

ABSTRACT

The current study aimed to investigate the acute effects of different light modalities on emotional regulation and bias.

We found that light modality had no significant effect on response time (RT). However, valence and gender interacted significantly with RT. We also found that participants made fewer false alarm (FA) errors in the blue light condition compared to the dim light condition. Gender, age and valence had no significant effects on FA error rates. These results indicate that blue light enhances emotional regulation, while dim light attenuates it.

INTRODUCTION

- Research suggest that non-image forming (NIF) effects of light impacts circadian rhythm, sleep, arousal, and mood.
- Though light has been established as the most important circadian rhythm modulator, its acute effects on mood and emotional processing have yet to be fully investigated.
- Emotional regulation occurs when emotional information interacts with cognitive control, and FA-rates in emotional Go/No-Go tasks can be used as a measure of emotional regulation [1].
- Humans tend to approach happy faces faster and more frequently relative to negative faces. This is reflected in shorter RT in emotional Go/No-Go tasks. This can be used as a measure of emotional bias [2, 3].

METHOD

The study included 34 healthy young adults who completed four separate test days in four different light modalities in a random order: polychromatic dim light (<5 photopic lux (lx)) and bright light (1000 lx), and monochromatic blue light ($\lambda_{max}=455$ nm, 60 lx) and red light ($\lambda_{max}=625$ nm, 200 lx). An emotional Go/No-Go test with happy and sad faces, using images from the FACES [4] database was used to measure emotional regulation and bias. In a preliminary analysis, two separate Linear Mixed-Effects Analyses with two (valence) by four (light) levels were run to investigate the relationship of Response Time (RT) and False Alarms (FA) with light, sex and age.

RESULTS

The sample consisted of 21 (61.8%) females with a mean age of 21.8 (SD = 2.72).

Effects of Light Condition, Valence, Gender and Age on Response Time

We found significantly shorter RT to positive stimuli compared to negative stimuli (see Figure 1) across all light conditions (Estimate = -0.02, 95% CI = -0.04 – -0.01, $p = 0.007$), as well as a significant sex effect (Estimate = 0.04, 95% CI = 0.01 – 0.08, $p = 0.008$), where females had shorter RT than males. There was no significant effect of age or light condition on RT (see Figure 2).

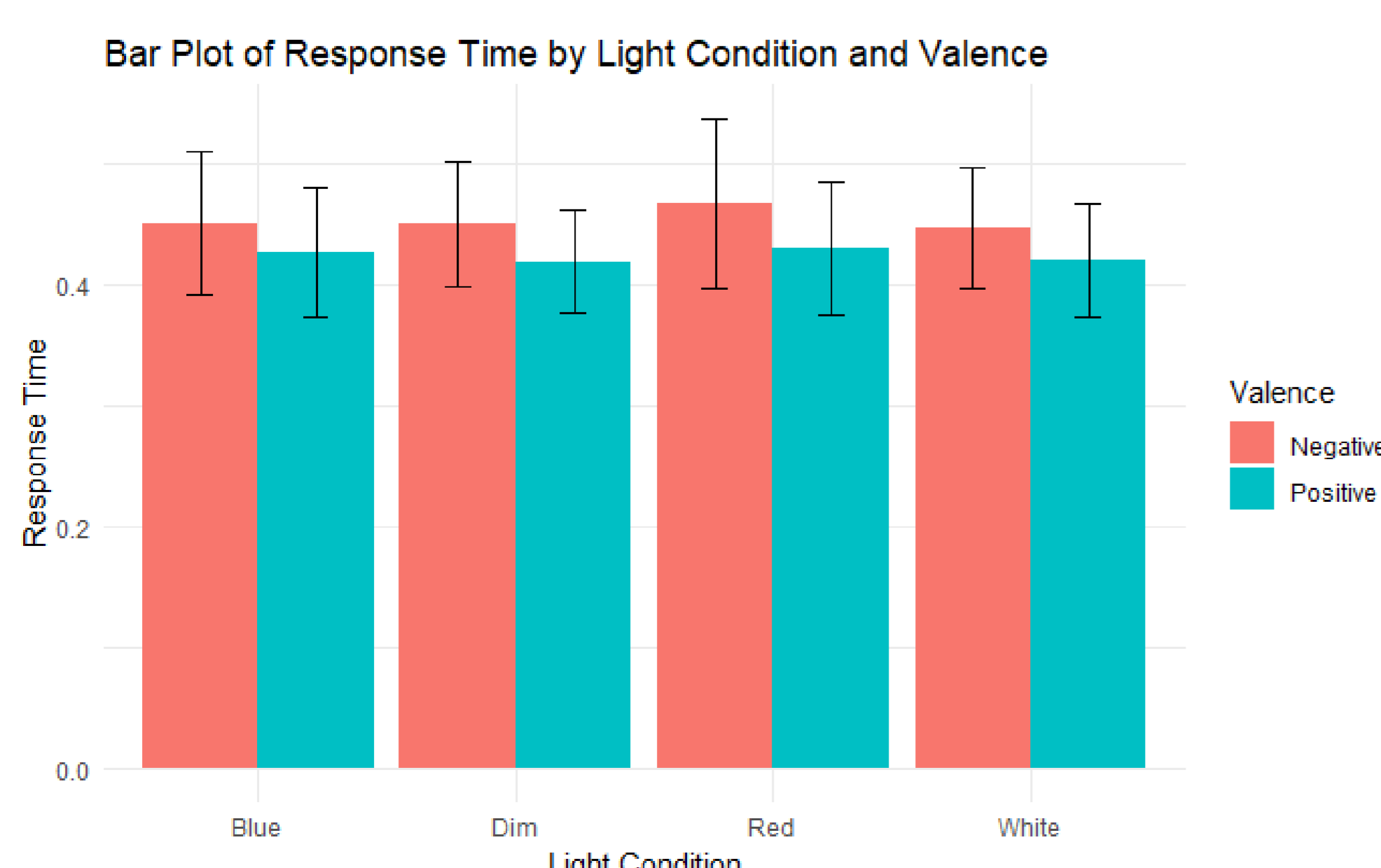


Figure 1. Average RT (in seconds) to faces with positive and negative valence across four light conditions, measured in seconds.

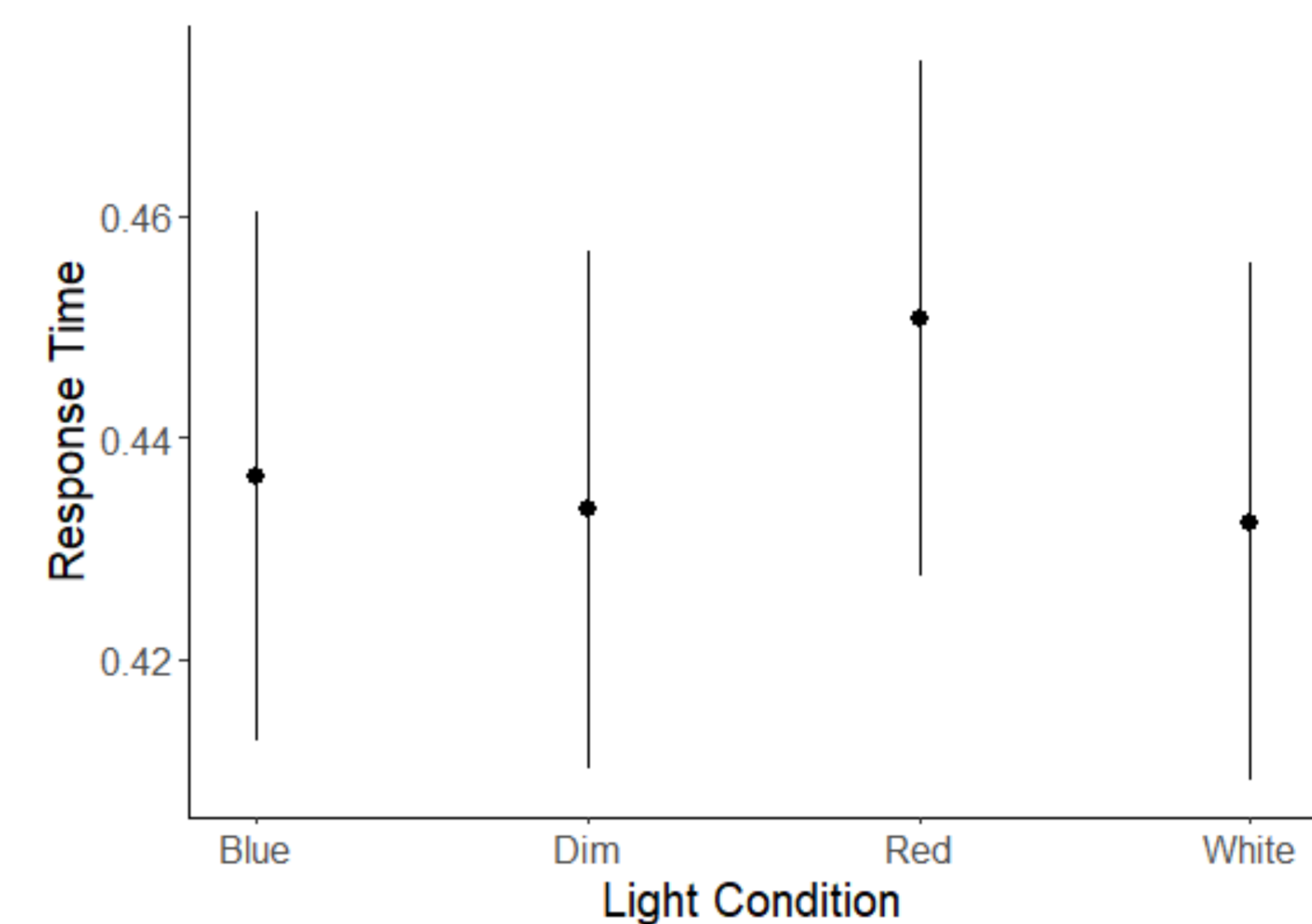


Figure 2. Average RT (in seconds) to emotional across four light conditions, measured in seconds.

Effects of Light Condition, Valence, Gender and Age on False Alarm Error Rates

We found that participants exhibited a higher rate of FA in the dim light condition (see Figures 3 and 4) compared to the blue light condition (Estimate = 1.30, 95% CI: 0.40 – 2.20, $p = 0.005$). No significant interaction effect was detected between FA-rates and valence, age or sex.

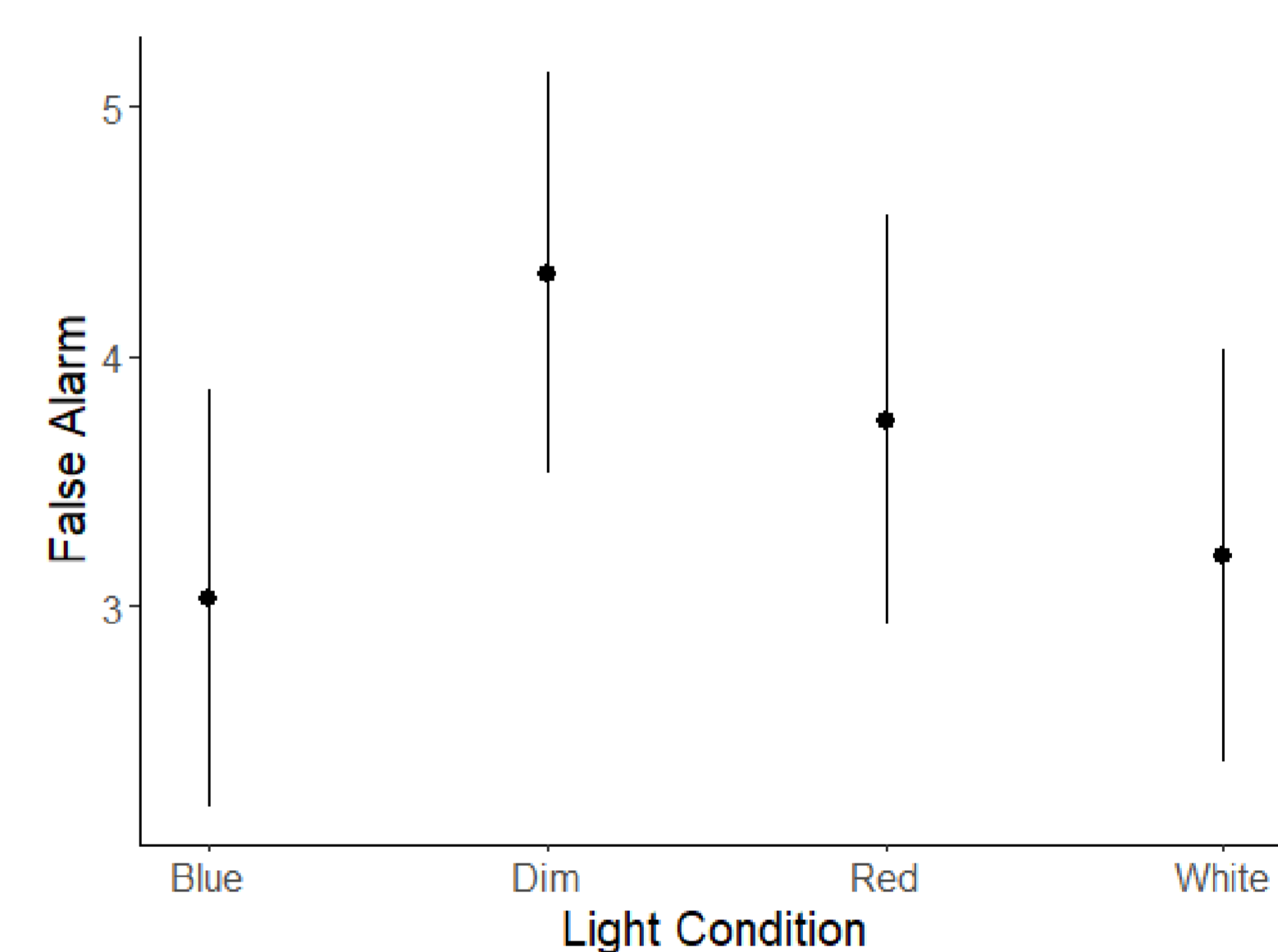


Figure 3. Average FA to emotional across four light conditions.

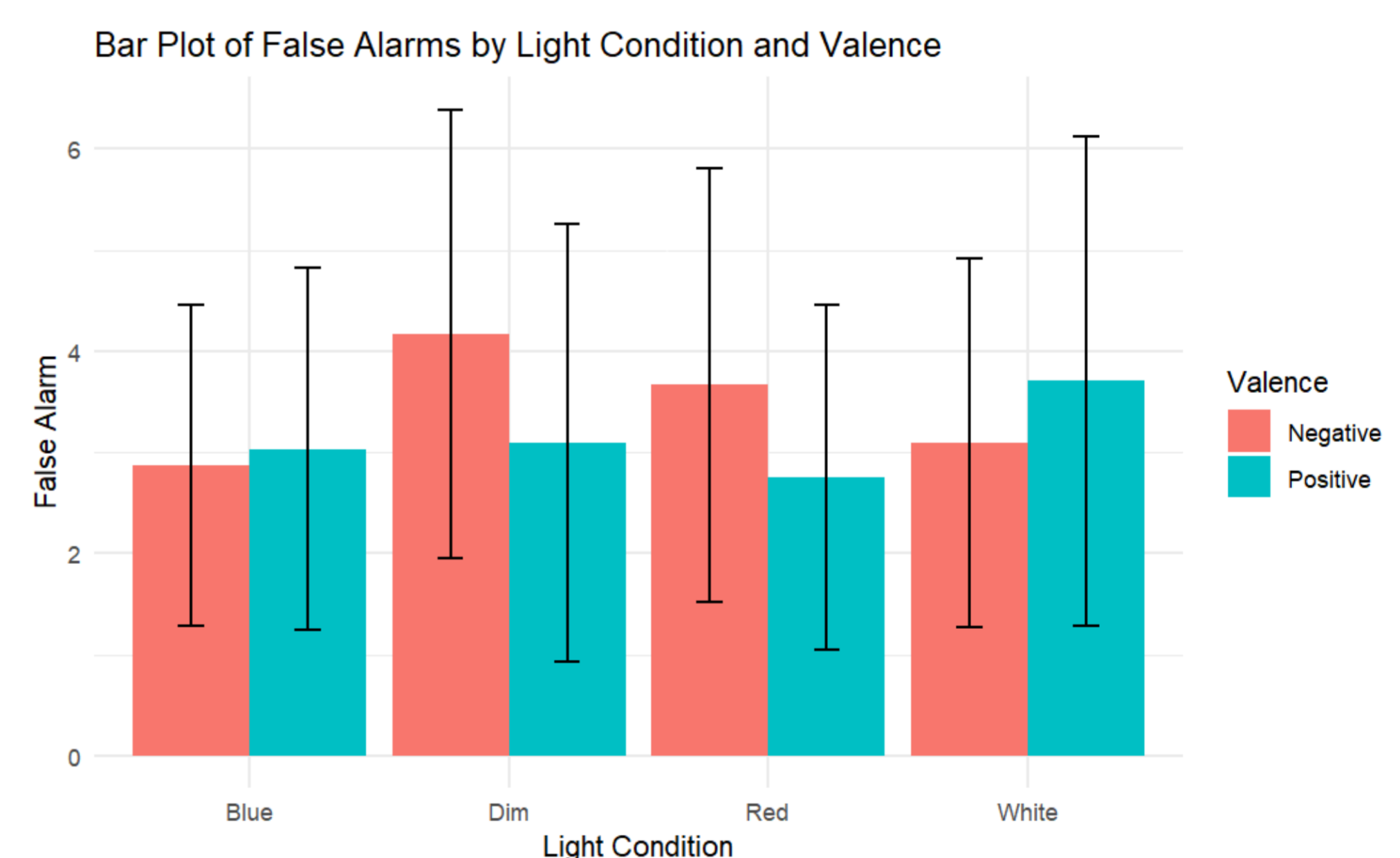


Figure 4. Average FA to faces with positive and negative valence across four light conditions.

CONCLUSION

No significant interaction effects between light condition and RT were found, but both valence and gender had significant interactions with RT. Participants made fewer FA errors in the blue light condition compared to the dim light condition.

REFERENCES

1. Tottenham, N., Hare, T. A., & Casey, B. J. (2011). Behavioral assessment of emotion discrimination, emotion regulation, and cognitive control in childhood, adolescence, and adulthood. *Frontiers in Psychology*, 2, 39–39. [DOI](#)
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