



The Effects of Sleep Deprivation and Chronotype on the Perception of Emotional Facial Expressions – An Experimental Study

X. Yang¹, J. Ling¹, J. Zhang², J.H. Hsiao¹, S.X. Li^{1,3}

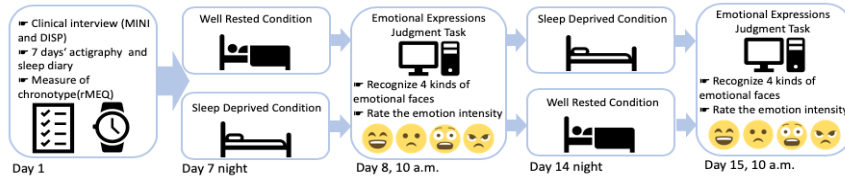
¹Department of Psychology, The University of Hong Kong, ² Department of Psychology, Stanford University, ³The State Key Laboratory of Brain and Cognitive Sciences, The University of Hong Kong

Introduction

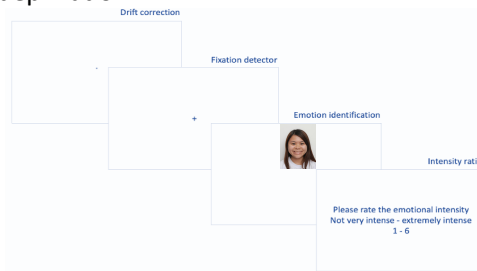
Sleep disruption is linked to impaired cognitive and emotional processing, which may potentially give rise to an increased risk for developing mental health problems. Meanwhile, previous research showed that chronotype, i.e. individual differences in their preferred timing for rest and activity, is associated with psychopathology. In this study, we aimed to examine the effects of sleep deprivation and chronotype on one's ability to recognize facial expressions of emotions.

Methods

Young adults (N = 21, Age: 20.10 ± 1.84 years, Female = 52.4%) with normal or corrected to normal vision and no history of psychological disorders and sleep problems were recruited to take part in this experiment.



Participants underwent two experimental conditions (well-rested at home vs. one-night of sleep deprivation in the laboratory) in the counterbalanced order. In both conditions, participants completed an emotional facial expression judgment task in the morning following rest/sleep deprivation.



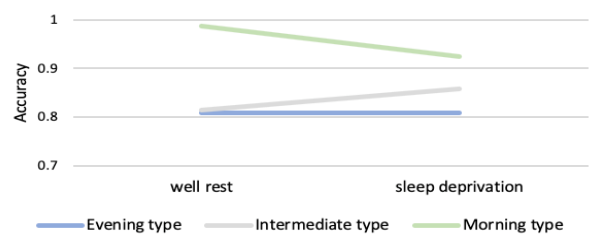
The emotional expressions judgement task is adapted from Zhang et al. (2018). In this task, participants will be asked to recognize the facial expression and rate the emotion intensity from 1 to 6. The facial expression pictures (450 × 600 pixels) of 4 emotions: happy, sad, fearful and angry, are from the database Zhang et al.'s laboratory created.

Results

Participants were classified into 3 groups based on their rMEQ scores:

- Evening-type (N = 6)
- Intermediate-type (N = 11)
- Morning-type (N = 4).

Accuracy of identifying fearful faces by conditions (well-rest/sleep deprivation) and chronotypes

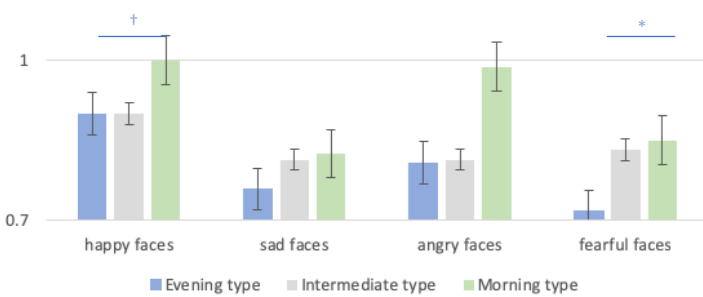


When identifying fearful faces, there's a significant main effect of chronotypes on the accuracy, $F(2,36) = 6.75, p < .01$.

- M vs. I: 0.96 vs. 0.84, $t(36) = -3.05, p = .01$
- M vs. E: 0.96 vs. 0.81, $t(36) = -3.56, p < .01$

And for Morning-type group, their accuracy is significantly higher in well rest condition than sleep deprivation condition, $t(36) = -2.08, p < .01$.

Accuracy of identifying different faces by chronotypes in the well rested condition



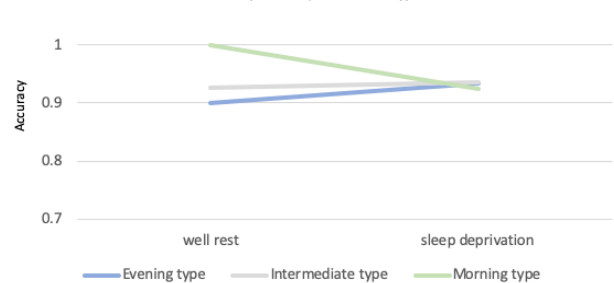
In well-rested condition, there was a significant difference in the accuracy of identifying fearful faces and a marginally significant difference in the accuracy of identifying happy faces across three groups.

- Fearful faces: E vs. I vs. M: 0.81 vs. 0.81 vs. 0.99, $\chi^2 = 8.133, p = .017$
- Happy faces: E vs. I vs. M: 0.90 vs. 0.93 vs. 1.00, $\chi^2 = 5.492, p = .064$

Discussion

Our findings demonstrated the effects of sleep loss on compromising individual's ability to recognize emotional facial expression. In addition, there were differential effects of chronotype on emotional perception in response to sleep deprivation. Further research is needed to investigate the mechanism underlying the association between chronotype, sleep loss and disrupted emotional perception.

Accuracy of identifying happy faces by conditions (well-rest/sleep deprivation) and chronotypes



When identifying happy faces, there's a marginally significant interaction effect of chronotypes and sleep conditions, $F(2,36) = 2.75, p = .08$.

- No effect was found when identifying sad and angry faces
- No effect was found in reaction time or emotion intensity rating