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Visual modulation of pleasure in subjects with physical and social anhedonia

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ABSTRACT

Anhedonia is a personality trait associated with a decrease in the ability to feel pleasure. We investigated the experience of pleasure in individuals with physical and social anhedonia for positive pictures with varying levels of luminance contrast. Photographs with either a sensory or a social content were modified with a contrast-gradation procedure. Participants had to report the intensity of the pleasure they experienced in response to these pictures. Twenty-six subjects with physical anhedonia, 18 with social anhedonia and 34 control subjects completed the task. In controls, high-contrast pictures elicited an intense feeling of pleasure, whereas low contrast pictures elicited little pleasure. Although they were also sensitive to the modulation of contrast, subjects with physical and social anhedonia reported less pleasure than controls, across a larger range of contrast levels for sensory and social pictures, respectively. The findings suggest that the deficit in the experience of positive emotion in anhedonia is associated with a diminished pleasure intensity, fairly selective for the sensory or the social emotion dimension. This study encourages further investigation of the interaction between perceptual encoding and emotional processing in anhedonia.

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1. Introduction

Following Meehl's descriptions of the schizotype as both lacking pleasure from social interaction and having weakened feelings of joy, affection, love, pride, and self-respect (1962), Chapman et al. operationalized these clinical observations by the psychometric measure of physical and social anhedonia (Chapman et al., 1976). The Physical Anhedonia Scale (PAS) and the Social Anhedonia Scale (SAS) have been used to identify individuals putatively at risk for psychosis. These subjects have different personality profiles, with high SAS scorers having more schizophrenia spectrum symptoms than individuals with high PAS scores (Chapman et al., 1994; Kwapil, 1998).

The present work is aimed at studying the feeling of pleasure in individuals with physical or social anhedonia. Emotional processes in high PAS or high SAS subjects have been studied using emotion-eliciting stimuli. When subjects with physical anhedonia are asked to rate their feeling on an unpleasant–pleasant axis, they report less positive ratings than controls, in response to positive slides (Fitzgibbons and Simons, 1992; Ferguson and Katkin, 1996) or during imagery of positive emotional scripts (Fiorito and Simons, 1994). However, this was not found in other studies using slides (Germans and Kring, 2000) or film clips (Berenbaum et al., 1987). Researchers have used physiological measures to study state-activation elicited through perception. Although subjective ratings of state-activation in subjects with physical anhedonia are mixed (Fitzgibbons and Simons, 1992; Fiorito and Simons, 1994; Germans and Kring, 2000; Mathews and Barch, 2006), these subjects were found to display abnormal skin conductance responses (Simons, 1981; Bernstein, and Riedel, 1987; but see Fiorito and Simons, 1994), fewer changes in heart rate response when processing emotional stimuli (Simons et al., 1982; Fitzgibbons and Simons, 1992; Fiorito and Simons, 1994; Ferguson and Katkin, 1996) and abnormal affective startle eyeblink modulation (Roedema and Simons, 1994; Allen et al., 1995; but see Simons and Giardina, 1992). Furthermore, subjects with physical anhedonia did not have a larger P3 component of the event-related potential in response to cues predicting the presentation of arousing stimuli than in response to cues predicting non-arousing stimuli (Simons, 1982; Miller et al., 1984; Pierson et al., 1987). Despite some inconsistencies, subjective and physiological findings provided by direct confrontation with emotional stimuli evoke a general pattern of emotional hyporesponsiveness in subjects with high levels of physical anhedonia. There is no behavioral evidence for this in subjects with social anhedonia. Subjects with social anhedonia have not been found to differ from controls in terms of emotional modulation of the startle reflex (Gooding et al., 2002). However, these subjects reported lower scores on the Positive And Negative Affect Schedule (Gooding et al., 2002), and differential emotional processing is apparent through their atypical perceptual biases in response to emotion chimera (Luh and Gooding, 1999), as well as abnormal performances in word pronunciation (Kerns and Berenbaum, 2000) or emotion working memory tasks (Gooding and Tallent, 2003).

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In the present article, we address the issue of the subjective intensity of pleasure felt by subjects with anhedonia when presented with positive pictures. The study was designed with the following two main purposes: (1) assessing the modulation of the intensity of pleasure in varying perceptual conditions; (2) comparing subjects with physical anhedonia with social anhedonia, whose differences in terms of emotional processing have received little study. Our paradigm is based on the modulation of a physical attribute of pictures with positive content. Affective properties of a visual scene are thought to be related to the amount of interpretable information that it contains (Biederman and Vessel, 2006) and are conveyed by physical stimulus characteristics (color, spatial frequency, local/global features) (e.g. Schupp et al., 2008). We used the attenuation of the luminance contrast of photographs as a procedure for degrading the perceptual content. In an affective judgment task, positive pictures with either a sensory or a social content were displayed at five different contrast levels. Contrast was attenuated until 20% of its initial value, a level that should not be weak enough to interfere with the identification of the content, according to recognition studies of natural scenes (Avidan et al., 2002; Mace et al., 2005). French participants, selected for their high scores for physical or social anhedonia, had to rate their emotional experience facing each picture in terms of intensity of pleasure. Given the effect of contrast on perceptibility, we anticipated that affect intensity would linearly decrease with contrast attenuation. We tested whether, compared with control subjects, subjects with anhedonia would subjectively experience different levels of pleasure intensity as a function of contrast. In addition, given the personality differences between these subjects (Rey et al., 2009), we hypothesized that subjects with physical and social anhedonia would show a different pattern of affective ratings.

2. Methods

2.1. Selection procedure

We used True–False self-completed questionnaires to screen 1400 students from the Pierre et Marie Curie University, including the revised versions of the PAS and SAS (Chapman et al., 1976) and the Magical Ideation Scale (MIS; Eckblad and Chapman, 1983). The PAS includes 61 items dealing with defects in the sensory and esthetic pleasures of eating, touching, feeling, sex, temperature, movement, smell, sight and sound. The PAS includes items such as: “The beauty of sunsets is greatly overrated” (keyed true). The SAS consists of 40 items concerning asociality and indifference to others, assessed by measuring interpersonal pleasures. The SAS includes items such as: “I sometimes become deeply attached to people I spend a lot of time with” (keyed false). Higher total scores on these scales indicate a lower capacity to feel pleasure and, thus, greater anhedonia. Details regarding the psychometric properties of the French versions of the PAS and SAS can be found elsewhere (Loas and Boyer, 1994; Kosmadakis et al., 1995). Whereas the PAS and the SAS assess the negative dimension of schizotypy, the MIS relates to the positive dimension of schizotypy, with 30 items assessing belief in implausible or invalid causality, like: “Good luck charms don't work” (keyed false).

Three groups of subjects were studied: one group of subjects with physical anhedonia (PhysAnh), one group of subjects with social anhedonia (SocAnh), and one control group. Subjects with scores falling at least 1.96 standard deviations beyond the mean for their gender on the PAS or SAS were recruited as PhysAnh and SocAnh subjects, respectively. Subjects with social anhedonia often have elevated scores on the PAS around the threshold, making the selection of subjects with an isolated social anhedonia difficult. Therefore, we subjects included in the SocAnh group also often had high PAS scores. Subjects with scores up to 0.5 S.D. above the mean for their gender on the two anhedonia scales were selected as controls. The score on the MIS was not considered in the selection procedure, but was later used to compare the groups for positive schizotypy.

2.2. Participants groups

In total, 38 subjects with physical anhedonia, 31 with social anhedonia and 37 controls participated in this study. The participants completed the PAS and the SAS again, to check for score stability. Fifteen participants with anhedonia were excluded due to variation of anhedonia score between screening and recruitment, with the second score obtained not reaching the threshold for selection or scores displaying variation by more than 1 S.D. of the mean for the subject's gender for the initial screening.

In a clinical interview, participants were administered the Mini International Neuropsychiatric Interview (M.I.N.I.; Sheehan et al., 1997) to check for any current or past Axis I psychiatric diagnoses according to DSM-IV criteria for affective disorders (American Psychiatric Association, 1994) or a history of neurological illness. One control subject with a history of substance abuse and two on antidepressants were excluded from the analyses. Subjects meeting diagnostic criteria for current major depressive disorder (3 with physical anhedonia and 6 with social anhedonia) or psychotic disorder (1 with social anhedonia) were also excluded.

Fig. 1. Examples of pictures with sensory (upper part) and social (lower part) content.

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