



# Voluntary and involuntary emotional memory following an analogue traumatic stressor: The differential effects of communality in men and women



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## ABSTRACT

**Background:** Men and women show differences in performance on emotional processing tasks. Sex also interacts with personality traits to affect information processing. Here we examine effects of sex, and two personality traits that are differentially expressed in men and women – instrumentality and communality – on voluntary and involuntary memory for distressing video-footage.

**Methods:** On session one, participants ( $n = 39$  men; 40 women) completed the Bem Sex-Role Inventory, which assesses communal and instrumental traits. After viewing film-footage of death/serious injury, participants recorded daily involuntary memories (intrusions) relating to the footage on an online diary for seven days, returning on day eight for a second session to perform a voluntary memory task relating to the film.

**Results:** Communality interacted with sex such that men with higher levels of communality reported more frequent involuntary memories. Alternatively, a communality  $\times$  sex interaction reflected a tendency for women with high levels of communality to perform more poorly on the voluntary recognition memory task.

**Limitations:** The study involved healthy volunteers with no history of significant psychological disorder. Future research with clinical populations will help to determine the generalizability of the current findings.

**Conclusion:** Communality has separate effects on voluntary and involuntary emotional memory. We suggest that high levels of communality in men and women may confer vulnerability to the negative effects of stressful events either through the over-encoding of sensory/perceptual-information in men or the reduced encoding of contextualised, verbally-based, voluntarily accessible representations in women.

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## 1. Introduction

Distressing involuntary (intrusive) memories are a common experience in psychological disorders (Brewin, Gregory, Lipton, & Burgess, 2010) especially after stressful life-events, as in Posttraumatic Stress Disorder (PTSD). However, susceptibility to these symptoms varies as a function of pre-existing vulnerability factors (DiGangi et al., 2013). A more complete understanding of these vulnerabilities depends on prospective studies which are time-consuming and expensive. In the meantime, the contribution

of specific risk factors to symptom-development can be fruitfully explored using experimental approaches which model psychological distress in healthy individuals. One commonly-used laboratory approach for investigating intrusive memories is the stressful-film paradigm (Holmes & Bourne, 2008). This approach has been used, for example, to examine the role of psychological traits such as positive schizotypy (Steel, Fowler, & Holmes, 2005) and trait mood variables (Laposa & Alden, 2008) in the development of intrusive memories.

Sex has rarely been investigated in well-powered analogue studies of intrusive memories. This is perhaps surprising given that (female) sex is an established risk factor for the development of psychological disorders. On the other hand, sex *per se* may not be sufficient to determine risk. For example, in the case of elevated risk of Posttraumatic Stress Disorder (PTSD) in women, pre-existing and

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habitual information-processing styles may also play an important role in aetiology (Olf, Langeland, Draijer, & Gersons, 2007). However the nature of sex-specific information-processing factors in the onset and maintenance of psychological distress remains unclear, although clues from related research suggest that ‘gender-role’<sup>1</sup> rather than sex may be an important determinant of how emotional information is processed. These studies suggest that an individuals’ self-concept, particularly their social identity, defined in terms of stereotyped masculine (agentic, instrumental) and feminine (communal, expressive) traits, affect the way in which emotional information is perceived and encoded.

These traits are influenced by both biological and socialisation processes in childhood (Eagly & Wood, 2013) such that women are more likely to (be encouraged to) develop affiliative, empathic and interpersonally-oriented behaviours whereas men develop task-focused, assertive and systemizing behaviours.

A relatively small number of studies have investigated the relationship between emotional information processing, and instrumentality and communality. For example, Bourne and Maxwell showed that an interaction between participant sex and instrumentality (referred to as ‘masculinity’) predicted lateralization of facial emotion recognition (Bourne & Maxwell, 2010). Similarly, Cahill and colleagues showed that voluntary recognition memory for peripheral, visual aspects of a negatively-valenced story was higher in individuals with high levels of communality (referred to as ‘femininity,’ Cahill, Gorski, Belcher, & Huynh, 2004). ‘Central’ information, conveying the gist of the story on the other hand, was better recognised in those with higher levels of instrumentality.

Behavioural responses to negatively valenced stimuli may also be influenced by communality and instrumentality. For example while women showed higher levels of anxiety and avoidance in a behavioural avoidance task, low levels of instrumentality, regardless of sex, were associated with higher levels of avoidance (McLean & Hope, 2010). These studies suggest that processing of threat-relevant stimuli is at least partially determined by gendered personality traits rather than sex alone.

It remains unclear how these traits affect memory for highly negatively-valenced and arousing material such as that designed to simulate (within ethical limits) aspects of the highly stressful or traumatic experiences associated with the onset of psychological disorders (e.g. PTSD and depression). According to some clinical theories of PTSD, highly emotional events result in memory representations formed at a sensory level (involving, for example, perceptual priming) as well as verbally-based, conceptual and contextual-level representations (Brewin, Dalgleish, & Joseph, 1996; Brewin et al., 2010; Ehlers & Clark, 2000). Distressing intrusive memories reflect the preferential encoding of sensory/perceptual detail during highly stressful events, whereas the contextual/conceptual memory system is simultaneously inhibited by stress, resulting in impoverished verbally-based, voluntarily retrievable memory for the event. As such, clinical theories of disorders characterised by intrusive memories predict *impairment* in voluntary memory for highly stressful events (Brewin, 2014), at least in some vulnerable individuals.

Here we investigate both voluntary and involuntary memory for distressing film scenes involving death and injury (i.e. an analogue

traumatic stressor), focussing on sex, and the gender-related personality constructs, instrumentality and communality as predictors, in a study that also investigated the effects of a post-encoding working memory task. To date only a single study has reported a role for instrumentality and communality in emotional memory performance, although that study focused exclusively on voluntary memory (Cahill et al., 2004). No study that we are aware of has yet examined the role of these traits on the occurrence of involuntary emotional memories.

Given the higher prevalence of psychological disorder characterised by intrusive memories in women, our main hypothesis was that sex, and/or communality would predict frequency of involuntary memories for the stressful film. Further, given that one theory of intrusive memories (Brewin et al., 1996) proposes that separable systems subservise voluntary and involuntary emotional memory, and the suggestion that voluntary memory *suppression* may accompany the over-encoding of sensory/perceptual aspects of events (Brewin, 2014), we also explored the possibility of a negative association between communality and/or (female) sex and voluntary memory performance. Instrumentality has, by and large, been associated with psychological well-being (Helgeson, 1994) rather than psychopathology so was not predicted to be associated with the occurrence of involuntary memories.

## 2. Method

### 2.1. Design and participants

The study received approval from University College London/University College London Hospital ethics committee. Participants from a research-participant database completed an online screening survey to assess inclusion/exclusion criteria. Inclusion criteria were: age 18–40 years and fluency in English. Exclusion criteria included previous experiences of significant distress at the sight of blood or injuries or previous experience of any mental health problem requiring psychiatric or psychological treatment. Seventy nine participants provided consent and completed the study (39 men, 40 women).

### 2.2. Procedure

Although a primary aim of the study was to examine sex and gender-related differences between groups, another aspect of the study examined whether performing a visuospatial versus a verbal *post-film* task influenced subsequent intrusion frequency (Holmes, James, Coode-Bate, & Deeprose, 2009). As such participants were sequentially allocated to one of two working memory tasks (visuospatial or verbal 2-back) or a control task performed 30 min *after* the stressful film (during which time they completed filler tasks: book-search and listening to music). The former two groups were designed to use equivalent stimuli (as described in Gray, 2001) to test whether matched visuospatial and verbal task stimuli in the respective types of a 2-back working memory task modulated intrusive memories. All groups showed equivalent levels of intrusions in the follow-up period [ $F(2,79) = 0.41$ ,  $p = 0.665$ ] so groups were collapsed to concentrate this report solely on effects of sex and gender-related traits (communality and instrumentality) on emotional memory.

Participants attended two experimental sessions. In session one they completed trait and pre-film state questionnaires, viewed the stressful film, repeated the state questionnaires. At the end of the session participants were then given detailed instructions on completing the online intrusions diary for seven days. They returned on day eight to complete a compliance measure and episodic memory tasks related to the stressful film.

<sup>1</sup> Some researchers have used the terms ‘femininity’ and ‘masculinity’ to refer to individual differences purportedly measured by ‘gender role’ inventories (e.g. the Bem Sex Roles Inventory). However, there is now wide agreement that such measures actually tap narrower constructs of communality (expressiveness) and instrumentality (agency) respectively (Spence, 1993) which are nonetheless, more strongly expressed in women and men respectively.

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