

## Emotion–cognition interactions in schizophrenia: Implicit and explicit effects of facial expression

Stefanie C. Linden<sup>a,b,\*</sup>, Margaret C. Jackson<sup>a</sup>, Leena Subramanian<sup>a</sup>, Claudia Wolf<sup>a</sup>, Paul Green<sup>c</sup>, David Healy<sup>c</sup>, David E.J. Linden<sup>a,b</sup>

<sup>a</sup> Wolfson Centre for Clinical and Cognitive Neuroscience, School of Psychology, Bangor University, United Kingdom

<sup>b</sup> North Wales Clinical School, Bangor, United Kingdom

<sup>c</sup> North Wales Department of Psychological Medicine, Hergest Unit, Bangor, United Kingdom

### ARTICLE INFO

#### Article history:

Received 26 June 2009

Received in revised form 13 October 2009

Accepted 24 November 2009

Available online 27 November 2009

#### Keywords:

Psychosis

Memory

Emotion

Angry

Happy

### ABSTRACT

Working memory (WM) and emotion classification are amongst the cognitive domains where specific deficits have been reported for patients with schizophrenia. In healthy individuals, the capacity of visual working memory is enhanced when the material to be retained is emotionally salient, particularly for angry faces. We investigated whether patients with schizophrenia also have an enhanced WM capacity for angry faces. We compared 34 inpatients with schizophrenia and 34 age-, handedness- and gender-matched control participants in three separate tasks. In the WM task, participants saw two faces with angry, happy or neutral emotional expressions for 2 s and had to decide whether a probe face presented after a 1 s delay was identical to one of them. In the emotion classification task, they had to assign these faces to the appropriate categorical emotion. They also rated faces for valence and arousal. Although patients performed generally worse on the working memory task, they showed the same benefit for angry faces as control participants. However, patients were specifically impaired for angry faces on the emotion classification task. These results indicate preserved implicit emotion processing in schizophrenia patients, which contrasts with their impairment in explicit emotion classification. With regard to clinical practice, our findings underline the importance of assessing responsiveness to emotions in patients with schizophrenia, with a view possibly to utilize preserved implicit emotion processing in cognitive remediation programs.

© 2009 Elsevier Ltd. All rights reserved.

### 1. Introduction

The ability to retain socio-emotional information in working memory (WM) is fundamental to normal social cognition. Visual WM is a limited capacity memory store that has been shown to be able to retain approximately two faces at any one time (Jackson & Raymond, 2008). Effective storage of facial information in visual WM is essential for fluid and coherent face-to-face communication. The majority of social interactions take place within an emotional context, and previous research has found that facial expression modulates the degree to which face identities are successfully remembered: WM capacity is greater for angry compared to happy or neutral faces (Jackson, Wolf, Johnston, Raymond, & Linden, 2008; Jackson, Wu, Linden, & Raymond, 2009). This ‘angry face benefit’ in WM might serve to ensure a timely and appropriate response

when one’s personal safety is in threat, for example preparation of approach or avoid reactions.

Working memory deficits in schizophrenia have been widely reported (Silver, Feldman, Bilker, & Gur, 2003). They affect both the verbal and the visuospatial modality (Reichenberg & Harvey, 2007) and often precede clinical symptoms (Hambrecht, Lammertink, Klosterkoetter, Matuschek, & Pukrop, 2002). Working memory deficits are amongst the core candidates for neurocognitive trait markers of the disorder, supported by their presence in first-degree relatives (Park, Holzman, & Goldman-Rakic, 1995), especially when demand on executive processes is high (Conklin, Curtis, Calkins, & Iacono, 2005). Deficits of working memory and other executive functions may be related to negative symptoms, psychosocial deficits and poor prognosis (Twamley, Palmer, Jeste, Taylor, & Heaton, 2006) and have been recognized as a target for both pharmacological (O’Grada & Dinan, 2007) and psychological (Greenwood, Landau, & Wykes, 2005) interventions. Because deficits in WM remain even after symptom improvement (Snyder et al., 2008), a better understanding of the nature of WM deficits and their underlying brain mechanisms is needed in order to improve treatment strategies.

\* Corresponding author at: School of Psychology, Bangor University, Penrallt Road, Brigantia Building, Bangor LL57 2AS, Gwynedd, Wales, UK.  
Tel.: +44 1248 382211; fax: +44 1248 382599.

E-mail address: [s.linden@bangor.ac.uk](mailto:s.linden@bangor.ac.uk) (S.C. Linden).

**Table 1**  
Demographic and clinical data for both groups.

	Healthy controls (HC)		Schizophrenia patients (SZ)	
	N/Mean	SD	N/Mean	SD
Participants	34		34	
NART	114.30 <sup>a</sup>	8.49	105.78 <sup>b</sup>	10.27
Age	29.91	10.06	31.21	10.80
Male/female	28/6		28/6	
Right/left-handed	30/4		30/4	
PANSS positive			18.82	5.35
PANSS negative			20.12	6.72
PANSS general			35.15	7.30
PANSS composite			-1.18	8.47
Illness duration [months]			83.50	88.71
CPZE (mg/day)			298.91	273.65

CPZE: chlorpromazine equivalent.

<sup>a</sup> N = 30.

<sup>b</sup> N = 32.

Emotion recognition, particularly classification of emotional faces, is another domain where deficits have been reported in schizophrenia (Kucharska-Pietura, David, Masiak, & Phillips, 2005; Pinkham et al., 2008; Van't Wout et al., 2007). Several emotion classification studies indicate that emotion processing deficits in schizophrenia are more pronounced for negative facial affects (Koehler et al., 2003; Mandal, Pandey, & Prasad, 1998). Unlike the working memory deficit, where the correlation with symptoms has been inconsistent, emotion recognition deficits were correlated with social impairment (Hooker & Park, 2002). While dysfunction of the frontal lobes (Perlstein, Carter, Noll, & Cohen, 2001) has been implicated in the visual WM deficits, activation changes in an emotion circuit involving the superior temporal sulcus (Michalopoulou et al., 2008) and limbic areas (Fakra, Salgado-Pineda, Delaveau, Hariri, & Blin, 2008) may underlie the emotion classification deficit.

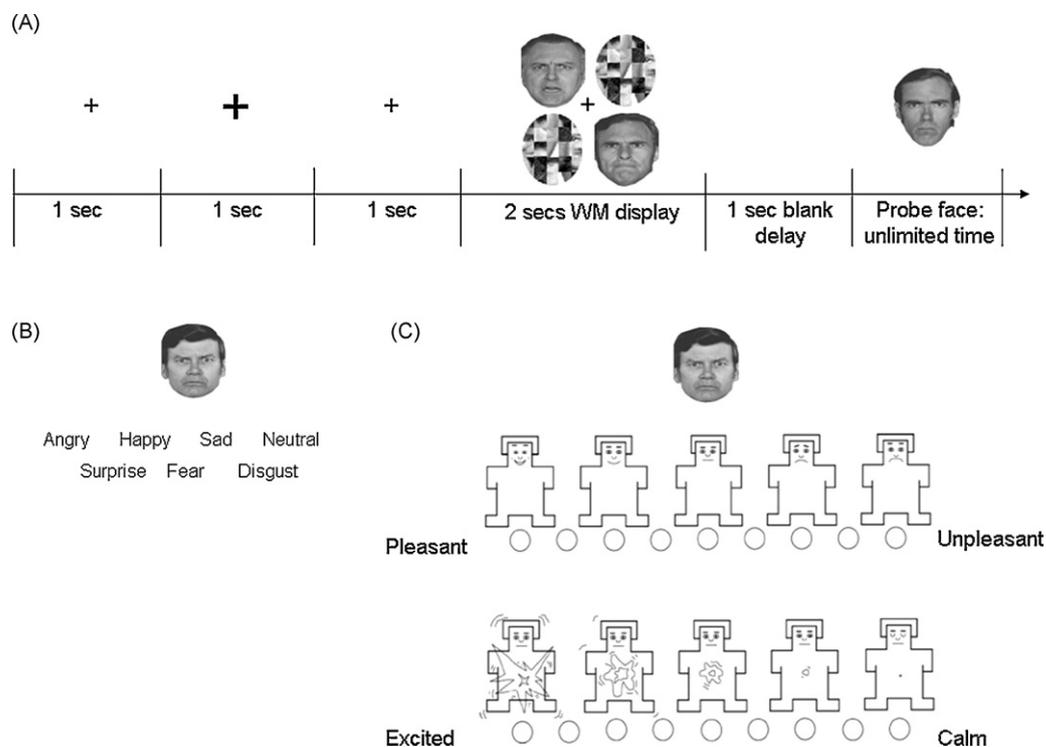
In light of the difficulties of developing remediation strategies for these cognitive deficits, it would be interesting to probe whether patients suffering from schizophrenia are still responsive to implicit emotion cues that may be utilized to obtain cognitive benefits. Such implicit emotion benefits have mainly been reported for threat related stimuli, probably because of their higher evolutionary salience. For example angry faces were preferentially processed in visual search (Fox et al., 2000) and other selective attention tasks. This preference for angry faces correlated with social phobia (Mogg, Philippot, & Bradley, 2004) and anxiety (Mogg, Garner, & Bradley, 2007).

We have recently developed a task that probes implicit effects of emotion on WM and showed a benefit for angry faces. Functional magnetic resonance imaging (fMRI) revealed that this angry benefit in face WM was supported by activation of the globus pallidus (Jackson et al., 2008). In the present study we investigated whether schizophrenia patients – although impaired in overall WM performance and emotion classification – would still show the same angry faces benefit in WM as healthy individuals.

## 2. Methods

### 2.1. Participants and diagnostic assessment

34 patients with schizophrenia and 34 healthy age-, gender- and handedness-matched controls participated in the study (Table 1). After complete description of the study to the subjects, written informed consent was obtained. The study was approved by the ethics committees of the School of Psychology, Bangor University, and the Local Research Ethics Committee of the National Health Service. Author S.L., a psychiatrist, confirmed the clinical diagnosis of schizophrenia according to DSM-IV-TR-criteria (American Psychiatric Association) with a semi-structured interview modelled on the SCID (Kay et al., 1991). We assessed each patient's current psychopathology with the Positive and Negative Syndrome Scale (PANSS, Kay et al., 1991) and pre-morbid verbal intelligence with the National Adult Reading test (Russell et al., 2000), in the native speakers of English of both groups (30 controls and 32 patients). We ruled out deficits in face recognition with the Benton test (Benton, Hamsher, Varney, & Spreen, 1983). In this test the participant is shown a single front



**Fig. 1.** Example trials. (A) Working memory task. An example of an angry faces trial is shown. Participants are shown two faces (expressing the same emotion, either angry, happy, or neutral) to retain in WM and are asked to state whether the subsequent probe face was present or absent in the WM display. The task was identity-based; the probe face always displayed the same expression as the WM display faces; expression was task irrelevant. (B) Expression classification task. Participants chose the expression label thought to match the face. (C) Arousal/valence rating task. Participants rated how aroused and pleasant each face made them feel.

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات