Categorisation deficit of facially expressed anger in insomnia: Commentary on Zhang et al. Individuals with insomnia misrecognize angry faces as fearful faces while missing the eyes: An eye-tracking study

AKRAM, Umair <http://orcid.org/0000-0003-0150-9274>

Published version

AKRAM, Umair (2019). Categorisation deficit of facially expressed anger in insomnia: Commentary on Zhang et al. Individuals with insomnia misrecognize angry faces as fearful faces while missing the eyes: An eye-tracking study. Sleep, 42 (2).

Title: Categorisation Deficit of Facially Expressed Anger in Insomnia

(Commentary on Zhang et al. Individuals with insomnia misrecognize angry faces as fearful faces while missing the eyes: An eye-tracking study)

Author: Umair Akram PhD[a,b*]

[a]Department of Psychology, Sociology and Politics, Sheffield Hallam University, Uk.
[b]Sleep and Circadian Neuroscience Institute, University of Oxford, UK

For submission to: SLEEP as a commentary

Institution work performed: Sheffield Hallam University, Uk.
Number of tables: 0
Number of Figures: 0
Abstract word count: n/a
Manuscript word count: 1252
References: 27

COI: No conflicts of interest declared in relation to this letter.
Financial support declaration: This letter was not supported by funding.

***Corresponding Author:** u.akram@shu.ac.uk Department of Psychology, Sociology and Politics, Sheffield Hallam University, Collegiate Crescent, Sheffield, South Yorkshire, S10 2BP, UK.

Individuals with insomnia often report problems with emotion regulation and impaired social interactions[1,2], and previous research concurs that insomnia is associated with a blunted response to emotional facial stimuli depicting fear, sadness, and happiness[3,4] and insomnia salient facial stimuli depicting tiredness.[5] Moreover, both insomnia and sleep apnea patients demonstrate an impaired ability to categorize faces depicting happiness and sadness (but not anger, surprise or disgust) when compared with normal-sleepers.[3] Considering an individual's capacity to correctly gauge facial expressions remains fundamental for effective social interaction, and in influencing social judgments (e.g., perceived health and attractiveness), these outcomes present negative psychosocial implications for those with insomnia.[6] Despite this, research examining how individuals with insomnia perceive facially expressed emotions remains limited.

To that end, the novel work by Zhang and colleagues[7], published in SLEEP, moves research in this area forward by expanding on simple categorization and intensity rating tasks commonly used to identify perception alteration of facially expressed emotions in insomnia. Specifically, the important work by Zhang and colleagues[7] used eye-tracking to assess the role of visual attention control while examining how those with insomnia perceive and categorize emotional faces relative to normal-sleepers. Indeed, considering Individuals often visually observe stimuli which attracts their attention[8], this method allows for a more objective and direct examination of attentional control to be recorded throughout the presentation of stimulus.[9,10]

Here, the authors identify deficits in the categorization of angry faces, which were more likely to be perceived as fearful faces among those with insomnia when compared to normal-sleepers using a time-based task. Diverging from prior research using a similar methodology however[4], no group differences in emotional intensity ratings for each expression were observed. Crucially, Zhang and colleagues moved away from traditional approaches to eye-tracking analysis. Specifically, a hidden Markov modelling approach for eye movement data (EMHMM) clustered gaze behaviour of all participants into two representative patterns: nose-mouth, where gaze was emphasised vertically along the facial midline between the nose and mouth; and eyes-mouth, where gaze was emphasized along lateral features such as the eyes and corners of the moth. Using this approach, no difference in the distribution of these patterns emerged whilst both groups observed happy faces, those with insomnia adopted the nose-mouth pattern more frequently whilst observing facially expressed anger, fear and sadness when compared to normal-sleepers. Based on mixed evidence proposing the eye and/or mouth regions to be key in the accurate recognition of facially expressed anger[11-13], the author's postulate a deficit in eye-region attention to account for the impaired ability to categorize this expression amongst those with insomnia.

Zhang and colleagues have presented a highly influential study, applying a novel methodology to an area of research often overlooked in insomnia when compared with experimental sleep deprivation.[14-16] However, whilst the eye-tracking data presented sheds light on why individuals with insomnia in this particular sample present deficits in categorizing angry faces, the outcomes vary substantially from the aforementioned previous research both in relation to emotional blunting and recognition accuracy.[3,4] The four expressions used by Zhang and colleagues[7] are typical recognised cross-culturally[17]. The authors cultural differences in face-processing as a potential factor for the divergence in outcomes. Previous research amongst western samples have commonly use well validated emotional facial stimuli sets including the (JACFEE) Japanese and Caucasian

FacialExpressions of Emotion[3,18], the KDEF (Karolinska Directed Emotional Faces)[5,19] and the widely used Ekman and Friesen faces.[4,17] In contrast, Zhang and colleagues validated the subset of faces used from their database with (n=13) individuals providing emotional intensity and genuineness ratings on a scale of 1-5. Interestingly here mean ratings for intensity of each expression were moderately high, however ratings of genuineness were somewhat lower (i.e. sadness < 3/5). It would be interesting to determine in what way the initial set of images were validated, and if any comparison to neutral faces were made? Moving forward, it would certainly be worthwhile to replicate the methods used by Zhang and colleagues[7] using a well validated and cross-culturally appropriate stimuli (i.e. JACFEE), similar to Cro¨nlein and colleagues[3], amongst both Western and East Asian populations.

As reported by Zhang and colleagues[7], Individuals with insomnia more frequently adopted nose-mouse patterns of visual behaviour, frequently overlooking the eye-region. However, accuracy for all other expressions remained consistent with normal-sleepers. Although potentially due to variation in the significance of particular facial regions in classifying specific expressions and/or the task used[17-19], contrasting research has demonstrated heightened attention for the eye-region of both neutral and tired faces amongst individuals with insomnia.[20,21] Given the substantial overlap between facial features which serve to characterize the perception of both tired and sad faces (i.e. swollen eyes, dark circles under the eyes)[22], it is surprising that individuals with insomnia here demonstrated avoidance for this area whilst observing such faces. This may stem from the differences in the task used (i.e. reaction time vs. time capped free viewing; singular vs. dual presentation). Alternatively, this could be due to limited physiological changes in facial structure which can be made by a presumably healthy and screened actor when it comes to ecologically expressing sadness. Next, whereas the EMHMM accounts for individual differences in spatial and temporal information, it would still be interesting to unpick gaze behaviour to specific non-overlapping regions of interest examining more traditional parameters (e.g. first fixation onset, first fixation duration, total gaze duration), and how this may correlate with accuracy and intensity of ratings.

Emotional faces have been widely amongst populations with mental health conditions (e.g. anxiety, depression, bipolar disorder, anorexia nervosa) to examine alterations in attention and perception relative to controls.[23-26] However, further consideration needs to be given to individuals with Insomnia Disorder. This line of inquiry is undoubtedly at an early stage and moving forward a number of considerations should be taken into account. First, it should consider how individuals with insomnia perceive neutral faces in terms of emotional intensity when compared to normal-sleepers. With that in mind, unpublished research from our group demonstrates those presenting clinically significant insomnia symptoms differentially interpret neutral faces as being more emotionally intense in ratings of happiness and attractiveness relative to normal-sleepers. Therefore, when presented with the corresponding expressive face, individuals with insomnia may provide an accentuated or attenuated response in comparison. Indeed, it is well noted that the neutral expression may be appraised as threatening due to the structural features of the face rather than the emotional content.[27] To that end, the inclusion of a neutral expression and assessment of emotional valance would be beneficial when clarifying differences in the perception of neutral faces and identifying how emotionally expressive faces are perceived in terms of valence rather than just intensity. The latter inclusion would determine whether particular expressions are considered to be

threatening in nature amongst those with insomnia. Next, research should explore clinical implications of identifying abnormalities in face processing amongst individuals with insomnia. Eventually, once a clearer picture emerges in this population, would there be scope for intervention and treatment? How would the understanding of this area feed in to theoretical perspectives in terms of the development and maintenance of the disorder? Do co-morbid psychiatric symptoms and self-reports of daytime sleepiness play a role? Should we consider subjective vs. objective measures of sleep continuity to determine the role of 'sleep-loss'?

To summarise, I would like to thank Zhang and colleagues[7] for their important and highly novel contribution to the somewhat overlooked study of facially expressed emotion perception in insomnia. Hopefully, this study encourages further work in this area serving to provide a better understanding in relation to the points raised.

References

1. Baglioni C, Spiegelhalder K, Lombardo C, Riemann D. Sleep and emotions: a focus on insomnia. Sleep medicine reviews. 2010 Aug 1;14(4):227-38.
2. Espie CA, Kyle SD, Hames P, Cyhlarova E, Benzeval M. The daytime impact of DSM-5 insomnia disorder: comparative analysis of insomnia subtypes from the Great British Sleep Survey. The Journal of clinical psychiatry. 2012;73:e1478-84.
3. Crönlein T, Langguth B, Eichhammer P, Busch V. Impaired recognition of facially expressed emotions in different groups of patients with sleep disorders. PloS one. 2016;11:e0152754.
4. Kyle SD, Beattie L, Spiegelhalder K, Rogers Z, Espie CA. Altered emotion perception in insomnia disorder. Sleep. 2014;37:775-83.
5. Akram U, Sharman R, Newman A. Altered perception of facially expressed tiredness in insomnia. Perception. 2018;47:105-11.
6. Axelsson J, Sundelin T, Ingre M, Van Someren EJ, Olsson A, Lekander M. Beauty sleep: experimental study on the perceived health and attractiveness of sleep deprived people. Bmj. 2010 Dec 15;341:c6614.
7. Zhang J, Chan AB, Lau EY, Hsiao JH. Individuals with insomnia misrecognize angry faces as fearful faces while missing the eyes: An eye-tracking study. Sleep.
8. Jonides J. Voluntary versus automatic control over the mind's eye's movement. In: Long J, Baddeley A, eds. Attention and Performance IX. Hillsdale, NJ: Lawrence Erlbaum Associates; 1981:187–203.
9. Eizenman M, Lawrence HY, Grupp L, et al. A naturalistic visual scanning approach to assess selective attention in major depressive disorder. Psychiatry Res. 2003;118:117–128.
10. Godijn R, Theeuwes J. Parallel allocation of attention prior to the execution of saccade sequences. J Exp Psychol Hum Percept Perform. 2003;29:882–896.
11. Schyns PG, Petro LS, Smith ML. Transmission of facial expressions of emotion co-evolved with their efficient decoding in the brain: behavioral and brain evidence. Plos one 2009;4:e5625.
12. Espie CA, Kyle SD, Hames P, Gardani M, Fleming L, Cape J. The Sleep Condition Indicator: a clinical screening tool to evaluate insomnia disorder. BMJ open 2014;4:e004183.
13. Eisenbarth H, Alpers GW. Happy mouth and sad eyes: scanning emotional facial expressions. Emotion 2011;11:860.
14. Van Der Helm E, Gujar N, Walker MP. Sleep deprivation impairs the accurate recognition of human emotions. Sleep. 2010;33:335-42.
15. Cote KA, Mondloch CJ, Sergeeva V, Taylor M, Semplonius T. Impact of total sleep deprivation on behavioural neural processing of emotionally expressive faces. Experimental brain research. 2014;232:1429-42.

16. Killgore WD, Balkin TJ, Yarnell AM, Capaldi II VF. Sleep deprivation impairs recognition of specific emotions. Neurobiology of Sleep and Circadian Rhythms. 2017;3:10-6.
17. Ekman P. Are there basic emotions? Psychol Rev 1992;99:550-3.
18. Matsumoto D, Ekman P. Japanese and Caucasian facial expressions of emotion (JACFEE) and neutral faces (JACNeuF). 1995.
19. Lundqvist D, Flykt A, Öhman A. The Karolinska directed emotional faces (KDEF). CD ROM from Department of Clinical Neuroscience, Psychology section, Karolinska Institutet. 1998;91:630.
20. Akram U, Ellis JG, Myachykov A, Barclay NL. Preferential attention towards the eye-region amongst individuals with insomnia. Journal of sleep research 2017;26:84-91.
21. Akram U, Robson A, Ypsilanti A. Sleep-related attentional bias for faces depicting tiredness in insomnia: evidence from an eye-tracking study. Journal of Clinical Sleep Medicine. 2018;14:959-65.
22. Sundelin T, Lekander M, Kecklund G, Van Someren EJ, Olsson A, Axelsson J. Cues of fatigue: effects of sleep deprivation on facial appearance. Sleep. 2013;36:1355-60.
23. Bradley BP, Mogg K, White J, Groom C, De Bono J. Attentional bias for emotional faces in generalized anxiety disorder. British Journal of Clinical Psychology. 1999;38:267-78.
24. Bourke C, Douglas K, Porter R. Processing of facial emotion expression in major depression: a review. Australian and New Zealand Journal of Psychiatry. 2010;44:681-96.
25. Pollatos O, Herbert BM, Schandry R, Gramann K. Impaired central processing of emotional faces in anorexia nervosa. Psychosomatic Medicine. 2008;70:701-8.
26. Surguladze SA, Marshall N, Schulze K, Hall MH, Walshe M, Bramon E, Phillips ML, Murray RM, McDonald C. Exaggerated neural response to emotional faces in patients with bipolar disorder and their first-degree relatives. Neuroimage. 2010;53:58-64.
27. Oosterhof NN, Todorov A. The functional basis of face evaluation. Proceedings of the National Academy of Sciences. 2008;105:11087-92.