Addictive Behaviors 106 (2020) 106382

Contents lists available at ScienceDirect

Addictive Behaviors

journal homepage: www.elsevier.com/locate/addictbeh

Socio-affective processing biases in severe alcohol use disorders: Experimental and therapeutic perspectives

Arthur Pabst[a], Alexandre Heeren[a,b], Pierre Maurage[a,b,*]

[a] Louvain Experimental Psychopathology Research Group, Psychological Sciences Research Institute, Université Catholique de Louvain, Louvain-la-Neuve, Belgium
[b] Clinical Neuroscience Division, Institute of Neuroscience, Université Catholique de Louvain, Brussels, Belgium

HIGHLIGHTS

- Preliminary data indicate that patients with SAUD exhibit biases toward social threat.
- Such biases may impede social relations and prognosis.
- We review current evidence and offer recommendations to directly study these biases.
- This new field could initiate innovative interventions reducing relapse in SAUD.

ARTICLE INFO

Keywords:
Alcohol use disorder
Socio-affective processing
Attentional bias
Interpersonal functioning
Relapse
Eye tracking

ABSTRACT

Previous literature has consistently reported socio-affective information processing impairments in patients with severe alcohol use disorder (SAUD). Some recent studies have also suggested that these patients might exhibit biases toward stimuli indicating social threat, such as angry or disgusted faces. Such biases have been largely documented in other psychopathological disorders like anxiety, where they play a critical role in the emergence and maintenance of the disorder. A comprehensive understanding of these biases in SAUD would thus deepen the understanding of interpersonal difficulties and relapse-related factors. However, to date, no study has directly explored these biases in SAUD. In order to initiate efforts to address this issue, we first review preliminary evidence supporting the hypothesis of biased processing of social threat in SAUD. Then, we identify possible pathways through which such biases might negatively impact the course of the disorder. Finally, we provide precise recommendations and available materials to develop research in this promising field, and underline the related theoretical and clinical perspectives.

1. Introduction

As social individuals, human beings have a strong need to feel included and related to others. When this need is thwarted, psychological well-being (Matthews et al., 2016; Taylor, Taylor, Nguyen, & Chatters, 2018) and even life expectancy (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015; Tanskanen & Anttila, 2016) are reduced. Interpersonal difficulties play an important role in severe alcohol use disorders (SAUD), as defined in the DSM-5 (American Psychiatric Association, 2013). Indeed, situations of social exclusion and interpersonal conflict are frequent in SAUD and influence the disease's course by constituting significant relapse triggers (Marlatt, 1996; Mau, Muller, & Roessler, 2019; Witkiewitz and Marlatt, 2004; Zywiak, Westerberg, Connors, & Maisto, 2003). Conversely, the presence of social support is a predictor of long-term abstinence (Sliedrecht, de Waart, Witkiewitz, & Roozen, 2019). Therefore, it is paramount to improve our understanding of the downstream causes that negatively affect social relationships in SAUD.

Several societal factors contribute to interpersonal problems in SAUD. For example, this population is at high risk of being confronted with stigma (i.e., negative attitudes and social rejection; Pescosolido et al., 2010; Schomerus et al., 2011) and dehumanization (i.e., the denial of one's human features; Fontesse, Demoulin, Stinglhamber, & Maurage, 2019) from the general population, which underlines the need for sensitization campaigns raising awareness on this disorder. Beyond these external variables, neuropsychological studies have also highlighted that intrapersonal factors might negatively affect interpersonal relations in SAUD, shedding light on valuable individual

* Corresponding author at: Psychological Sciences Research Institute, Université Catholique de Louvain, Place du Cardinal Mercier, 10, B-1348 Louvain-la-Neuve, Belgium.
E-mail address: pierre.maurage@uclouvain.be (P. Maurage).

https://doi.org/10.1016/j.addbeh.2020.106382
Received 12 January 2020; Received in revised form 11 February 2020; Accepted 2 March 2020
Available online 05 March 2020

treatment targets. Most recently, numerous studies have documented socio-affective impairments in SAUD, with facial emotion decoding and Theory of Mind (broadly defined as the ability to infer other's mental state, beliefs, and feelings) abilities being most affected (Bora & Zorlu, 2017; Castellano et al., 2015; Donadon & Osório, 2014; Le Berre, 2017, 2019; Maurage, Rolland, & D'Hondt, 2019) and predicting treatment dropout and relapse (Rupp, Derntl, Osthaus, Kemmler, & Fleischhacker, 2017). Moreover, this line of work has suggested that patients with SAUD, like many other psychiatric populations (Bantin, Stevens, Gerlach, & Hermann, 2016; García-Blanco et al., 2017; Hommer et al., 2014; Leyman, Raedt, Schacht, & Koster, 2007; Mogg, Millar, & Bradley, 2000) might process socio-affective information in a biased fashion, and particularly exhibit biases[1] towards negative or socially threatening cues. These biases are conceptualized as transdiagnostic factors contributing to psychopathology-related social stress and exclusion (Reinhard et al., 2019). They might also underpin the above-mentioned socio-affective impairments: a selective processing of negative social information may prevent patients from correctly assessing and accurately reacting to social situations. Their presence could thus have tremendous implications for the understanding of SAUD development and related interpersonal problems. Surprisingly, no scientific effort has been devoted to their direct exploration in SAUD. In this paper, we thus aim at (i) reviewing the preliminary empirical evidence supporting the presence of socio-affective biases in SAUD, (ii) discussing the mechanisms through which they might negatively influence the course of SAUD, and (iii) outlining innovative research avenues to move forward in the exploration of these biases.

2. Current evidence for socio-affective biases in SAUD

While socio-affective biases have never been directly measured in SAUD, several arguments suggest that they are involved in this disorder:

(1) Patients with SAUD exhibit modified processing of socially threatening emotions. They are less accurate and slower than controls to identify emotions conveyed by faces, as well as to estimate emotional intensity (e.g., Foisy et al., 2007; Kornreich et al., 2001a; Kornreich et al., 2001b; Kornreich et al., 2002; Kornreich et al., 2013; Maurage et al., 2009; Philippot et al., 1999). However, differences across emotions remain to be clarified. In a recent meta-analysis, Bora and Zorlu (2017) underlined that patients' modified emotion processing abilities are most evident for faces displaying anger and disgust, with only small-sized effects observed for other emotions, and no difference for happy faces. Therefore, rather than being characterized by general socio-affective impairments, patients with SAUD might exhibit selective changes for processing anger and disgust, which are construed as emotions signaling social threat since they elicit behavioral tendencies destined to punish moral violators (Chapman, Kim, Susskind, & Anderson, 2009; Seip, Van Dijk, & Rotteveel, 2014).

(2) Patients with SAUD over-estimate the presence of socially threatening emotions. Beyond the reduced decoding accuracy presented above, SAUD is actually related to a confusion between emotions, and to an over-estimation of anger and disgust. Indeed, Philippot et al. (1999) evidenced a tendency to perceive negative emotions in happy faces and to misattribute anger and contempt (which the authors interpreted as signals of interpersonal conflict) to faces actually displaying other emotions. Frigerio, Burt, Montagne, Murray, and Perrett (2002) further showed that patients with SAUD more frequently misrecognized sad faces as angry or disgusted. Foisy et al. (2007) also found both a tendency to misperceive anger and disgust as sadness and to report disgust in sad faces. Later, Maurage and colleagues (2009) showed that patients overestimate the intensity of facial stimuli presenting anger, and confirmed that they also detect anger in stimuli actually presenting sadness, fear, and even neutral emotions. More recently, Freeman et al. (2018) further supported previous findings by revealing specific error patterns in SAUD when categorizing emotional facial expressions, with patients more often perceiving anger and disgust in other negative and neutral emotions. Altogether, these behavioral studies using different tasks and measures support the view that people with SAUD exhibit, beyond the mere reduced performance in emotion decoding, biases towards the over-estimation of socio-affective information signaling social threat.

(3) Patients with SAUD have modified brain activations related to social threat. Congruent with the proposal of altered social threat processing, patients with SAUD display increased dorsal anterior cingulate cortex (dACC) activation compared to healthy controls when processing angry faces (Park et al., 2015). Moreover, they show higher insula and dACC activations when confronted with social threat, namely during social exclusion (Maurage et al., 2012). Interestingly, higher dACC activation to specific stimuli (smoking cues) is related to attentional biases (AB) towards the same specific stimuli in smokers (Luijten et al., 2011). Additionally, the dACC and insula are involved in the attribution of salience to and the detection and appraisal of social threat (Heilig, Epstein, Nader, & Shaham, 2016; Kawamoto, Ura, & Nittono, 2015). Therefore, this pattern of neural activation may reflect a heightened sensitivity to stimuli signaling social threat in SAUD, which might underlie the biased processing of these stimuli.

3. Impact of socio-affective biases in SAUD

Given the above-mentioned influence of social factors on the development and maintenance of SAUD, we argue that the biased processing of social threat may act as harbingers of relapse, via two complementary pathways (Fig. 1):

(1) At short term, it may increase patients' perception of social threat and augment their vulnerability to social rejection. This proposal is supported by results among healthy participants showing that experimentally inducing an AB social threat led to increased anxiety during social exclusion (Heeren, Peschard, & Philippot, 2012). Furthermore, such biases could impede their ability to regulate the negative affects resulting from social exclusion (Gerber & Wheeler, 2009), as shown by persistent brain activations related to negative emotions and social exclusion even after the end of the actual exclusion episode (Maurage et al., 2012). Conversely, when excluded, healthy participants typically attend to positive social information, which is viewed as an adaptive way to recover from the negative effects associated with it (Dewall, Maner, & Rouby, 2009). The tendency of patients with SAUD to show biases toward social threat rather than positive social signals following social exclusion might thus exacerbate its negative consequences and deprive patients from typical emotion regulation resources, leading them to resort to alcohol as an alternative way of coping with social exclusion feelings (Fairbairn & Sayette, 2014).

(2) In the long run, biases toward social threat may deteriorate existing social relationships and prevent the emergence of new ones, reducing social support. For instance, biases toward socially threatening information might favor the interpretation of ambiguous social situations as hostile, and thus lay the ground for inappropriate responses such as aggression or avoidance, lowering social bonding. In accordance with this view, studies showed that AB towards social threat are implicated in the negative interpretation of ambiguous social signals (Haller et al., 2017; White, Suway, Pine, Bar-Haim, & Fox, 2011). Furthermore, both the tendency to misperceive anger in non-angry stimuli and AB towards social threat are linked with the frequency of aggressive behaviors (Hall, 2006; Miller & Johnston, 2019; Penton-Voak et al., 2013). Consequently, biases towards social threat in SAUD might influence the interpersonal problems encountered in this population, by promoting social avoidance or aggression among patients and

[1] Here, we define biases as the preferential allocation of cognitive resources to specific emotional stimuli (e.g., alcohol-related stimuli or social stimuli) as compared to neutral ones.

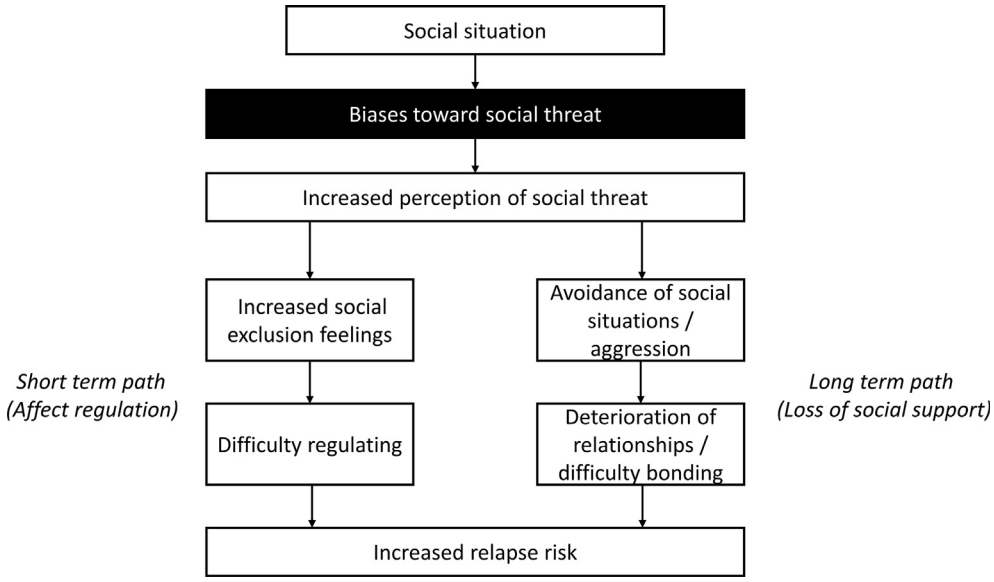

Fig. 1. Schematic representation of the postulated short and long term paths leading from socio-affective biases towards interpersonal threat to clinical outcomes.

by favoring a desire for social distance among other individuals. The resulting social seclusion would again expose patients to higher relapse risk (Sliedrecht et al., 2019).

4. Towards a comprehensive investigation of socio-affective biases in SAUD

Previous sections underscored the pertinence of studying socio-affective biases in SAUD. Here, we provide means to initiate a research program in this promising field. A crucial first step is to ascertain the genuineness of the bias via direct experimental examination. Such a goal can be achieved by employing validated cognitive bias paradigms such as the dot-probe task (MacLeod, Mathews, & Tata, 1986), which has been largely used in other psychopathological states to measure AB. Here, we focus on AB rather than memory or interpretation biases because AB may be upstream determinants of the two other biases: selectively attending to specific stimuli in a scene may influence its interpretation and facilitate the encoding and recall of these stimuli (Blaut, Paulewicz, Szastok, Prochwicz, & Koster, 2013; Bowler et al., 2017; Everaert, Duyck, & Koster, 2014; Haller et al., 2017; White et al., 2011). In the dot-probe task, image pairs (one emotional, one neutral) are presented, one image being subsequently replaced by a target that participants are instructed to characterize as fast and accurately as possible. Faster reaction times to targets replacing the emotional image are typically indexing AB. This task has often been employed in SAUD to measure alcohol-related AB (i.e., using pictures of alcoholic versus soft drinks; Field & Cox, 2008), but it has never been used to study socio-affective processes in this population. This gap can be filled by using socio-affective stimuli, such as emotional faces: by showing pairs consisting of one neutral and one emotionally-loaded face of different valences (e.g., happy, sad, fearful, angry, disgusted), one can directly test whether patients exhibit biased attentional processing of certain socio-affective information and whether it is specific to socially threatening ones (as predicted by previous studies). At a later stage, task specificities can be modified to draw more ecologically valid conclusions by testing whether the bias persists when the stimuli of interest (i.e., presenting socially threatening emotions) are paired with non-neutral emotions (e.g., non-socially threatening but negative emotions like sadness) rather than neutral stimuli. Its generalization to non-socially threatening stimuli (e.g., visual scenes depicting situations related to anger or disgust) should also be tested.

Reaction-time based AB indices reveal the location of attention when images disappear, but fail to capture attentional deployment over time (McNally, 2019). Therefore, complementing the dot-probe task with eye tracking measures is valuable to study the dynamics of attention. Eye tracking is a useful tool to unfold the nature of attentional processes in alcohol-related disorders (Maurage, Masson, Bollen, & D'Hondt, 2020), and eye-movements yield more reliable AB indices than reaction times (Christiansen, Mansfield, Duckworth, Field, & Jones, 2015). Eye tracking measures would thus track the evolution of overt attention allocation over time by computing gaze indices for different time windows of the trials (Schofield, Johnson, Inhoff, & Coles, 2012). It would also help in the characterization of the biases, with initial gaze orienting or first fixation latency indices reflecting rather automatic attentional capture, whereas total dwell time indexes more controlled processes (Armstrong & Olatunji, 2012). This precise characterization is paramount since different mechanisms (i.e. attentional, but also perceptive, memory or executive processes) might underpin the biases. Especially, SAUD is characterized by neurocognitive deficits (Bühler & Mann, 2011; Stavro, Pelletier, & Potvin, 2013), which may play a role in the proposed biases. The eye tracking indices described above can shed light on the cognitive processes involved: longer dwell time on threatening faces can, for example, reflect patient's inability to exert executive control over attention. The implication of cognitive control deficits can be further explored by manipulating explicit instructions during the dot-probe task (e.g., "do not look at threatening faces"). In this paradigm, the number of fixations on the threatening face indexes failures to voluntarily control attention. Finally, the processes underlying AB can be further revealed through the identification of neural underpinnings of the biases using neuroimaging or neuromodulation techniques.

After evidencing socio-affective biases in SAUD, another critical step would be to investigate their interpersonal and clinical impact, notably by manipulating AB. Indeed, using the eye tracker, attention can be trained away from negative stimuli (or towards positive ones) through gaze-contingent operant conditioning (positive/negative feedback is provided when participants look at positive/negative stimuli; e.g., Sanchez, Everaert, & Koster, 2016; Sanchez-Lopez, Everaert, Van Put, De Raedt, & Koster, 2019 but see Heeren, Mogoaşe, McNally, Schmitz, & Philippot, 2015; Heeren, Mogoaşe, Philippot, & McNally, 2015 for criticisms vis-à-vis attentional bias modification procedures for social material). We previously mentioned that biases toward social threat might play a causal role in exacerbating the negative consequences of social exclusion in SAUD. This can be tested by manipulating AB in

patients before inducing social exclusion (see Reinhard et al., 2019 for a review of social exclusion studies in psychiatry) and measuring the resulting affective state. Note that this protocol can be flexibly adapted to test the causal role of AB in the interpretation of ambiguous social stimuli (Sanchez, Romero, Maurage, & De Raedt, 2017) or avoidance behaviors of social situations (Rougier et al., 2019). We also predicted that patients with SAUD would not display typical biases towards positive social cues following exclusion, leading to the impaired regulation of the associated negative feelings. Contrasting the performance of patients and controls using a dot-probe task (containing both positive and threatening social stimuli) following social exclusion, and monitoring their negative affects directly after exclusion and after the dot-probe task, would allow stating on the validity of our prediction. Importantly, if our hypotheses regarding the social and clinical impact of the biases in SAUD are supported by their experimental manipulation described above, their reduction through such manipulation should lead to positive clinical outcomes. Therefore, if experimental protocols prove successful in modifying the biases, they could constitute a worthy intervention technique for practitioners. Raising awareness on the existence and impact of the bias may also help people with SAUD to develop their ability to regulate and counteract negative affects and behavioral consequences (e.g., favoring reappraisal and approach of social situations rather than avoidance; Bernstein & Zvielli, 2014; Zvielli, Amir, Goldstein, & Bernstein, 2016).

5. Conclusion

We argued that studying socio-affective biases in SAUD constitutes an innovative and promising research avenue holding critical implications. At the fundamental level, it will enrich the growing body of literature reporting socio-affective abnormalities in SAUD, and provide novel mechanistic insights vis-à-vis the interpersonal difficulties characterizing this population. At the clinical level, the description of cognitive biases toward social threat in SAUD can lead to targeted interventions complementing current treatments, particularly attentional bias modification procedures that have proven to be useful in social anxiety (Lazarov, Pine, & Bar-Haim, 2017) and are transposable to SAUD.

Role of the funding source

Alexandre Heeren and Pierre Maurage (Senior Research Associates) are funded by the Belgian Fund for Scientific Research (F.R.S.-FNRS, Brussels, Belgium). This funding source did not exert any influence or censorship on the present work.

Declaration of interest

None.

CRediT authorship contribution statement

Arthur Pabst: Conceptualization, Writing - original draft, Writing - review & editing, Project administration. **Alexandre Heeren:** Conceptualization, Writing - review & editing, Supervision, Project administration. **Pierre Maurage:** Conceptualization, Writing - review & editing, Supervision, Project administration, Funding acquisition.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.addbeh.2020.106382.

References

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders DSM-5* (5th ed.). American Psychiatric Publishing.

Armstrong, T., & Olatunji, B. O. (2012). Eye tracking of attention in the affective disorders: A meta-analytic review and synthesis. *Clinical Psychology Review, 32*(8), 704–723. https://doi.org/10.1016/j.cpr.2012.09.004.

Bantin, T., Stevens, S., Gerlach, A. L., & Hermann, C. (2016). What does the facial dot-probe task tell us about attentional processes in social anxiety? A systematic review. *Journal of Behavior Therapy and Experimental Psychiatry, 50*, 40–51. https://doi.org/10.1016/j.jbtep.2015.04.009.

Bernstein, A., & Zvielli, A. (2014). Attention Feedback Awareness and Control Training (A-FACT): Experimental test of a novel intervention paradigm targeting attentional bias. *Behaviour Research and Therapy, 55*, 18–26. https://doi.org/10.1016/j.brat.2014.01.003.

Blaut, A., Paulewicz, B., Szastok, M., Prochwicz, K., & Koster, E. (2013). Are attentional bias and memory bias for negative words causally related? *Journal of Behavior Therapy and Experimental Psychiatry, 44*(3), 293–299. https://doi.org/10.1016/j.jbtep.2013.01.002.

Bora, E., & Zorlu, N. (2017). Social cognition in alcohol use disorder: A meta-analysis. *Addiction, 112*(1), 40–48. https://doi.org/10.1111/add.13486.

Bowler, J. O., Hoppitt, L., Illingworth, J., Dalgleish, T., Ononaiye, M., Perez-Olivas, G., & Mackintosh, B. (2017). Asymmetrical transfer effects of cognitive bias modification: Modifying attention to threat influences interpretation of emotional ambiguity, but not vice versa. *Journal of Behavior Therapy and Experimental Psychiatry, 54*, 239–246. https://doi.org/10.1016/j.jbtep.2016.08.011.

Bühler, M., & Mann, K. (2011). Alcohol and the human brain: A systematic review of different neuroimaging methods. *Alcoholism: Clinical and Experimental Research, 35*(10), 1771–1793. https://doi.org/10.1111/j.1530-0277.2011.01540.x.

Castellano, F., Bartoli, F., Crocamo, C., Gamba, G., Tremolada, M., Santambrogio, J., ... Carrà, G. (2015). Facial emotion recognition in alcohol and substance use disorders: A meta-analysis. *Neuroscience and Biobehavioral Reviews, 59*, 147–154. https://doi.org/10.1016/j.neubiorev.2015.11.001.

Chapman, H. A., Kim, D. A., Susskind, J. M., & Anderson, A. K. (2009). In bad taste: Evidence for the oral origins of moral disgust. *Science, 323*(5918), 1222–1226. https://doi.org/10.1126/science.1165565.

Christiansen, P., Mansfield, R., Duckworth, J., Field, M., & Jones, A. (2015). Internal reliability of the alcohol-related visual probe task is increased by utilising personalised stimuli and eye-tracking. *Drug and Alcohol Dependence, 155*, 170–174. https://doi.org/10.1016/j.drugalcdep.2015.07.672.

Dewall, C. N., Maner, J. K., & Rouby, D. A. (2009). Social exclusion and early-stage interpersonal perception: Selective attention to signs of acceptance. *Journal of Personality and Social Psychology, 96*(4), 729–741. https://doi.org/10.1037/a0014634.

Donadon, M. F., & Osório, F. de L. (2014). Recognition of facial expressions by alcoholic patients: A systematic literature review. *Neuropsychiatric Disease and Treatment, 10*, 1655–1663. https://doi.org/10.2147/NDT.S65376.

Everaert, J., Duyck, W., & Koster, E. H. W. (2014). Attention, interpretation, and memory biases in subclinical depression: A proof-of-principle test of the combined cognitive biases hypothesis. *Emotion (Washington, D.C.), 14*(2), 331–340. https://doi.org/10.1037/a0035250.

Fairbairn, C. E., & Sayette, M. A. (2014). A social-attributional analysis of alcohol response. *Psychological Bulletin, 140*(5), 1361–1382. https://doi.org/10.1037/a0037563.

Field, M., & Cox, W. M. (2008). Attentional bias in addictive behaviors: A review of its development, causes, and consequences. *Drug and Alcohol Dependence, 97*(1–2), 1–20. https://doi.org/10.1016/j.drugalcdep.2008.03.030.

Foisy, M.-L., Kornreich, C., Petiau, C., Parez, A., Hanak, C., Verbanck, P., ... Philippot, P. (2007). Impaired emotional facial expression recognition in alcoholics: Are these deficits specific to emotional cues? *Psychiatry Research, 150*(1), 33–41. https://doi.org/10.1016/j.psychres.2005.12.008.

Fontesse, S., Demoulin, S., Stinglhamber, F., & Maurage, P. (2019). Dehumanization of psychiatric patients: Experimental and clinical implications in severe alcohol-use disorders. *Addictive Behaviors, 89*, 216–223. https://doi.org/10.1016/j.addbeh.2018.08.041.

Freeman, C. R., Wiers, C. E., Sloan, M. E., Zehra, A., Ramirez, V., Wang, G.-J., & Volkow, N. D. (2018). Emotion recognition biases in alcohol use disorder. *Alcoholism, Clinical and Experimental Research.*. https://doi.org/10.1111/acer.13802.

Frigerio, E., Burt, D. M., Montagne, B., Murray, L. K., & Perrett, D. I. (2002). Facial affect perception in alcoholics. *Psychiatry Research, 113*(1–2), 161–171.

García-Blanco, A., López-Soler, C., Vento, M., García-Blanco, M. C., Gago, B., & Perea, M. (2017). Communication deficits and avoidance of angry faces in children with autism spectrum disorder. *Research in Developmental Disabilities, 62*, 218–226. https://doi.org/10.1016/j.ridd.2017.02.002.

Gerber, J., & Wheeler, L. (2009). On being rejected: A meta-analysis of experimental research on rejection. *Perspectives on Psychological Science: A Journal of the Association for Psychological Science, 4*(5), 468–488. https://doi.org/10.1111/j.1745-6924.2009.01158.x.

Hall, C. W. (2006). Self-reported aggression and the perception of anger in facial expression photos. *The Journal of Psychology, 140*(3), 255–267. https://doi.org/10.3200/JRLP.140.3.255-267.

Haller, S. P. W., Doherty, B. R., Duta, M., Kadosh, K. C., Lau, J. Y. F., & Scerif, G. (2017). Attention allocation and social worries predict interpretations of peer-related social cues in adolescents. *Developmental Cognitive Neuroscience, 25*, 105–112. https://doi.org/10.1016/j.dcn.2017.03.004.

Heeren, A., Peschard, V., & Philippot, P. (2012). The causal role of attentional bias for threat cues in social anxiety: A test on a cyber-ostracism task. *Cognitive Therapy and Research, 36*(5), 512–521. https://doi.org/10.1007/s10608-011-9394-7.

Heeren, A., Mogoaşe, C., McNally, R. J., Schmitz, A., & Philippot, P. (2015). Does

attention bias modification improve attentional control? A double-blind randomized experiment with individuals with social anxiety disorder. *Journal of Anxiety Disorders, 29*, 35–42. https://doi.org/10.1016/j.janxdis.2014.10.007.
Heeren, A., Mogoașe, C., Philippot, P., & McNally, R. J. (2015). Attention bias modification for social anxiety: A systematic review and meta-analysis. *Clinical Psychology Review, 40*, 76–90. https://doi.org/10.1016/j.cpr.2015.06.001.
Heilig, M., Epstein, D. H., Nader, M. A., & Shaham, Y. (2016). Time to connect: Bringing social context into addiction neuroscience. *Nature Reviews. Neuroscience, 17*(9), 592–599. https://doi.org/10.1038/nrn.2016.67.
Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: A meta-analytic review. *Perspectives on Psychological Science: A Journal of the Association for Psychological Science, 10*(2), 227–237. https://doi.org/10.1177/1745691614568352.
Hommer, R. E., Meyer, A., Stoddard, J., Connolly, M. E., Mogg, K., Bradley, B. P., ... Brotman, M. A. (2014). Attention bias to threat faces in severe mood dysregulation. *Depression and Anxiety, 31*(7), 559–565. https://doi.org/10.1002/da.22145.
Kawamoto, T., Ura, M., & Nittono, H. (2015). Intrapersonal and interpersonal processes of social exclusion. *Frontiers in Neuroscience, 9*, 62. https://doi.org/10.3389/fnins.2015.00062.
Kornreich, C., Blairy, S., Philippot, P., Dan, B., Foisy, M., Hess, U., ... Verbanck, P. (2001). Impaired emotional facial expression recognition in alcoholism compared with obsessive-compulsive disorder and normal controls. *Psychiatry Research, 102*(3), 235–248.
Kornreich, C., Blairy, S., Philippot, P., Hess, U., Noël, X., Streel, E., ... Verbanck, P. (2001). Deficits in recognition of emotional facial expression are still present in alcoholics after mid- to long-term abstinence. *Journal of Studies on Alcohol, 62*(4), 533–542.
Kornreich, Charles, Brevers, D., Canivet, D., Ermer, E., Naranjo, C., Constant, E., ... Noël, X. (2013). Impaired processing of emotion in music, faces and voices supports a generalized emotional decoding deficit in alcoholism. *Addiction, 108*(1), 80–88. https://doi.org/10.1111/j.1360-0443.2012.03995.x.
Kornreich, Charles, Philippot, P., Foisy, M.-L., Blairy, S., Raynaud, E., Dan, B., ... Verbanck, P. (2002). Impaired emotional facial expression recognition is associated with interpersonal problems in alcoholism. *Alcohol and Alcoholism (Oxford, Oxfordshire), 37*(4), 394–400. https://doi.org/10.1093/alcalc/37.4.394.
Lazarov, A., Pine, D. S., & Bar-Haim, Y. (2017). Gaze-contingent music reward therapy for social anxiety disorder: A randomized controlled trial. *The American Journal of Psychiatry, 174*(7), 649–656. https://doi.org/10.1176/appi.ajp.2016.16080894.
Le Berre, A.-P. (2019). Emotional processing and social cognition in alcohol use disorder. *Neuropsychology, 33*(6), 808–821. https://doi.org/10.1037/neu0000572.
Le Berre, A.-P., Fama, R., & Sullivan, E. V. (2017). Executive functions, memory, and social cognitive deficits and recovery in chronic alcoholism: A critical review to inform future research. *Alcoholism, Clinical and Experimental Research, 41*(8), 1432–1443. https://doi.org/10.1111/acer.13431.
Leyman, L., Raedt, R. D., Schacht, R., & Koster, E. H. W. (2007). Attentional biases for angry faces in unipolar depression. *Psychological Medicine, 37*(3), 393–402. https://doi.org/10.1017/S003329170600910X.
Luijten, M., Veltman, D. J., van den Brink, W., Hester, R., Field, M., Smits, M., & Franken, I. H. A. (2011). Neurobiological substrate of smoking-related attentional bias. *NeuroImage, 54*(3), 2374–2381. https://doi.org/10.1016/j.neuroimage.2010.09.064.
MacLeod, C., Mathews, A., & Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology, 95*(1), 15–20.
Marlatt, G. A. (1996). Taxonomy of high-risk situations for alcohol relapse: Evolution and development of a cognitive-behavioral model. *Addiction (Abingdon, England), 91*(Suppl), S37–S49.
Matthews, T., Danese, A., Wertz, J., Odgers, C. L., Ambler, A., Moffitt, T. E., & Arseneault, L. (2016). Social isolation, loneliness and depression in young adulthood: A behavioural genetic analysis. *Social Psychiatry and Psychiatric Epidemiology, 51*, 339–348. https://doi.org/10.1007/s00127-016-1178-7.
Mau, M., Muller, A. E., & Roessler, K. K. (2019). Alcohol relapse and near-relapse experiences show that relapse models need to be updated. *Alcoholism Treatment Quarterly, 37*(3), 285–301. https://doi.org/10.1080/07347324.2018.1532775.
Maurage, P., Campanella, S., Philippot, P., Charest, I., Martin, S., & de Timary, P. (2009). Impaired emotional facial expression decoding in alcoholism is also present for emotional prosody and body postures. *Alcohol and Alcoholism (Oxford, Oxfordshire), 44*(5), 476–485. https://doi.org/10.1093/alcalc/agp037.
Maurage, P., Joassin, F., Philippot, P., Heeren, A., Vermeulen, N., Mahau, P., ... de Timary, P. (2012). Disrupted regulation of social exclusion in alcohol-dependence: An fMRI Study. *Neuropsychopharmacology, 37*(9), 2067. https://doi.org/10.1038/npp.2012.54.
Maurage, P., Masson, N., Bollen, Z., & D'Hondt, F. (2020). Eye tracking correlates of acute alcohol consumption: A systematic and critical review. *Neuroscience & Biobehavioral Reviews, 108*, 400–422. https://doi.org/10.1016/j.neubiorev.2019.10.001.
Maurage, P., Rolland, B., & D'Hondt, F. (2019). Socio-Emotional Deficits in Severe Alcohol Use Disorders. In V. R. Preedy (Ed.). *Neuroscience of Alcohol* (pp. 373–381). Academic Press. https://doi.org/10.1016/B978-0-12-813125-1.00039-8.
McNally, R. J. (2019). Attentional bias for threat: Crisis or opportunity? *Clinical Psychology Review, 69*, 4–13. https://doi.org/10.1016/j.cpr.2018.05.005.
Miller, N. V., & Johnston, C. (2019). Social threat attentional bias in childhood: Relations to aggression and hostile intent attributions. *Aggressive Behavior, 45*(3), 245–254. https://doi.org/10.1002/ab.21813.
Mogg, K., Millar, N., & Bradley, B. P. (2000). Biases in eye movements to threatening facial expressions in generalised anxiety disorder and depressive disorder. *Journal of Abnormal Psychology, 109*, 695–704.
Park, M.-S., Kim, S.-H., Sohn, S., Kim, G.-J., Kim, Y.-K., & Sohn, J.-H. (2015). Brain activation during processing of angry facial expressions in patients with alcohol dependency. *Journal of Physiological Anthropology, 34*(1), 6. https://doi.org/10.1186/s40101-015-0046-6.
Penton-Voak, I. S., Thomas, J., Gage, S. H., McMurran, M., McDonald, S., & Munafò, M. R. (2013). Increasing recognition of happiness in ambiguous facial expressions reduces anger and aggressive behavior. *Psychological Science, 24*(5), 688–697. https://doi.org/10.1177/0956797612459657.
Pescosolido, B. A., Martin, J. K., Long, J. S., Medina, T. R., Phelan, J. C., & Link, B. G. (2010). "A disease like any other"? A decade of change in public reactions to schizophrenia, depression, and alcohol dependence. *The American Journal of Psychiatry, 167*(11), 1321–1330. https://doi.org/10.1176/appi.ajp.2010.09121743.
Philippot, P., Kornreich, C., Blairy, S., Baert, I., Den Dulk, A., Le Bon, O., ... Verbanck, P. (1999). Alcoholics' deficits in the decoding of emotional facial expression. *Alcoholism, Clinical and Experimental Research, 23*(6), 1031–1038.
Reinhard, M. A., Dewald-Kaufmann, J., Wüstenberg, T., Musil, R., Barton, B. B., Jobst, A., & Padberg, F. (2019). The vicious circle of social exclusion and psychopathology: A systematic review of experimental ostracism research in psychiatric disorders. *European Archives of Psychiatry and Clinical Neuroscience*. https://doi.org/10.1007/s00406-019-01074-1.
Rougier, M., Muller, D., Courset, R., Smeding, A., Devos, T., & Batailler, C. (2019). Toward the use of approach/avoidance tendencies as attitude measures: individual- and group-level variability of the ingroup bias. *European Journal of Social Psychology*. https://doi.org/10.1002/ejsp.2653 in press.
Rupp, C. I., Derntl, B., Osthaus, F., Kemmler, G., & Fleischhacker, W. W. (2017). Impact of social cognition on alcohol dependence treatment outcome: Poorer facial emotion recognition predicts relapse/dropout. *Alcoholism: Clinical and Experimental Research, 41*(12), 2197–2206. https://doi.org/10.1111/acer.13522.
Sanchez, A., Everaert, J., & Koster, E. H. W. (2016). Attention training through gaze-contingent feedback: Effects on reappraisal and negative emotions. *Emotion (Washington, D.C.), 16*(7), 1074–1085. https://doi.org/10.1037/emo0000198.
Sanchez, A., Romero, N., Maurage, P., & De Raedt, R. (2017). Identification of emotions in mixed disgusted-happy faces as a function of depressive symptom severity. *Journal of Behavior Therapy and Experimental Psychiatry, 57*, 96–102. https://doi.org/10.1016/j.jbtep.2017.05.002.
Sanchez-Lopez, A., Everaert, J., Van Put, J., De Raedt, R., & Koster, E. H. W. (2019). Eye-gaze contingent attention training (ECAT): Examining the causal role of attention regulation in reappraisal and rumination. *Biological Psychology, 142*, 116–125. https://doi.org/10.1016/j.biopsycho.2019.01.017.
Schofield, C. A., Johnson, A. L., Inhoff, A. W., & Coles, M. E. (2012). Social anxiety and difficulty disengaging threat: Evidence from eye-tracking. *Cognition & Emotion, 26*(2), 300–311. https://doi.org/10.1080/02699931.2011.602050.
Schomerus, G., Lucht, M., Holzinger, A., Matschinger, H., Carta, M. G., & Angermeyer, M. C. (2011). The stigma of alcohol dependence compared with other mental disorders: A review of population studies. *Alcohol and Alcoholism (Oxford, Oxfordshire), 46*(2), 105–112. https://doi.org/10.1093/alcalc/agq089.
Seip, E. C., Van Dijk, W. W., & Rotteveel, M. (2014). Anger motivates costly punishment of unfair behavior. *Motivation and Emotion, 38*(4), 578–588. https://doi.org/10.1007/s11031-014-9395-4.
Sliedrecht, W., de Waart, R., Witkiewitz, K., & Roozen, H. G. (2019). Alcohol use disorder relapse factors: A systematic review. *Psychiatry Research, 278*, 97–115. https://doi.org/10.1016/j.psychres.2019.05.038.
Stavro, K., Pelletier, J., & Potvin, S. (2013). Widespread and sustained cognitive deficits in alcoholism: A meta-analysis. *Addiction Biology, 18*(2), 203–213. https://doi.org/10.1111/j.1369-1600.2011.00418.x.
Tanskanen, J., & Anttila, T. (2016). A prospective study of social isolation, loneliness, and mortality in Finland. *American Journal of Public Health, 106*(11), 2042–2048. https://doi.org/10.2105/AJPH.2016.303431.
Taylor, H. O., Taylor, R. J., Nguyen, A. W., & Chatters, L. (2018). Social isolation, depression, and psychological distress among older adults. *Journal of Aging and Health, 30*(2), 229–246. https://doi.org/10.1177/0898264316673511.
White, L. K., Suway, J. G., Pine, D. S., Bar-Haim, Y., & Fox, N. A. (2011). Cascading effects: The influence of attention bias to threat on the interpretation of ambiguous information. *Behaviour Research and Therapy, 49*(4), 244–251. https://doi.org/10.1016/j.brat.2011.01.004.
Witkiewitz, K., & Marlatt, G. A. (2004). Relapse prevention for alcohol and drug problems: That was zen. *This Is Tao. American Psychologist, 59*(4), 224–235. https://doi.org/10.1037/0003-066X.59.4.224.
Zvielli, A., Amir, I., Goldstein, P., & Bernstein, A. (2016). Targeting biased emotional attention to threat as a dynamic process in time: Attention feedback awareness and control training (A-FACT). *Clinical Psychological Science, 4*(2), 287–298. https://doi.org/10.1177/2167702615588048.
Zywiak, W. H., Westerberg, V. S., Connors, G. J., & Maisto, S. A. (2003). Exploratory findings from the Reasons for Drinking Questionnaire. *Journal of Substance Abuse Treatment, 25*(4), 287–292. https://doi.org/10.1016/s0740-5472(03)00118-1.