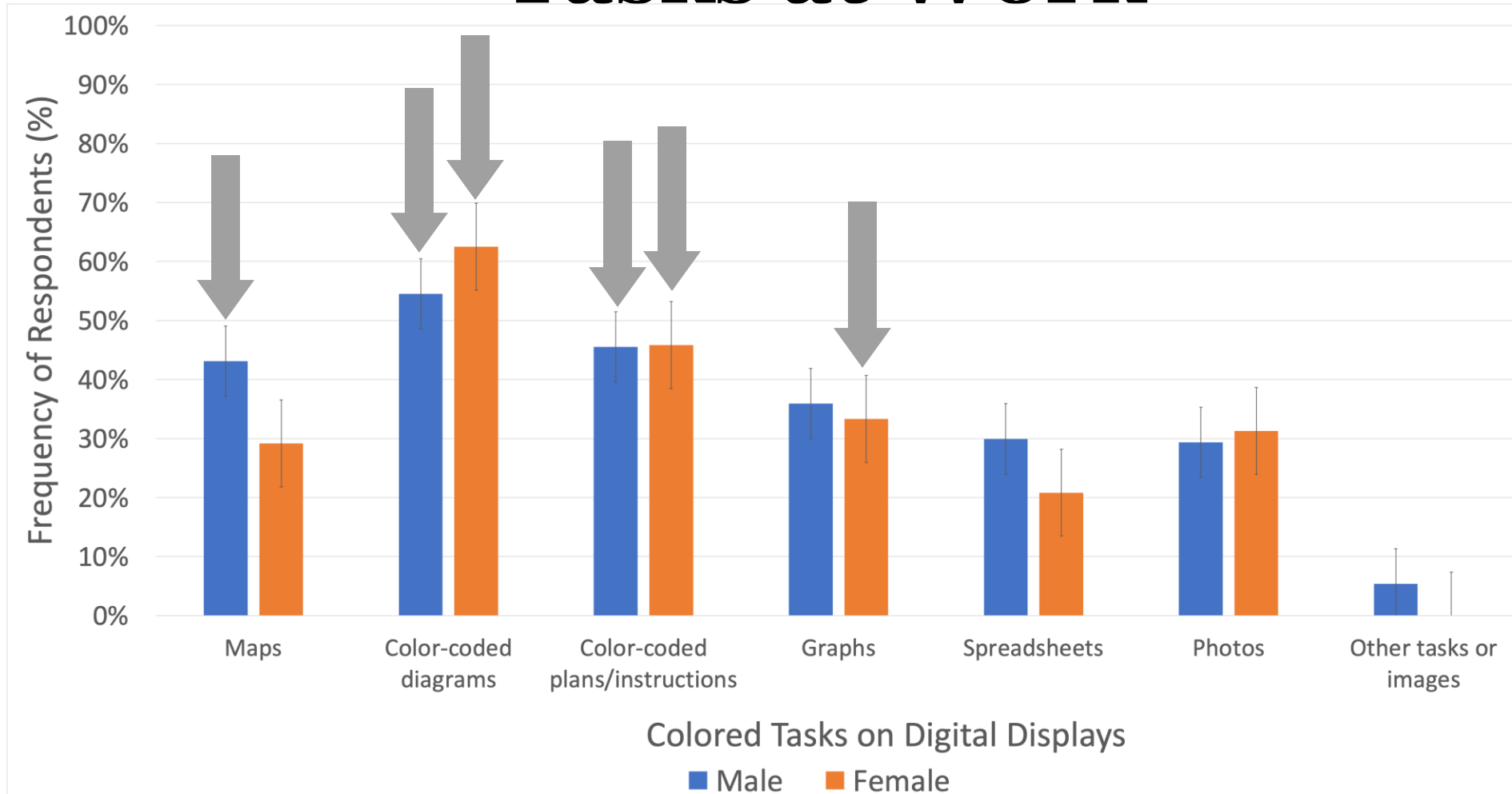
Distribution of Respondents

- **TOTAL**: 381 respondents
- **Survey Platform**
 - **Closed** (Leger): 283 respondents (74%)
 - **Open** (Social Media-Facebook and Twitter): 98 respondents (26%)
- **Location**
 - **Canada**: 224 respondents (59%)
 - **USA**: 157 respondents (41%)
- **Age Group**
 - **Youth** (10-17yo) : 129 respondents (34%)
 - **Adult** (≥ 18 yo): 252 respondents (66%)



- **Sex**
 - **Male**: 280 respondents (73%)
 - **Female**: 101 respondents (27%)

Results – Reported Difficulty with Colored Tasks at Work



Male: 167 (78%)
Female: 48 (22%)

TOTAL: 215

Figure 1. The frequency of male and female respondents who ranked the difficulty of various colored tasks at work (n=215).

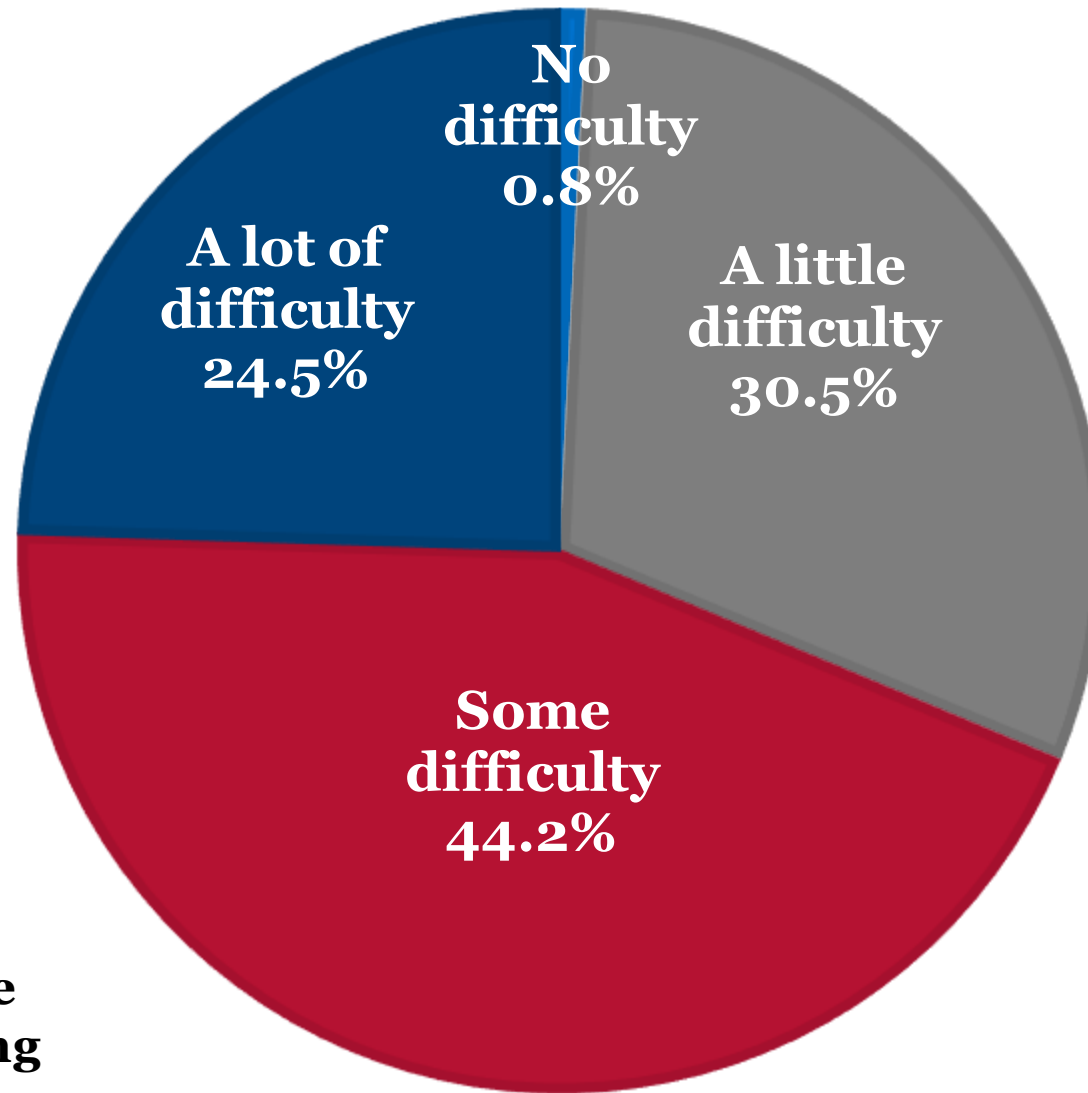


Figure 2. The distribution of the ranked level of difficulties among the seven color-related tasks performed by respondents when working/volunteering.

Males

■ No difficulty ■ A little difficulty ■ Some difficulty ■ A lot of difficulty

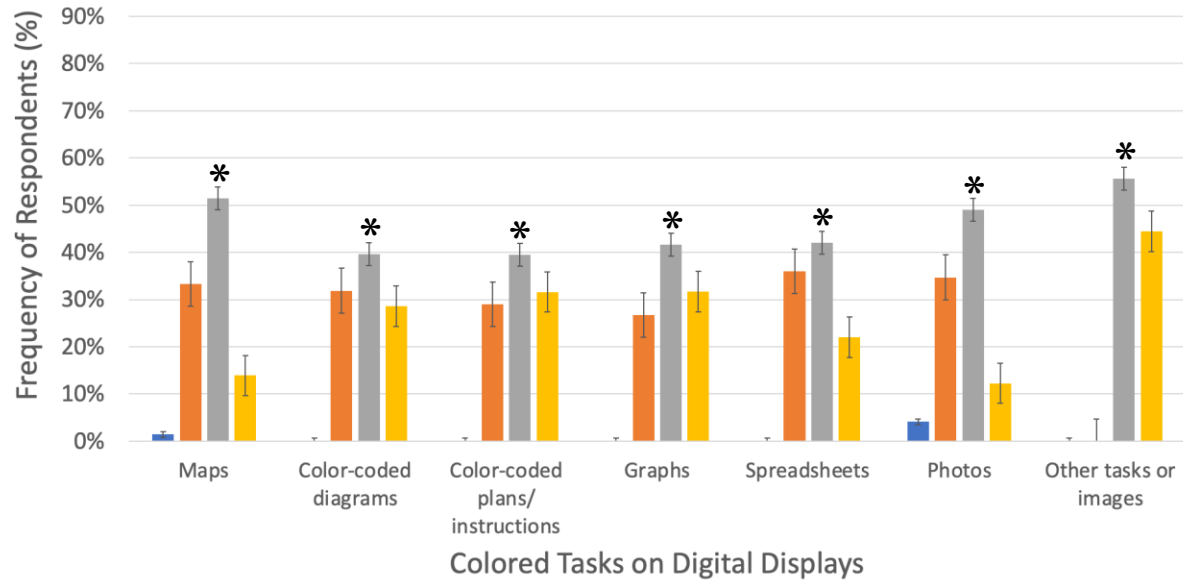
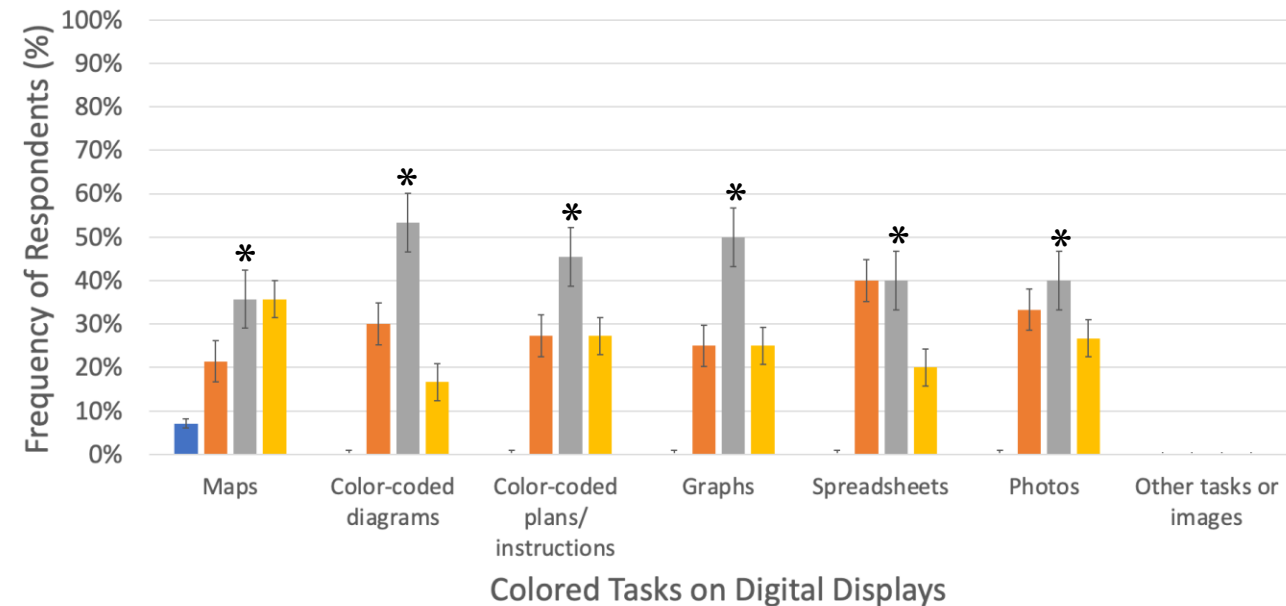


Figure 3.
Distribution of ranked difficulty by male (n=167) and female (n=48) respondents when reading, interpreting, reviewing, creating, or editing the various content on digital displays at school.

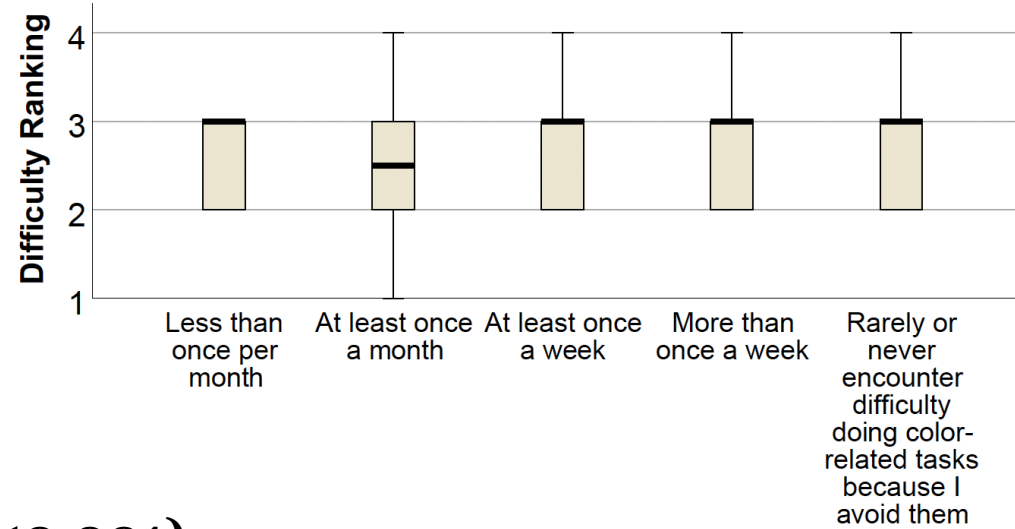
Females

■ No difficulty ■ A little difficulty ■ Some difficulty ■ A lot of difficulty

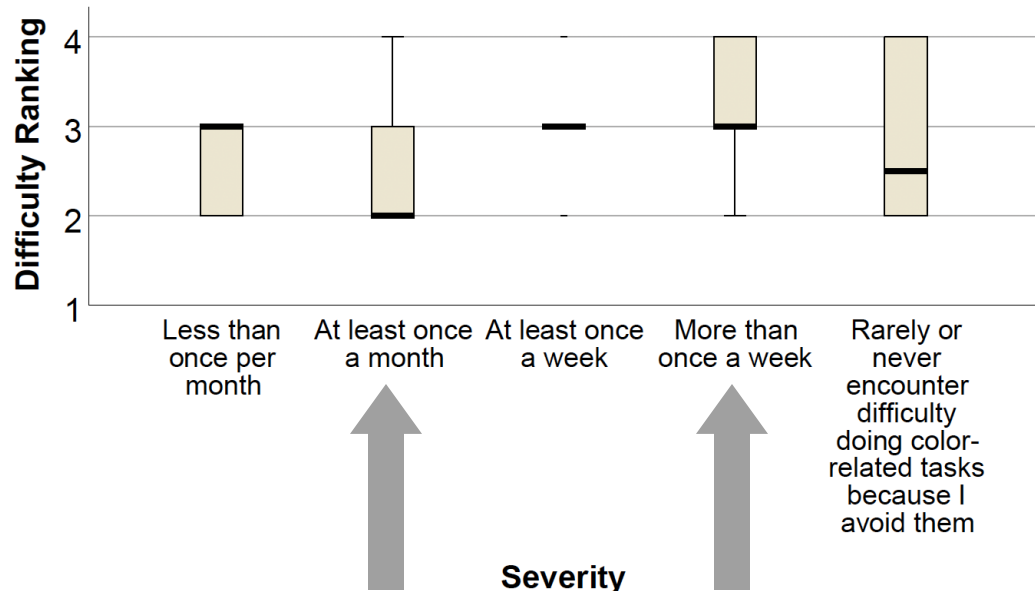


Results – Effect of “Severity” on the Rankings

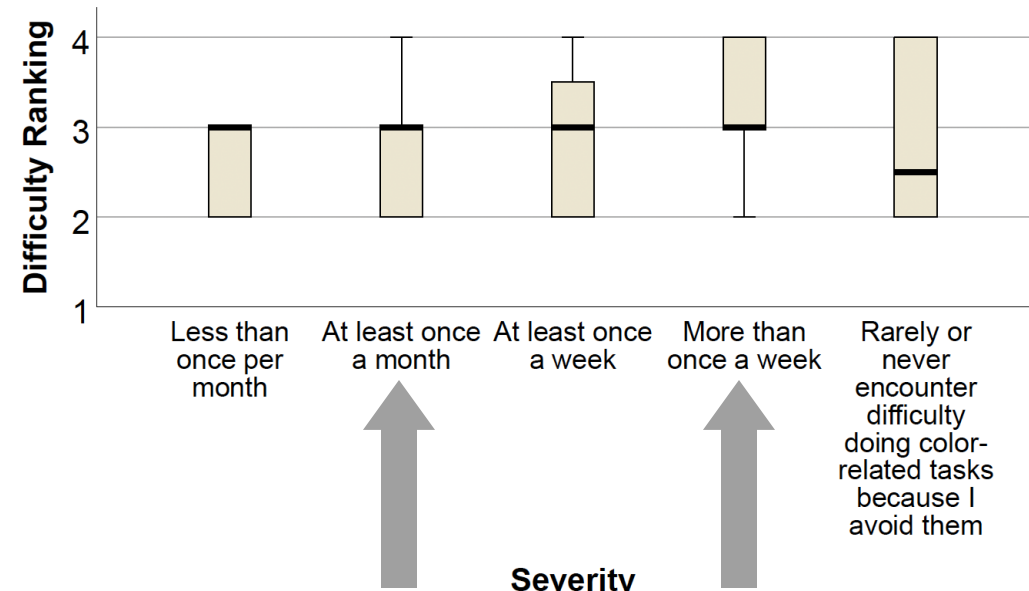
Maps (p = 0.527)



Color-coded diagrams (p < 0.001)



Color-coded plans/instructions (p = 0.021)



Severity

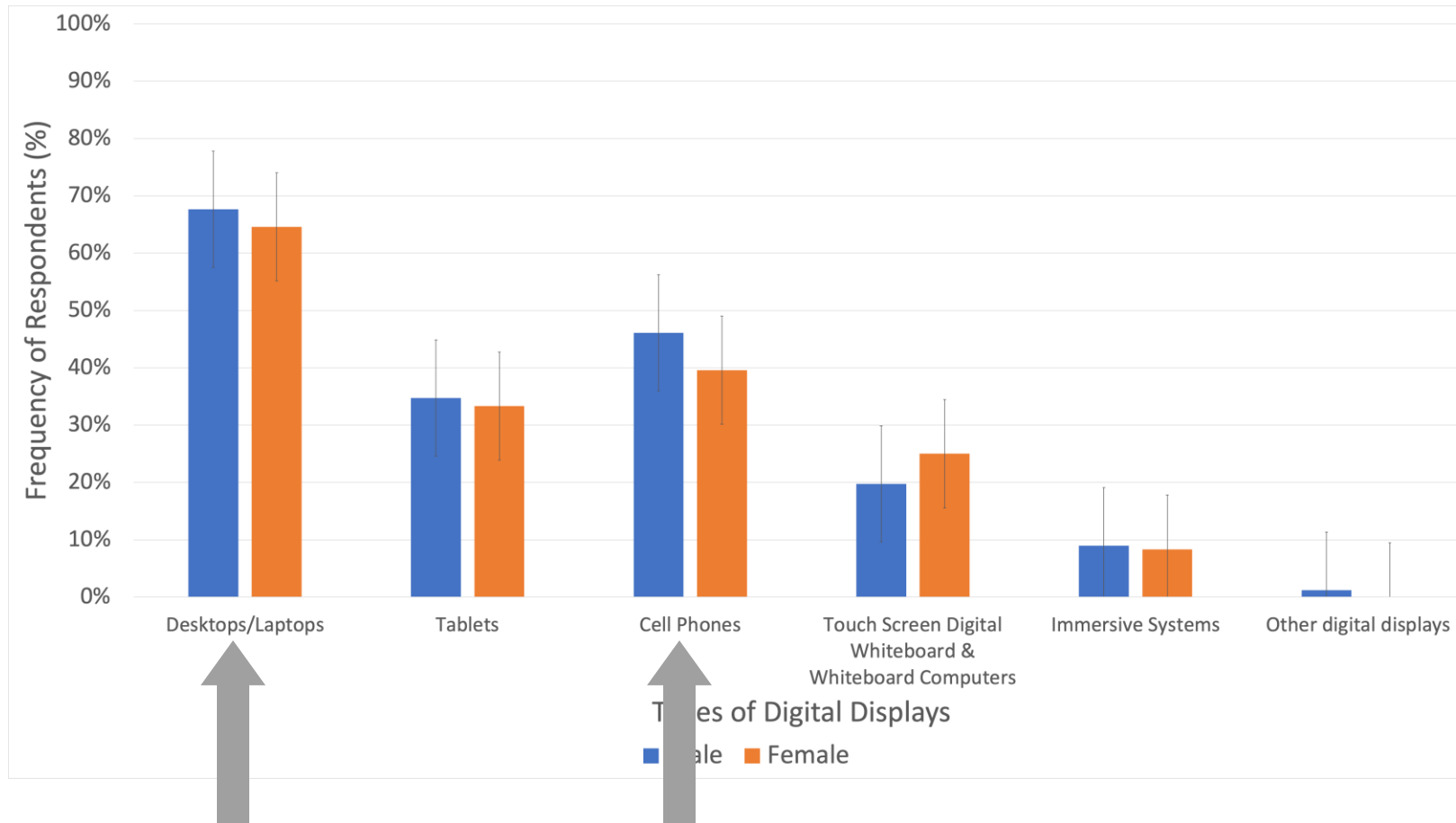


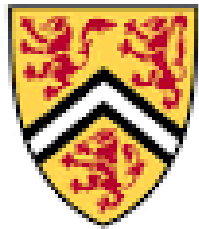
Figure 4. The frequency of male and female respondents who had trouble using digital displays at work (n=215).

Conclusions

- Nearly all (99%) color defectives experienced at least a little difficulty with at least one of the colored tasks when using digital displays at work/volunteering.
- Color-coded diagrams and plans/instructions are the most challenging tasks for color defectives at the workplace.
- The results show that software developers need to focus more of their efforts in designing more accessible graphic colors on displays for color defectives to enhance their experiences as digital users.

Acknowledgments

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& VISION SCIENCE

Qualcomm

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