Neuropsychiatric Disease and Treatment

Dovepress

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EXPERT OPINION

Below and beyond the recognition of emotional facial expressions in alcohol dependence: from basic perception to social cognition

This article was published in the following Dove Press journal:
Neuropsychiatric Disease and Treatment
18 November 2014
Number of times this article has been viewed

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Abstract: Studies that have carried out experimental evaluation of emotional skills in alcohol-dependence have, up to now, been mainly focused on the exploration of emotional facial expressions (EFE) decoding. In the present paper, we provide some complements to the recent systematic literature review published by Donadon and de Lima Osório on this crucial topic. We also suggest research avenues that must be, in our opinion, considered in the coming years. More precisely, we propose, first, that a battery integrating a set of emotional tasks relating to different processes should be developed to better systemize EFE decoding measures in alcohol-dependence. Second, we propose to go below EFE recognition deficits and to seek for the roots of those alterations, particularly by investigating the putative role played by early visual processing and vision–emotion interactions in the emotional impairment observed in alcohol-dependence. Third, we insist on the need to go beyond EFE recognition deficits by suggesting that they only constitute a part of wider emotional deficits in alcohol-dependence. Importantly, since the efficient decoding of emotions is a crucial ability for the development and maintenance of satisfactory interpersonal relationships, we suggest that disruption of this ability in alcohol-dependent individuals may have adverse consequences for their social integration. One way to achieve this research agenda would be to develop the field of affective and social neuroscience of alcohol-dependence, which could ultimately lead to major advances at both theoretical and therapeutic levels.

Keywords: alcohol-dependence, emotion, social cognition, vision

Introduction

Donadon and de Lima Osório[1] have recently published a systematic literature review on the recognition of emotional facial expressions (EFE) by alcohol-dependent individuals (ADI). Their article offers the first synthesis of the literature concerning this crucial yet underexplored topic, and the authors have to be commended for their work. Indeed, such a review not only provides the state of the art on a research topic but also triggers discussions and arouses comments. We thus propose to extend this review by presenting three complementary arguments, outlining research perspectives currently developed in the blooming field of emotional ability impairment presented by ADI.

First, a methodological argument addresses the importance of identifying the processes involved in the various emotional tasks used by previous studies. This clarification would possibly explain the controversial results obtained in previous explorations of EFE recognition in ADI. Second, a conceptual argument proposes to go below mere EFE recognition, and to clarify the causes and underlying factors

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influencing potential deficits in this ability. Importantly, the possible influence of basic perceptive impairments and the role played by early vision–emotion interactions will be underlined. Finally, a perspective argument presents the notion that, while EFE recognition deficit is of interest, it only constitutes one facet of a larger range of emotional and interpersonal deficits in ADI. This stresses the need to further explore more complex affective and social processes that play a crucial role in the development and maintenance of alcohol-related disorders.

Systemizing EFE decoding measures

Donadon and de Lima Osório[1] emphasize a controversy among earlier studies exploring EFE recognition in ADI, as some experimental findings have indicated a clear deficit while others have failed to identify any difference between ADI and control participants. If this conclusion is accurate in view of the current literature, it also stresses the need to propose hypotheses explaining these discrepancies, as well as a future research agenda to overcome them. We propose that these contrasting results might at least be partly explained by the type and sensitivity of the emotional task used to evaluate EFE recognition. Indeed, ADI might show preserved performance in tasks with low complexity (eg, classifying the intensity of EFE as high or low), as these tasks only require superficial EFE processing, frequently leading to a ceiling effect. Conversely, when complex and high-level emotional processing is required (eg, multiple choice between a large range of emotional labels, emotional intensity manipulation, use of mixed emotions), impairments are systematically described in ADI. This "task emotional complexity" hypothesis is further illustrated by the absence of happiness processing deficit reported in earlier studies in ADI. This has usually been interpreted as a preservation of positive emotions recognition but, in our view, it might rather be the mere consequence of a complexity effect, as happiness is usually the only positive EFE used and thus pops out when presented with different negative ones, facilitating its identification. It has been recently shown[2] that when various positive emotional EFE are used, ADI recognition deficit is generalized to these emotions. As a whole, we agree that earlier results led to equivocal conclusions, and we urge future studies to take task emotional complexity into account and to clearly identify the cognitive processes underlying task performance. Donadon and de Lima Osório[1] suggest a standardization of experimental procedure to test EFE recognition in ADI, but it appears illusory to seek for a unique "ideal EFE recognition task". We rather propose to design a battery of emotional tasks, each exploring a specific level of emotional processing based on a clear characterization of the successive processes involved in EFE recognition. For instance, comparison of labeling (ie, selecting among several emotional labels the one that best fits a particular expression), matching (ie, identifying a previously presented target face among distractors), and detecting (ie, identification of an emotional expression among other sequentially presented expressions, emotional or neutral) abilities would allow the disentanglement of the role played by semantic, memory, and perceptual processes. As studies on EFE decoding in ADI have up to now focused on explicit tasks, it also appears important to use implicit tasks (ie, which do not require a conscious and deliberate emotional processing). Even though it should be acknowledged that there is still no consensus about modules and processes underlying EFE recognition, recent cognitive and behavioral models[3] offer a reliable basis to develop a systematized and theoretically driven exploration of emotional recognition in ADI, which would allow 1) identifying the specific emotional processing stages responsible for EFE recognition impairment and 2) clarifying the current controversies hampering the expansion of this research field. An important point also concerns the selection of control participants, as emotional processing differences exist in normal populations presenting, for instance, variations in subclinical tendencies of depression and anxiety.[4,5] Therefore, even if the normal controls are considered healthy, subclinical thresholds can still modulate the perception of emotions. These findings emphasize the need for accurate "control measures" to eliminate the possible influence of unrelated personality traits, as differences between normal and psychiatric populations may be underestimated or exaggerated because of the existence of these subclinical tendencies in the experimental and control groups.[6]

Below EFE recognition: vision–emotion interactions

An implicit assumption of Donadon and de Lima Osório's[1] review is that the EFE recognition tasks used in earlier studies constitute a direct and specific exploration of emotion decoding abilities, and therefore that the deficit observed in ADI for those tasks unequivocally indexes an emotion processing impairment. However, those studies did not use nonemotional control tasks to determine the specificity of the deficits for emotional processing. In fact, even though an earlier study[7] has suggested that EFE recognition is indeed specially impaired in ADI compared to other complex facial

tasks (eg, sex or age recognition), several data suggest that EFE recognition deficit might not be the direct consequence of emotion processing failure, but rather the consequence of more general and low-level cognitive impairments biasing the initial stimuli processing and thus hampering later emotional processing stages. Centrally, we insist on the role played by early visual processing and vision–emotion interactions in the emotional impairment observed in ADI, as well as on the usefulness of neuroscience techniques to further explore the successive stages leading to efficient EFE recognition.

Most studies mentioned in Donadon and de Lima Osório's literature review used behavioral techniques, and the review only briefly presents the electrophysiological and neuroimaging results without underlining their crucial implications. While offering major insights concerning EFE recognition deficit in ADI, behavioral measures (ie, accuracy and reaction time measures) can only provide information about the final output of emotional tasks and do not offer direct evidence about the preservation or impairment of the successive processing stages involved in emotional recognition. Those underlying processes can nonetheless be assessed by means of neuroscience techniques such as functional magnetic resonance imaging (fMRI) and event-related potentials (ERPs). Donadon and de Lima Osório[1] only mention that findings from these kinds of studies have revealed a deficient activation in "emotional" areas of the brain (such as amygdala as well as cingulate, orbitofrontal, and insular cortex) during EFE recognition, suggesting that neuroscience results have confirmed that the deficit is indeed specifically related to emotional abilities. However, our reading is that neuroscience studies have offered a far more complex contribution to this field and have centrally allowed the identification of the origin of the EFE decoding deficit on the cognitive continuum.

While presenting a low spatial resolution in comparison with fMRI, ERPs have a very high temporal resolution allowing precise exploration of the processes successively involved in a task, and notably the perceptive, attentional, and decisional steps sequentially involved in EFE recognition.[8] ERPs studies have centrally shown that EFE decoding deficits in ADI originates as soon as early visual processes.[9,10] Indeed, during EFE recognition, ADI present impairments for the ERPs components related to early visual processing (P100 component) and visual expertise (N170 component). These results clearly suggest that visual-spatial deficits related to alcohol abuse and dependence, which are among the most severe dysfunctions observed in recently detoxified ADI,[11–13] might play a role in EFE decoding deficits.

This innovative proposal has been developed in a recent perspective article[14] positing that the classical explanation in terms of impaired emotional regions cannot fully account for the emotional deficits in ADI and that three main research avenues, requiring notably the use of neuroscience tools, should be addressed in the following years. First, several studies argue in favor of a visual deficit in ADI that starts from early processing steps.[15–17] This deficit may impact any visual processing, including not only EFE but also any type of emotional visual stimuli. In line with this, an earlier study found deficits in decoding emotional body postures among ADI.[18] Future studies should therefore investigate emotion decoding abilities of ADI for various types of emotionally laden stimuli such as natural scenes, for instance. Second, studies in healthy populations have suggested that magnocellular (MC) pathways play a crucial role in the early emotional evaluation of the stimuli by allowing a coarse but fast analysis of visual inputs. Even though it remains to be tested in ADI, several data suggest that alcohol consumption impairs MC pathways.[19,20] Future studies should test for possible alteration in MC pathways that might be partly responsible for emotional deficits in ADI. Third, the recent affective prediction hypothesis[21] proposes that affective responses modulate the processing from the very moment that visual stimulation begins by means of direct connectivity between early visual and emotion-related brain regions.[21] Specifically, a coarse impression of the visual input image is projected rapidly via fast MC pathways from early visual areas directly to the orbitofrontal cortex (in parallel to the systematic and slower propagation of the information along the ventral visual pathway), leading to an "initial guess" about the stimuli which is then combined with the bottom-up stream of analysis to facilitate recognition.[22] Affective content is thought to constitute an essential part of the early visual predictions conducted by this fast pathway, allowing the prioritization of information relevant to survival and well-being. Orbitofrontal cortex thus constitutes a crucial area for vision–emotion interactions,[21] but its role in the emotional deficits presented by ADI remains to be explored. Experimentally testing the affective prediction hypothesis in ADI (and centrally the role played by the orbitofrontal cortex), on the one hand, would constitute its first exploration in a population suffering from a mental disorder and, on the other hand, would offer a theoretical support for understanding the roots of emotion–vision interactions in alcohol dependence.

To sum up, while few studies have used neuroscience techniques to explore the origin of EFE recognition deficits in ADI, electrophysiological explorations have clearly shown

that this deficit can no more be considered as exclusively related to a pure emotion processing impairment. In particular, they suggest that visuospatial dysfunctions, which are well documented in ADI, could play a critical role and explain a general deficit in emotional visual perception. This role should nonetheless be clarified in the coming years using neuroscience tools, which would help to deepen the exploration of the processing underlying emotion recognition and to further determine what happens below EFE decoding, causing this deficit.

Beyond EFE recognition: affective abilities and social cognition

As underlined in the previous sections, EFE recognition deficit is an important concern in ADI and should be further explored to precisely determine its causes and extent. Still, we suggest that adopting a larger perspective would help in resolving these issues, as EFE decoding is only an aspect of the wide range of affective and social impairments presented by ADI. These latter issues play a central role in alcohol dependence, as >60% of relapses after detoxification can be directly attributed to emotional or interpersonal difficulties.[23]

First, emotional recognition impairments are not limited to facial stimuli, as this deficit has been found for other emotional stimuli. Indeed, it has been repeatedly shown that ADI have similar difficulties to identify the emotional content related to voices[24,25] and body postures,[18] suggesting that the EFE recognition deficit is not indexing a specific deficit for EFE but is rather a part of a more general emotion decoding impairment independent of the stimulus type or sensory modality. This proposal is reinforced by recent data describing a reduced ability to identify the emotion evoked by musical excerpts in ADI.[26] Moreover, this generalized emotional recognition impairment appears stronger in ecological situations, as it has been shown that in cross-modal emotional context (eg, simultaneous appearance of a voice and a face presenting congruent emotional state), ADI have an increased deficit compared to unimodal situations.[27] This suggests an inability to integrate these two stimuli in a coherent percept. As confirmed in neuroscience studies,[28,29] cross-modal integration of emotional stimulations is thus impaired in alcohol dependence.

Second, recent studies have explored complex affective abilities, going beyond the mere EFE recognition capacity. For example, the decoding of complex mental states expressed by human eyes has been explored in ADI, showing a generalized deficit for positive and negative emotional states together with a preserved decoding of nonemotional mental states.[2] This confirmed that the affective deficit extends beyond basic emotional states. Other studies have described, on the basis of questionnaires or experimental tasks, deficits in a wide range of emotional abilities such as empathy,[30,31] alexithymia,[32] or irony detection,[33] leading to the proposal of a wide affective processing deficit in ADI.

Finally, recent and innovative research has directly explored the consequences of these emotional impairments for social interactions. Indeed, a crucial assumption concerning EFE recognition deficit is that it leads to direct deleterious effects on everyday social life. Several studies have suggested that the disruption of EFE decoding in ADI may have adverse consequences for their social integration, as the efficient processing of EFE appears to be a central ability for the development and maintenance of satisfactory interpersonal relationships. Studies have shown that the magnitude of emotional decoding deficits is correlated with the intensity of self-reported interpersonal problems encountered in everyday life[34] and particularly the problems of self-control in social situations.[18] This has led to the hypothesis of a vicious circle:[35] the EFE decoding deficit exacerbates interpersonal problems, which in turn increases alcohol consumption, used as a coping strategy, further impairing EFE decoding. However, none of these correlational evidences has directly explored how ADI effectively perform in social interactions. Recent studies have tried to overcome these limits, notably showing that 1) ADI have dysfunctional self-beliefs in interpersonal context as they overestimate the social standards they have to attain in order to be positively evaluated by others during social interactions.[36] The inability to reach these overestimated social standards could reduce self-esteem and lead ADI to limit their interactions with others, thus reinforcing social isolation; 2) ADI have increased sensitivity to social rejection. An fMRI study based on ostracism induction indeed offered the first exploration of the cerebral correlates related to interpersonal abilities in alcohol dependence.[37] It showed that, compared to control participants, ADI present two brain activity modifications when rejected by others: on the one hand, an exaggerated perception of social rejection (as indexed by increased activation of the insula and anterior cingulate cortex) and, on the other hand, a reduced ability to regulate these rejection feelings and to inhibit the related negative emotions (as indexed by reduced activity in the ventromedial cortex). Further, ADI present a heightened sensitivity to unfairness in social transactions.[38] These preliminary results clearly suggest that interpersonal deficits in ADI constitute a crucial issue and deserve further investigation.

Conclusion

The aim of our paper was to complement the work of Donadon and de Lima Osório[1] by clarifying three key questions related to EFE recognition deficit in ADI: 1) What is the extent of this deficit? Rather than designing a unique and standardized EFE recognition task, we propose to develop a coordinated and exhaustive battery (using various explicit or implicit emotional tasks, each relating to different processes) in order to clarify the differential deficit between emotional subprocesses in ADI; 2) What are the causes of this deficit? Focusing on processes underlying EFE recognition would allow the identification of the basic and low-level processes that could be responsible for the deficit. Particularly, exploring visual impairments and the early interactions between emotion and vision in ADI would shed new light on the cognitive roots of the deficit; 3) What are the consequences of this deficit? Many experimental results now support the proposal that EFE recognition deficit only constitutes a part of larger emotional and interpersonal deficits in ADI. In our view, the development of the field of affective and social neuroscience of alcohol dependence, through integration of data from psychology, neuropsychology, electrophysiology and neuroimaging, could lead to major advances both at theoretical and therapeutic levels. It would be the foundation for an integrative and experimentally based model of affective and social impairments in alcohol dependence.

Acknowledgments

Salvatore Campanella and Pierre Maurage (Research Associates) were funded by the Belgian Fund for Scientific Research (FRS – FNRS, Belgium). Fabien D'Hondt was funded by an FSR incoming post-doc fellowship from the Université Catholique de Louvain, Belgium.

Disclosure

All authors report no conflict of interest in this work.

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