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Automatic visual-spatial perspective taking in alcohol-dependence: A study with happy emotional faces

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ABSTRACT

Background: Understanding the world from another's perspective is an important and potentially automatic human process which is crucial for efficient social interactions. However, while deficits have repeatedly been described for various interpersonal abilities in alcohol-dependence (AD), only one previous study has investigated perspective taking in this pathology.
Aim: The current study aimed to explore further how AD affects visual-spatial perspective taking (VSPT) by examining the effect of positive emotional stimuli on VSPT in both an AD and non-AD sample.
Methods: Reaction times (RT) for simple spatial judgments were measured. Participants made these judgments from their perspective, but judgments were either congruent or incongruent with the perspective of another agent. The emotion conveyed by that agent (happy or neutral) was manipulated across trials.
Results: Compared to baseline, both AD and non-AD groups displayed delayed RTs for spatial judgments when these were incongruent with the perspective of a happy agent (the expected VSPT RT cost, indicating automatic VSPT). The AD, but not the non-AD group, further displayed a VSPT RT cost when the agent expressed a neutral emotion.
Conclusion: There was no evidence that AD compromised automatic VSPT. However, as in previous research, AD was associated with differences in the processing of emotional stimuli. Future research should explore which 'real-world' settings are likely to trigger social confusion and misunderstanding.

1. Introduction

Alcohol-dependence (AD) is associated with a wide range of physiological and neurological problems (Bühler and Mann, 2011), having a particular impact on cognitive abilities (Stavro et al., 2013). The neurotoxic effects of alcohol in AD trigger a range of transient and long-term behavioral deficits, leading to cognitive and social issues, which may perpetuate excessive alcohol drinking (Oscar-Berman and Marinkovic, 2003).

AD also has detrimental effects on socio-emotional abilities, particularly during the processing of faces, voices, and words, leading to inaccurate assessments of the intensity of the emotion conveyed (Kornreich et al., 2013). Research has highlighted the problems which AD patients experience with emotional understanding (Bosco et al., 2014), Theory of Mind (Cox et al., 2018; Maurage et al., 2015), humor understanding (Uekermann et al., 2007), irony processing (Amenta et al., 2013) and social misdemeanors (faux pas; Cox et al., 2018; Thoma et al., 2013). While these previous studies have established that socio-emotional processing impairments are a key factor in AD, they have all focused on the conscious and deliberate processing of social information, as they were based on explicit social cognition tasks. However, during real-life interactions, the processing of social signals is most often automatic and unrelated to reflective evaluation. Furthermore, in other disorders different patterns of socio-emotional impairments have been reported depending on whether implicit or explicit tasks are used (e.g., ASD: Frith, 2004). This would suggest an important need for research into implicit socio-emotional processing in AD. Only one study has directly measured the effect of AD on an automatic social cognition task - visual-spatial perspective taking (Cox et al., 2016).

Cox et al. (2016) used an automatic visual-spatial perspective taking (VSPT) measure, previously used with a range of healthy and pathological populations (Zwickel and Müller, 2010; Zwickel et al., 2010;

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Pearson et al., 2013). Participants responded *from their perspective* to the location of a dot-probe that appeared to the left/right or above/below facial stimuli conveying neutral or fearful expressions. The reaction time cost measured the automatic perspective taking displayed when participants had to report a location of the dot that was incongruent with the perspective of the other agent (the face on the screen), i.e., left/right judgments. In previous studies with healthy participants, fearful, but not neutral, faces triggered automatic perspective taking, likely because the additional emotional content increases the salience of the other agents' perspective (Zwickel and Müller, 2010).

Cox et al. (2016) found both adults with AD and non-AD participants showed a visual-spatial perspective taking reaction time cost (VSPT RT cost) to the fearful faces. This suggests that while AD leads to impaired *high-level and explicit* social processing, it is not related to generalized social cognition impairments, given that implicit processing of social stimuli appears preserved. This is a potentially important result at both the theoretical level (by showing a differential rather than ubiquitous impairment) and the clinical level (by identifying implicit processing as a potential lever to rehabilitate social cognition in AD). However, in that initial experiment, AD patients did show socio-emotional processing *differences* to controls: whereas non-AD participants showed a VSPT RT cost to only fearful faces, AD participants showed this cost to *both* neutral and fearful faces, with no significant difference between them.

Two possible hypotheses could explain the difference in responding across AD and non-AD participants: (i) AD participants specifically overestimate the *negative* emotional content of faces, leading to a conflation of neutral and fearful faces, or potentially a carry-over effect of negative emotional content from the fearful faces to the neutral ones; (ii) in the context of perspective-taking, AD participants display a generalized increased salience for *all* faces, irrespective of emotional content. There is some evidence to support a hyper-responsiveness towards reporting negative emotions of facial stimuli in AD (Foisy et al., 2007a,b; Philippot et al., 1999; Townshend and Duka, 2003: though see Donadon and de Lima Osório, 2014). Given the potential for the Cox et al. (2016) data to have been predominantly triggered by over-estimated negative stimuli, the investigation of whether this effect is also preserved for positive stimuli (i.e., happy faces) is required before strong conclusions can be made about the nature of implicit social processing in AD.

The present study, therefore, uses the same methodology as Cox et al. (2016) to measure automatic VSPT in AD and non-AD participants, but with happy instead of fearful faces. With regard to AD and the processing of happiness, studies of labeling and intensity ratings (Clark et al., 2007; Kornreich et al., 2013; Maurage et al., 2009; Philippot et al., 1999) typically show preservation of explicit happiness processing. To date, no known research has investigated the effect of happy faces on automatic VSPT in either clinical or non-clinical populations. Although happy faces do not engender the same social value as fearful ones in relation to potential cues for threat and harm, they nonetheless constitute highly relevant information for adapted social interactions.

In sum this study investigates whether happy faces trigger spontaneous VSPT in both AD and non-AD groups, to clarify whether (1) automatic perspective taking to neutral stimuli in AD is related to a specific tendency to overestimate negative stimuli, and (2) the preservation of implicit social processing (automatic perspective taking) in AD to fearful faces generalizes to positive stimuli. We predicted that happy faces would elicit automatic perspective taking in much the same way that fearful faces do in non-AD populations. Additionally, based on the findings from Cox et al. (2016), we predicted that AD participants would also engage in automatic perspective taking to happy faces.

2. Method

2.1. Participants

All participants volunteered to take part. The study was approved by London Metropolitan University (where the work was carried out) committee and conducted in accordance with the ethical standards of the 1964 Declaration of Helsinki. The same 22 non-AD and 22 AD participants who took part in the earlier version of this study (see Cox et al., 2016, for full details) were recruited a few weeks later. The groups did not differ significantly in age (AD mean = 43 ± 12 years; non- AD mean = 42 ± 9 years, $t(42) = 0.18$, $p > 0.05$) or gender (both groups consisted of 11 men and 11 women). All participants were of British origin.

AD participants were all assessed according to the Diagnostic and Statistics Manual—IV-R (American Psychiatric Association, 2000) criteria for alcohol dependence by their keyworker at the time of entering treatment. The treatment service center participating in this study has an 'alcohol-free at the time of treatment' policy, and therefore all AD participants were alcohol-free at the time of testing, as assessed by their key-worker using a breathalyzer test. The groups differed on the Fast Alcohol Screening Test (FAST), a simple four-question audit to detect problem drinking (Hodgson et al., 2002): AD, M = 9.87, (SD = 4.01); non-AD, M = 1.02, (SD = 2.10). This difference was significant, $t(42) = 6.67$, $p < 0.001$. The mean number of alcohol units taken per day prior to treatment within the AD group was 14.21 (SD = 4.23) and the mean number of years of problematic drinking was 16.10 (SD = 8.74). The average number of attempts at detoxification was 1.50 (SD = 0.50).

None of the participants reported poly-drug use, psychiatric or neurological disease, as measured at the time of entering treatment by psychiatric assessment and past medical records. No AD participants were in withdrawal at the time of taking part, or currently on any medication relevant to aiding withdrawal symptoms (reporting 4+ weeks abstinence).

Daily and current smoking was more common in the group with AD $N = 7$, compared to the non-AD group $N = 4$. The Trait Anxiety Inventory for adults (STAI) was administered to control for the effects of anxiety (Spielberger et al., 1983). Anxiety scores were higher in the AD group, M = 41.23, (SD = 8.37) as compared to the non-AD group, M = 36.91, (SD = 11.28), but this difference was not significant $t(42) = -1.44$, $p > 0.05$. AD and non-AD groups also differed in their scores for depression (Beck Depression Inventory; BDI; Beck and Steer, 1990). BDI scores were higher for participants with AD, M = 12.34 (SD = 8.12) than for the control group, M = 9.87 (SD = 6.54) and this difference was significant $t(42) = -2.56$, $p < 0.001$. Although the participants with AD presented higher and a greater range of depression scores, neither groups' average scores reached what is considered to be the clinical level of depression.

2.2. Apparatus and stimuli

Stimuli were presented on a Toshiba laptop with a 21″ computer screen (85-Hz refresh rate) positioned 50 cm in front of the participants. Twelve male and 12 female grey-scaled faces with hair removed and presented within a rectangle were presented. The remainder of the screen was white. Twelve of the faces conveyed a happy expression (Fig. 1) and 12 a neutral expression. A black rectangle which was the same in size as the facial stimuli acted as a baseline stimulus.

2.3. Design and procedure

Half of participants completed the FAST, BDI and STAI before the trials and half after. Smokers were not asked to abstain before testing periods to maintain relative ecological validity and because nicotine withdrawal may negatively impact on testing (mood, irritability), as

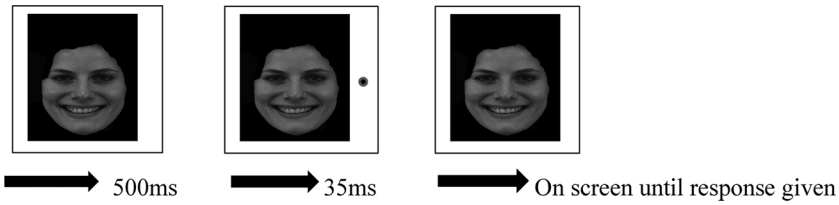

Fig. 1. Schematic of the Experiment.

well as being a disincentive for some participants taking part. Participants were instructed to complete a set of 10 practice trials before starting the recorded experiment. Test trials were pre-randomized into blocks of 12, consisting of faces incongruent; faces congruent; baseline (rectangles) incongruent; baseline congruent. Within each block of 12 – with the exception of the baseline trials – 6 faces conveyed happy and 6 neutral expressions. Instructions were given before each block of trials to remind participants to respond to the location of the dot. There was a total of 144 trials. Trials started with presentation of the stimuli and was followed 500 ms later by a dot-probe, 5∘ in diameter, that appeared for 35 ms. The dot then disappeared leaving the face on screen until a response was given (see Fig. 1). Reaction time was recorded from the onset of the dot-probe. For the incongruent trials the dot appeared 1∘ to the left or right of the face/rectangle, and for the congruent trials 1∘ above or below the face/rectangle. During the baseline trials the dot also appeared for the same duration and in the same locations but the stimulus was a black rectangle. Participants were asked to respond as quickly and as accurately as possible, pressing 's' to indicate left, and 'k' for dots on the right, 't' for those at the top, and 'b' for the bottom.

3. Results

3.1. Analysis of the test conditions

Analysis of covariance and correlation analysis showed that neither smoking, anxiety or depression had a significant effect on the RT for either group across conditions. Raw RT data is presented in Fig. 2. ANOVA main effects confirmed earlier findings: ADs responded slower than non-ADs $F(142) = 31.07$, $p < .001$, $R^2 = .42$; responses to incongruent trials were slower than congruent ones $F(142) = 6.20$, $p = .017$, $R^2 = .129$; and responses to faces were slower compared to baseline conditions $F(284) = 67.75$, $p < .001$, $R^2 = .617$.

Perspective taking was measured by calculating a difference score between the congruent and incongruent conditions, Fig. 3. Difference scores were analyzed in a 2-way mixed ANOVA with stimulus type as the within-participants factors and group as the between-participant factor. There was a main effect for stimulus type, $F(284) = 51.43$, $p < .001$, $R^2 = .550$, and for the group, $F(242) = 17.37$, $p < .001$, $R^2 = .293$. There was also a significant interaction between stimulus and group, $F(284) = 6.21$, $p = .005$, $R^2 = .129$. In the non-AD group, there was a significant perspective effect for happy faces $t(21) = 5.92$, $p < .001$ (CI 149.95 - - 75.50) but not with neutral faces. AD participants showed a perspective effect for both happy $t(21) = 7.50$, $p < .001$(CI −308.45 −174.46) and neutral faces $t(21) = 6.11$, $p < .001$ (CI -177.76 - - 87.51). Furthermore, the AD group showed an increased perspective taking effect for happy faces compared to neutral $t(21) = 6.90$, $p < .001$ (CI -133.21 - - 53.78).

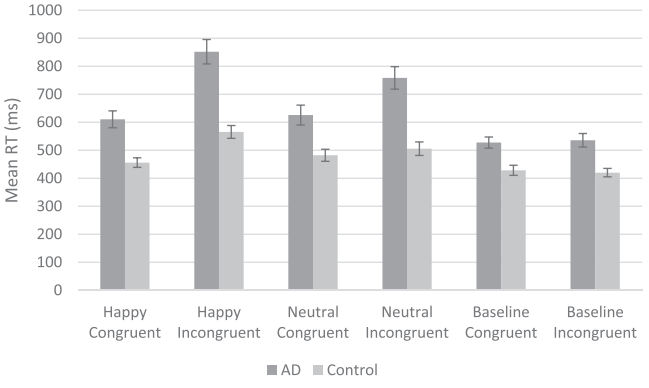

Fig. 2. Mean RTs (ms) to happy, neutral and baseline stimuli by perspective for participants with AD and the control (non-AD) participants.
Bars represent the standard error.

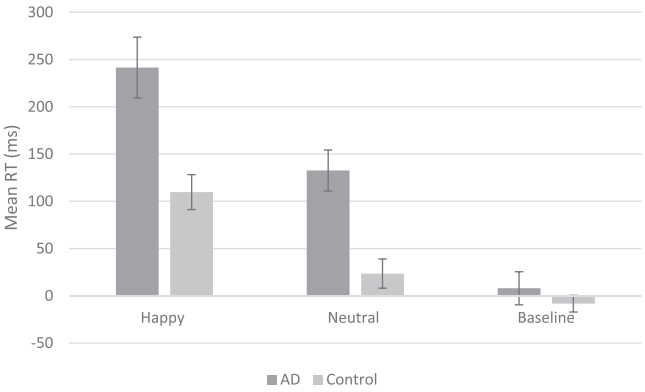

Fig. 3. Mean RTs (ms) as calculated by the difference score for happy, neutral and baseline stimuli for participants with AD and the control (non-AD) participants.
Bars represent the standard error.

Finally, in view of the high variance of RTs within our AD group we further explored whether VSPT was preserved beyond a group effect and thus conducted an adapted single-case versus group analysis (Crawford and Howell, 1998); all AD participants except one individual (who demonstrated an equal RT cost to both happy and neutral faces) demonstrated the same response pattern.

4. Discussion

A primary aim of this study was to investigate whether preservation of implicit social processing observed in our earlier work with fearful faces (Cox et al., 2016) extends to positive stimuli (happy faces). This was demonstrated: participants showed a VSPT RT cost to happy faces when reporting a spatial location *from their perspective* that was incongruent to that from the perspective of another agent. Hence, our results show that observing happy faces elicit spontaneous VSPT in both AD and non-AD observers.

Interestingly, there was an important point of difference with our earlier study. In our earlier study, non-AD participants showed a VSPT RT cost to fearful faces only, not to neutral faces. The AD group showed VSPT RT costs to both fearful and neutral faces, with the cost being similar to both. In the current study, the non-AD group showed a VSPT cost to happy faces, but not to neutral faces. The AD group showed a VSPT RT cost to both happy and neutral faces, although there was an *additional* cost to happy compared to neutral faces. In other words, there was a similar pattern of responding to positive stimuli across the non-AD and AD groups. This is broadly consistent with previous research using emotional faces, voices and music, showing that when presented with positive stimuli, patients with AD show relatively

similar responses to controls (Cox et al., 2018; Maurage et al., 2009; Kornreich et al., 2013). Further research is needed to understand the differential deficit for negative but preserved positive emotion processing.

There are several limitations to this study. While our previous work (Cox et al., 2016) and the current study provide a snapshot of behavior, due to restrictions on client data from the treatment service center, the complexity of the participants current mental and physical health lacks detail. Future studies should include more detail of the clinical background of the participants in order to set the current findings against a wider clinical picture. Furthermore, Kornreich et al. (2002) have shown that emotional facial expression deficits correlate negatively with interpersonal issues, thus future studies replicating these findings should seek to clarify the association between perceived interpersonal difficulties and perspective taking, and more globally the real-life impact of the deficits observed here on patients' social life and interpersonal relations.

In summary, across both of our studies, we find no evidence to suggest that AD participants are impaired in automatic VSPT. The relevance of the results together is that while AD may have a deleterious impact on explicit emotional processing they do not support the view that AD causes a blanket or generalized social processing deficit. Whatever the explanation for the difference between implicit and explicit emotion processing, our findings suggest that a large number of documented deficits in explicit social cognition do not extend to certain implicit tasks. Further research is needed to identify intact implicit socio-emotional processes, given their potential in therapeutic settings to rehabilitate social cognition in AD.

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Contributors

SC led the design of the experiment, data collection and analysis and the writing of the paper. PM consulted on the interpretation of the results and contributed to the writing of the paper. ROC contributed to the writing of the manuscript. CC was involved in the design of the study and in the writing of the paper. KR contributed to the experimental design, data analysis and writing of all drafts. All authors have read the manuscript and approve of its submission to Drug and Alcohol Dependence.

Conflicts of interest

No conflict declared.

References

Amenta, S., Noël, X., Verbanck, P., Campanella, S., 2013. Decoding of emotional components in complex communicative situations (irony) and its relation to empathic abilities in male chronic alcoholics: an issue for treatment. Alcohol. Clin. Exp. Res. 37, 339–347. http://dx.doi.org/10.1111/j.1530-0277.2012.01909.x.

American Psychiatric Association, 2000. DSM-IV-TR, diagnostic and statistical manual of mental disorders. Text Revision, 4th edition. APA, Washington, DC.

Beck, Aaron T., Steer, Robert A., 1990. Manual for the Beck Anxiety Inventory. Psychological Corporation, San Antonio, TX.

Bosco, F.M., Capozzi, F., Colle, L., Marostica, P., Tirassa, M., 2014. Theory of mind deficit in subjects with alcohol use disorder: an analysis of mindreading processes. Alcohol Alcohol. 49, 299–307. http://dx.doi.org/10.1093/alcalc/agt148.

Bühler, M., Mann, K., 2011. Alcohol and the human brain: a systematic review of different neuroimaging methods. Alcohol. Clin. Exp. Res. 35, 1771–1793.

Clark, U.S., Oscar-Berman, M., Shagrin, B., Pencina, M., 2007. Alcoholism and judgments of affective stimuli. Neuropsychology 21, 346–362.

Cox, S., Bertoux, M., Turner, J.J., Moss, A., Locker, K., Riggs, K., 2018. Aspects of alcohol use disorder affecting social cognition as assessed using the Mini Social and Emotional Assessment (mini-SEA). Drug Alcohol Depend. 187, 165–170.

Cox, S., Chandler, C., Simpson, A., Riggs, K., 2016. The effect of alcohol dependence on automatic visuo-spatial perspective taking. Drug Alcohol. Depend. 166, 21–25.

Crawford, J.R., Howell, D.C., 1998. Comparing an individual's test score against norms derived from small samples. Clin. Neuropsychol. 12, 482–486.

Donadon, M.F., de Lima Osório, F., 2014. Recognition of facial expressions by alcoholic patients: a systematic literature review. Neuropsychiatr. Dis. Treat. 10, 1655–1663.

Foisy, M.L., Kornreich, C., Petiau, C., Parez, A., Hanak, C., Verbanck, P., Pelc, I., Philippot, P., 2007a. Impaired emotional facial expression recognition in alcoholics: are these deficits specific to emotional cues? Psychiatry Res. 150, 33–41.

Foisy, M.L., Kornreich, C., Fobe, A., D'hondt, L., Pelc, I., Hanak, C., Verbanck, P., Philippot, P., 2007b. Impaired emotional facial expression recognition in alcohol dependence: Do these deficits persist with midterm abstinence? Alcohol. Clin. Exp. Res. 31, 404–410.

Frith, U., 2004. Emanuel Miller lecture: confusions and controversies about Asperger syndrome. J. Child Psychol. Psychiatry 45, 672–686.

Hodgson, R., Alwyn, T., John, B., Thom, B., Smith, A., 2002. The FAST alcohol screening test. Alcohol Alcohol. 37, 61–66.

Kornreich, C., Philippot, P., Foisy, M.L., Blairy, S., Raynaud, E., Dan, B., Hess, U., Noël, X., Pelc, I., Verbanck, P., 2002. Impaired emotional facial expression recognition is associated with interpersonal problems in alcoholism. Alcohol Alcohol. 37, 394–400.

Kornreich, C., Brevers, D., Canivet, D., Ermer, E., Naranjo, C., Constant, E., Verbanck, P., Campanella, S., Noël, X., 2013. Impaired processing of emotion in music, faces and voices supports a generalized emotional decoding deficit in alcoholism. Addiction 108. http://dx.doi.org/10.1111/j.1360-0443.2012.03995.x.

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 Alcohol. 44 (5), 476–485.

Maurage, F., de Timary, P., Tecco, J.M., Lechantre, S., Samson, D., 2015. Theory of mind difficulties in patients with alcohol dependence: beyond the prefrontal cortex dysfunction hypothesis. Alcohol. Clin. Exp. Res. 39, 980–988. http://dx.doi.org/10.1111/acer.12717.

Oscar-Berman, M., Marinkovic, K., 2003. Alcoholism and the brain: an overview. Alcohol. Res. Health 27, 125–133.

Pearson, A., Ropar, D., de, C., Hamilton, A.F., 2013. A review of visual perspective taking in autism spectrum disorder. Front. Hum. Neurosci. 7, 652. http://dx.doi.org/10.3389/fnhum.2013.00652.

Philippot, P., Kornreich, C., Blairy, S., Baert, I., Den Dulk, a, Le Bon, O., Streel, E., Hess, U., Pelc, I., Verbanck, P., 1999. Alcoholics' deficits in the decoding of emotional facial expression. Alcohol. Clin. Exp. Res. 23, 1031–1038 doi:00000374-199906000-00010 [pii].

Spielberger, C.D., Gorsuch, R.L., Lushene, P.R., Vagg, P.R., Jacobs, A.G., 1983. Manual for the State-Trait Anxiety Inventory (Form Y). Consulting Psychologists Press, Inc, Palto Alto, CA.

Stavro, K., Pelletier, J., Potvin, S., 2013. Widespread and sustained cognitive deficits in alcoholism: a meta-analysis. Addict. Biol. 18, 203–213.

Thoma, P., Winter, N., Juckel, G., Roser, P., 2013. Mental state decoding and mental state reasoning in recently detoxified alcohol-dependent individuals. Psychiatry Res. 205, 232–240.

Townshend, J.M., Duka, T., 2003. Mixed emotions: alcoholics' impairments in the recognition of specific emotional facial expressions. Neuropsychologia 41, 773–782.

Uekermann, J., Channon, S., Winkel, K., Schlebusch, P., Daum, I., 2007. Theory of mind, humor processing and executive functioning in alcoholism. Addiction 102, 232–240. http://dx.doi.org/10.1111/j.1360-0443.2006.01656.x.

Zwickel, J., Müller, H.J., 2010. Observing fearful faces leads to visuo-spatial perspective taking. Cognition 117, 101–105. http://dx.doi.org/10.1016/j.cognition.2010.07.004.

Zwickel, J., White, S.J., Coniston, D., Senju, A., Frith, U., 2010. Exploring the building blocks of social cognition: spontaneous agency perception and visual perspective taking in autism. Soc. Cogn. Affect. Neurosci. 6, 564–571.