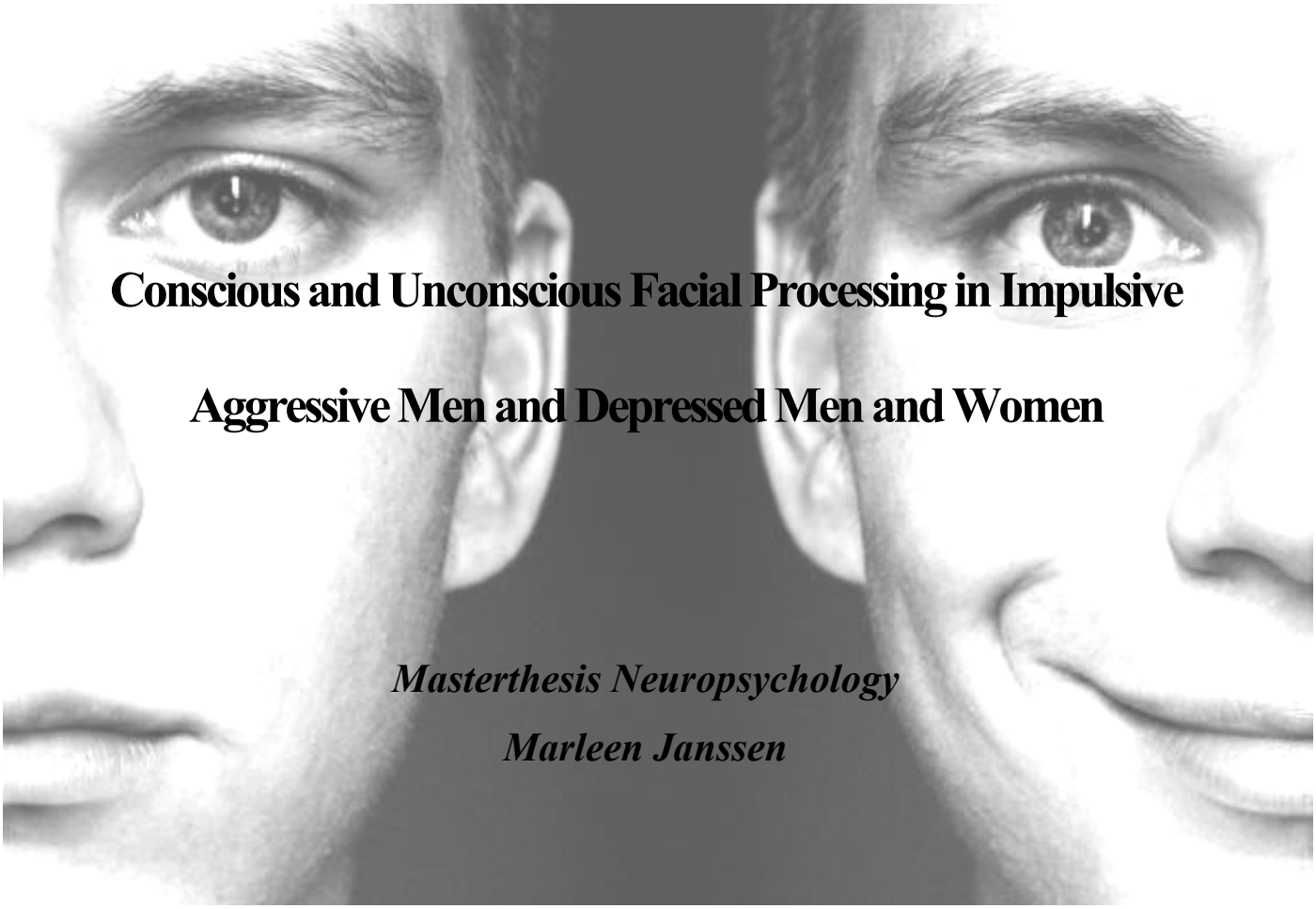

Conscious and Unconscious Facial Processing in Impulsive Aggressive Men and Depressed Men and Women

Masterthesis Neuropsychology

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Abstract

Background. This study was designed to investigate the relationship between psychopathology and decoding of social stimuli. Various types of psychopathology can be considered as maladaptive functioning of innate defence mechanisms to social stress and threat. An example of such an innate defence mechanism is the fight – flight system. According to Gilbert (2001) major depressive disorder and impulsive aggressive disorder can be interpreted in terms of a malfunctioning fight – flight system. In this study I assume that impulsive aggression and major depressive disorder are opposites in terms of the fight – flight system: whereas defences are blocked in patients with major depressive disorder they are executed to easily in patients with impulsive aggressive disorder. To investigate this assumption I studied the perception of social stimuli in impulsive aggressive patients and in patients who suffer from major depression. I tested a series of related hypothesis on the association between psychopathology and the decoding of social stimuli. The following hypotheses were tested: 1) Depressed patients report higher levels of submission than patients with impulsive aggressive disorder; 2) Patients with impulsive aggressive disorder report higher level of aggression and hostility than depressed patients; 3) Submissive behaviour is positively correlated with the response latency time to the Emotional Stroop Task (EST); 4) Compared to depressed men and women, patients with impulsive aggressive disorder show a shorter response latency time to the EST; 5) Subjects with impulsive aggressive disorder show a shorter response latency time to the unconscious (masked) version of the EST than to the conscious (unmasked) condition of the EST; 6) Severity of depression is positively correlated to the response latency time to the EST; 7) Aggression and impulsiveness are negatively correlated to the response latency time to the EST; 8) Depressed women show a shorter response latency time to the EST when compared to depressed men. **Method.** Twenty-seven outpatients of the Mental Health Care Friesland participated in this study. They were seven men and six women with major depressive disorder and fourteen men with impulsive aggressive disorder. To test the perception of social stimuli an Emotional Stroop Task was used. Participants were shown neutral, happy and angry facial expressions in two conditions of the Emotional Stroop Task. The faces were presented in two conditions: unconsciously (i.e. exposure time between 6 and 13 ms) and consciously. **Results.** The first hypothesis that depressed patients were more submissive than patients with impulsive aggressive disorder was confirmed. In line with the second hypothesis, aggressive patients tended to be more hostile and aggressive than depressed patients. The patients group did not differ in respect to self-reported depression or impulsiveness. In both groups the response latencies to the conscious condition of the EST were significantly higher than those to the unconscious condition. In the depressed patients this effect was confined to the men only. The response latencies did not differ between the different facially expressed emotions. In aggressive patients, but not in depressed patients, self-reported submission was positively correlated to the response latency to the unconscious condition of the EST. For the conscious condition of the EST a tendency in the same direction was observed. The fourth hypothesis has to be rejected: depressed patients and aggressive patients did not perform differently on the EST. Furthermore, patients with impulsive aggressive disorder show a shorter response latency time to the unconscious condition of the EST than to the conscious condition. No significant associations between severity of depression, aggression and impulsiveness and the response latency time to the EST were found in this study. Finally, in line with hypothesis eight, depressed women demonstrate a shorter response latency to the conscious condition of the EST when compared to depressed men. **Discussion.** Based on the present findings the hypothesis that major depressive disorder and impulsive aggressive disorder are opposites in terms of the fight – flight system needs to be refuted, but possible that the role of the fight – flight system differs between impulsive aggressive patients and depressed patients.

1. Introduction

Psychopathological behaviour, such as depression and aggression are common in our society. Depression is an increasingly widespread disorder. According to the World Health Organization, depression is the number one cause of disability and in terms of burden of disease it will be the second most important disorder by 2020 (Lakdawalla, Hankin, & Mermelstein, 2007). Aggression and violence make by far the most important reason for placement under entrustment in the Netherlands (Wartna, El Harbaci, & Essers, 2006). Recent data show that violent recidivism in people who have been discharged from prison or from emplacement under entrustment has increased over the last years (Wartna, El Harbaci, & Van der Knaap, 2005; Wartna et al., 2006). Nowadays, an increase is also noticeable of the amount of attention paid to aggression in media. This increased attention is an indication for social relevance of aggression and it's consequences.

Major depression disorder (MDD) is a mental disease characterized by episodes of reduced mood and interest. According to the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders common symptoms of depression include, loss of motivation, anhedonia, low self-esteem, sadness, somatic complaints, and difficulty in concentrating (DSM-IV-TR; American Psychiatric Association, 2000). Impulsive aggressive behaviours are characterized by recurrent acts of impulsive, affectively-driven aggression that is disproportionate to any actual provocation. These acts are not caused by another psychiatric or neurological disorder. Individuals with an impulsive aggression disorder (IAD) demonstrate frequent (e.g. twice a week) verbal and physical aggression (Coccaro, McCloskey, Fitzgerald, & Phan, 2007). Individuals who display impulsive aggressive behaviours respond to provocation with immediate and destructive violence and are often characterized as unpredictable and 'short fused' (Kockler, Stanford, Meloy, Nelson, Stanford, 2006).

1.1 Defence mechanisms and the fight – flight system

Both major depressive disorder and impulsive aggressive disorder can be considered as maladaptive functioning of innate defence mechanisms to social stress and threat (Gilbert, 2001). The human response to stress and threat has been represented as an essential defence mechanism in the process of survival. A coordinated behavioural stress response is believed to be at the core of reactions to threats of all kinds (e.g. an attack by predators, assaults by members of the same species, dangerous conditions such al fire, earthquake). Through principles of natural selection, an individual whose response to stress is successful will likely pass that adaptive response on to following generations. The fight – flight response is thought to be such an evolved response (e.g., Taylor et al., 2000; Gilbert, 2001). Cannon (1929) formulated this term for the first time to describe the human response to threat. The term captures the essence of the phenomena it describes.

The human fight – flight response can be described as the most immediate changes in physiological and behavioural state within a human, when exposed to stress. These changes are regulated by the central nervous system and the hypothalamic-pituitary-adrenal (HPA) axis. The individual's response to stress is

composed of cognitive, behavioural, endocrine and autonomic components that are designed to neutralize the disrupting effects of the stressor (Johnson, Kamilaris, Chrousos & Gold, 1992; MCDougall, Widdop & Lawrence, 2005).

Exposure to stress is generally linked to acute disruptions in behavioural and cognitive control (Verona & Kilmer, 2007). It has been proposed that abnormalities in the regulation of the stress response form a critical factor in the pathophysiology of several psychiatric disorders (Johnson et al., 1992). Various types of psychopathology can be interpreted in terms of malfunctioning fight – flight mechanisms (Gilbert, 2001). In this study, two disorders will be elucidated, namely major depressive disorder and impulsive aggressive disorder.

According to Gilbert (2001) depression is a state of chronic overarousal of the stress system related to experiences of defeat and entrapment in which strong motives for flight or fight are blocked. This chronic state forces demobilization. There are several reasons to believe that depressed people suffer chronic overarousal of their stress and defence system. Safeness and reassuring cues that can deactivate stress do not work in depressed patients and therefore depressed individuals are rarely easily reassured. Furthermore, when depressed people are confronted with new stressors they may not be able to generate coping behaviours that will down regulate their stress system. Also, defensive behaviours as displayed by depressed patients may worsen the situation. Finally, lack of resources, fear or guilt may all contribute to feeling trapped. Depressed people often ruminate on their entrapment and wish to get away. According to Sloman, Price, Gilbert and Gardner (1994) depressed patients have an automatic internal inhibitory control state that causes an internal loss of confidence, which inhibits challenging and confident explorative behaviour. When a stress conflict activates this state, it triggers submissive behaviour in depressed patients. This leads to reconciliation and ending of the conflict by turning off the aggression (Price et al., 1994; Sloman et al., 1994). Also, Cochrane and Neilson (1977) found that depressed patients suppressed anger more than nondepressed persons. Hence, depression can be interpreted as a blocked flight situation with no ability to flee (Gilbert, 2001; Gilbert, Gilbert & Irons, 2004). In line with this interpretation, at a physiological level, depressed patients show an increased secretion of the stress-sensitive cortisol hormone, as a result of an overactive HPA axis (e.g., Thase & Howland, 1995). Although a substantial literature has documented this link between MDD and abnormalities in HPA activity it is not without limitations. A meta-analytic study of Burke, Davis, Otte and Mohr (2005) showed that certain subgroups of patients with major depressive disorder show more blunted stress reactivity and impaired stress recovery. Moreover, this relatively unresponsive pattern of cortisol activity was most apparent in older and more severely depressed individuals (Burke et al., 2005).

Stress is a major factor that promotes aggression and violence in humans (Barnett, Fagan & Booker, 1991). It has been demonstrated that exposure to stress and corresponding negative affect are associated with increased maladaptive or impulsive behaviours (Verona & Kilmer, 2007). Pathological impulsive aggression can be viewed as an inappropriate and exaggerated response to perceived threat. Hence, this form of aggression can also be considered as (consequences of) malfunctioning of the fight – flight defence mechanisms. Berkowitz (1990) hypothesized that stressful events of all kinds can prime the initiation of

escape and attack behaviours. Within the framework of the fight – flight theory impulsive aggression can be seen as specific threat sensitivity of a person (Baron and Richardson, 1994; Gilbert, 2001). Aggression is associated with heightened approach and lowered withdrawal tendencies during social conflict (Harmon-Jones & Allen, 1998). Harmon-Jones and Allen (1998) suggest that persons with high dispositional anger have increased approach motivation and decreased withdrawal motivation. Additionally, in laboratory rats, Kruk, Halasz, Meelis and Haller (2004) have found a link between brain areas that modulate various stress responses as well as aggressive attack behaviours. They reported that stimulating attack-related centres in the rat brain simultaneously induce strong HPA axis and amygdala activation, implying that there exists a common interaction between mechanisms that involved in aggression and negative affective and stress responses (Kruk et al., 2004; see also Verona & Kilmer, 2007).

Thus, both major depressive disorder and impulsive aggressive disorder can be considered as maladaptive functioning of innate defence mechanisms to social stress and threat. However, whereas patients with IAD show an inappropriate and exaggerated response to stress in terms of fight, patients with MDD show an arrested flight response. In other words, in terms of the fight – flight system both disorders may be interpreted as opposites.

1.2 Decoding of social stimuli

Defence mechanisms consist of attentive processes that can be biased towards threat detection. When threats are detected they prime the fight – flight system. Adequate perception and interpretation of social stimuli are necessarily for an optimal functioning defence mechanism. In particular, facial expressions of emotion are essential for communication in humans (Darwin, 1872; Sato, Yoshikawa, Kochiyama, & Matsumura, 2004). The face signals one's emotional states to others. Also, other's facial expressions influence ones behaviour. Early-developing capacities for the perception of social stimuli are important for promoting personal relations with others and establishing interpersonal understanding (Ekman, 1992).

The experience of stress may affect emotion perception in persons. There is evidence that stress has the potential to impair accurate decoding of emotional stimuli, and to enhance the selective processing of threat stimuli in depressed patients (Mogg, Mathews, Bird, Macgregor-Morris, 1990; Bos, 2005). According to Beck's theory of depression the processing of social stimuli in depression can be interpreted by negative view of the self, of others and of the future (Beck, 1967). These negative cognitions become obvious in particular with respect to neutral or ambiguous stimuli. Research from the past has demonstrated that depression is associated with dysfunctional processing of emotional information. Several studies have provided strong evidence to support the existence of negative biases in several aspects of information-processing. First, a memory bias with enhanced recall of negative information but reduced specificity of autobiographical memory is noticeable in depressed patients (Williams & Broadbent, 1986). Secondly, depressed patients show an interpretation bias with ambiguous information being interpreted in a negative way (Nunn, Mathews & Trower, 1997) and also ruminative thinking over negative information (Donaldson, Hirsch & Fialko 2006; Mathews & Macleod, 1994). A considerable number of studies have demonstrated attentional biases in patients with a depression at longer presentation of negative information; no early

automatic attentional bias has been demonstrated (Mogg, Bradley & Williams, 1995; Leyman, De Raedt, Schacht & Koster, 2007). Several studies also demonstrated the absence of a 'protective bias' in depressed patients (e.g. McCabe, Gotlib & Martin, 2000). A protective bias is the tendency to avoid negative information, which is commonly found in non-depressed individuals (Leyman et al., 2007).

It has been argued that a biased processing of social threat play a role in the etiology and maintenance of emotional disorders (Mathews, Ridgeway & Williamson, 1996). A negative perceptual bias has been shown to predict an unfavourable course of the depression (Geerts, 1997; Bouhuys, Geerts & Gordijn, 1999a) and to depression relapse (Bouhuys, Geerts & Gordijn, 1999b; Bos et al., 2005; Leyman et al., 2007). One can argue that this selective attentional bias to negative emotions will result in an increased perception of danger in the environment and that subjects who show this tendency will experience anxiety more often than those who don't show such an attentional bias (Bradley et al., 1997; Mathews et al., 1996).

The induction of anger and aggression is also considered to be caused by a negative bias in the encoding of social threatening stimuli (Cohen, Eckhardt, & Schagat, 1998). Indeed, retrospective studies have shown that violent offenders tend to interpret social information more often in terms of other's hostile intentions than non-violent offenders. Also, when impulsive aggressive patients are compared to healthy individuals, they are less accurate in recognizing emotional expressions (Coccaro et al., 2007). The number of interpersonally violent crimes committed is correlated with negative biases in the perception of social stimuli (Dodge, Price, Bachorowski & Newman, 1990). McCloskey, Berman, Noblett and Coccaro (2006) showed that these patients are hyper-responsive to actual provocation and threat. Van Honk, Tuiten, De Haan, Van den Hout and Stam (2001) have shown that unconscious and conscious perception of social threatening facial expressions is linked to trait anger. The group with the higher score on trait anger showed an attentional bias for angry faces in the conscious and unconscious version of the Emotional Stroop Task (EST). Van Honk et al. (2000) have shown that unconscious perception of social threat, but not conscious perception, is associated with secretion of steroid hormones that are involved in the fight-flight system.

1.3 The role of the amygdala in decoding of social stimuli

The processing of threatening social stimuli appears to be located in the limbic systems (Gilbert, 2001). One of these areas is the amygdala. The amygdala is an important bilateral gray matter structure composed of several distinct nuclei and is located in the anterior medial section of the temporal lobe (Baas, Aleman, & Kahn, 2004). The amygdala activates other areas of the brain, including the hypothalamus (release of the fight – flight hormones) and the brainstem. It makes part of a network of structures that participate in the perception of threatening stimuli and the organization of autonomic responses to the stressor (Philips, Drevents, Rauch & Lane, 2003; Miller, Taber, Gabbard & Hurley, 2005). The importance of the amygdala in the initial response to emotionally salient stimuli has been demonstrated in animal studies. Studies of nonhuman primates have identified that cells in the amygdala respond selectively to faces and eye gaze (Phillips et al., 2003). One can therefore argue that the amygdala plays an important role enabling an individual automatic rapid preparation for potential danger (LeDoux, 2003; Van Honk et al., 2001). Sensory input reaches the amygdala by two pathways. Initial, all sensory information is relayed to the

thalamus. From the thalamus two divergent pathways emerge: a direct and an indirect pathway. The direct pathways from the thalamus can activate the amygdala on the basis of crude thalamic appraisals of sensory stimuli that indicate potential danger. This reflexive activation of the amygdala is referred to as 'bottom-up' regulation of emotion. This pathway operates on an unconscious level and acts independently of cortical input, even when the subjects have no conscious awareness of faces this automatically occurring activation appears (Sato et al., 2004). The direct pathway evaluates stimuli quickly and shows an immediate affective response without involvement of more complex information-processing systems (LeDoux, 1996; Philips et al., 2003). One can argue that in subjects who suffer from impulsive aggression facially expressed emotions by others are processed by a more active direct pathway of the amygdala. This assumption is supported by findings that in impulsive aggressive patients the reactivity of the amygdala to angry social stimuli is positively correlated with the extend of prior aggressive behaviour (Coccaro et al., 2007).

Sensory input can reach the amygdala also by indirect or 'top-down' pathways that involve sensory cortices. The sensory cortices assign significance to sensory stimuli based upon context and prior experience. Sensory input reaches the amygdala more slowly by this pathway (Dannlowski et al., 2007; Miller et al., 2005). In addition, patients with major depressive disorder show greater increases in response time from neutral to sad words relative to controls (Mitterschiffthaler et al., 2008). Following the suggestion that depressed people show arrested flight responses, one can assume that depressed patients process threatening social stimuli via the indirect pathway of the amygdala.

1.4 Hypotheses

This study was designed to investigate the assumption that depressed patients and impulsive aggressive patients demonstrate opposite fight – flight responses to a social stressor. I investigated the association between a negative perception bias and self reported depression, aggression and impulsiveness in patients with impulsive aggressive disorder an in those with major depressive disorder. For this purpose, I challenged the subjects' conscious and unconscious processing of other's facial expressions by using the EST as designed by Van Honk et al. (2001). The following hypotheses were tested:

1. Depressed patients report higher levels of submission than patients with impulsive aggressive disorder.
2. Patients with impulsive aggressive disorder report higher level of aggression and hostility than depressed patients.
3. Submissive behaviour is positively correlated with the response latency time to the EST.
4. Compared to depressed men and women, patients with impulsive aggressive disorder show a shorter response latency time to the EST.
5. Subjects with impulsive aggressive disorder show a shorter response latency time to the unconscious (masked) version of the EST than to the conscious (unmasked) condition of the EST.
6. Severity of depression is positively correlated to the response latency time to the EST.
7. Aggression and impulsiveness are negatively correlated to the response latency time to the EST.

Depression is more likely to occur in women, whereas impulsive aggressive disorder is more likely to occur men (Nolen-Hoeksema, 2001; Verona & Kilmer, 2007). Different arguments exits that could explain these gender differences. One of these arguments follows from an evolutionarily point that men and women differ in interests of life. Men are more responsible for tasks requiring aggressiveness, whereas women are more responsible for tasks that require nurturance. Taylor et al. (2000) propose a hypothesis that because of evolutionary processes and differential caregiving roles, women and men have developed different defence mechanisms. Whereas men show a more fight – flight response, women show a tend-and-befriend response towards threatening stimuli. This latter response has evolved in women to promote a support-seeking response to stress and reduce behaviour that is related to attack. This tend-and-befriend response to social stress is more likely to guarantee the protection of the female and her offspring than flight – fight behaviour. In short, as stated before, I consider impulsive aggression and depressive disorder as a consequence of maladaptive functioning of innate defence mechanisms of the fight – flight system. Since I reasoned that the fight – flight response is less likely to appear in women than in men I looked at the gender – specific aspects of facial processing. Women's responses to social stress via social cognitive challenges (e.g. the EST) will be less apparent than responses of depressed men. Therefore, I hypothesized that depressed women show a shorter response latency time to the EST compared to depressed men (hypothesis 8).

2. Method

2.1 Subjects

Participants were recruited at the Mental Health Care Friesland outpatient divisions of the city and the region Leeuwarden. Inclusion criteria for patients with MDD were: age between eighteen and fifty years old; diagnosis of unipolar non-psychotic depression (DSM-IV-TR 296.2; 296.3; 311); severity of depression >18 on the Beck's Depression Inventory (BDI-II-NL; Beck, 1987; Bosscher, Koning & Van Meurs, 1986). For the patients with IAD inclusion criteria were: age between eighteen and fifty years old; diagnosis of impulsive aggression behaviours (DSM-IV-TR 312.30; 312.34). The exclusion criteria for both groups were: (mild) traumatic brain injury; limited sight or colour-blindness; limited knowledge of the Dutch language; substance dependency or abuse of substances; use of sedative medication; use of antidepressants other than SSRI's or SNRI's; use of other psychoactive medication, except Dipiperon (max. 80 mg); (presumption of) mentally disabled and comorbid disorders on Axis I and Axis II. All patients gave written informant consent.

2.2 Materials

The assessments were the same for both groups. These consisted of a series of questionnaires and a conscious, an unconscious version of the EST and an awareness check.

2.2.1 Questionnaires

The Gilbert Submissive Scale (GSS) (Allan & Gilbert, 1997) was administrated to determine the severity of submissive behaviours. The questionnaire consists of 16 statements; the subject can determine to what extent the statement applies to him. There are five answer possibilities. A total score is computed (range from 0 – 64) that indicates the submissive attitude of the participant and serves as an indicator of fight (low submissive behaviours) respectively flight responses (high submissive behaviours) (Allan & Gilbert, 1997).

To assess the severity of depressive symptoms all patients completed the Beck Depression Inventory-II-NL (BDI-II-NL; Beck, 1987; Bosscher, Koning & Van Meurs, 1986). The BDI is a 21-item questionnaire. A total score is computed (range 0 – 63) that is used as a measure of the severity of depression.

To define the degree of aggression the Dutch version of the Buss-Durkee Hostility Inventory (BDHI) was administrated (Buss & Perry, 1992; Lange et al., 1995). The BDHI is a 29-item questionnaire. The test has two subscales, namely Overt Aggression and Covert Aggression. A total score is computed (range 0 – 145) that represents hostility and tendency for aggressive behaviour.

The degree of impulsivity was assessed by the use of the Dutch version of the Barratt Impulsivity Scale (BIS) was administrated (Barrat, 1985; Lijffijt & Barrat, 2005). The BIS consists of 30 items and measures attentional impulsiveness (focussing on the task at hand), motor impulsiveness (acting on the spur of the moment), and nonplanning impulsiveness (lack of planning ant thinking carefully). A total score is computed (range 0-120) that represents the severity of the impulsiveness.

2.2.2 The Emotional Stroop Task

Two conditions of the EST were used in this research: an unconscious and conscious condition. All participants completed the EST in the same order (i.e. the unconscious condition followed by the conscious condition). In both conditions ten different pictures of individuals, each displaying a neutral, an angry and a happy expression, were used. The emotional faces that were used were the Ekman and Friesen's Pictures of Facial Affect (1976). Ten Duplications of each face were made and coloured by placing a red, green or blue transparent folio in front of the picture. Figure 1 (see Appendix 1) present examples of the resulting faces.

In the unconscious condition of the EST the faces were presented for 6-13 ms only. This time is too short to allow conscious processing of faces (i.e. via the indirect pathway via the neocortex), but sufficient for unconscious processing (i.e. via the direct pathway via amygdale). A trial consisted of a slide of a fixation point, which was shown for 750 ms. This fixation point was followed by the target slide (the coloured, neutral, angry or happy face) and the mask (a meaningless picture). The colours of the mask were congruent with the colours of their target-faces. Every emotional face was presented in the three different colours. Thirty neutral faces, thirty angry faces and thirty happy faces were presented in a random order ranging. The task of the participants was to indicate the colour of the mask as quickly as possible. The participant's response was detected by the keyboard and registered by the computer's clock. An extra set of stimuli was prepared for practice-trials. For this practice trail only neutral faces were used.

In condition 2, the conscious condition, the same materials as in condition 1 were used. In this condition no masking of faces was presented. Once more, the instruction was to indicate the colour of the face as quickly

as possible and in addition to ignore the content of the picture. Both for the unconscious (masked) as the conscious (unmasked) condition the response latency times were assessed with the help of E-prime (version 2.0; Sneider, Eschman & Zuccolotto, 2001), a computer application, that is capable of generating these Emotional Stroop experiments and collecting millisecond precision data.

2.2.3 Awareness Check

To test whether participants were unaware of the presented faces in the unconscious condition an awareness check was administrated. The same coloured faces as in the EST were used, but instead of naming the colours the purpose was to indicate the emotions of the facial expressions. In this three-alternative forced choice procedure, a random set of 30 masked faces was shown to the subjects. Subjects were told in advance that 10 neutral, 10 angry and 10 happy faces were in the condition and they were instructed to indicate, through pushing a button, whether the presented slide had been a neutral, angry or happy expression. Despite the fact that in most cases the subject had no clue of the facial expression, he or she had to make a choice. To avoid the possibility that subjects were aware of the emotional faces a cut-off was determined. Through a non-parametrical binomial test a cut-off score of 15 was determined. The minimal chance-level performance lies at 10 correct answers and the maximal level at 15 correct answers. Subjects with a score above 15 correct answers were excluded from the data. For subjects who scored 15 or less correct answers the masking was considered successful.

2.3 Procedure

At the beginning of the experiment participants were told that the researchers were interested in the relation between psychical complaints and the decoding of social stimuli and the environment. Thereafter, patients completed the questionnaires, followed by the two conditions of the EST. In order to perform this computer task, participants were seated at +/- 50 cm in front of computer in a comfortable position. The participants were instructed to ignore the content of the picture and to name the colour as quickly as possible. After the two conditions of the EST where completed participants completed the awareness check.

2.4 Statistics

The data of this pilot study were analysed with the Statistical Package for Social Science (SPSS, version 15.0). To investigate whether and how groups differed in demographical variables and in the self-reported aggression, depression, impulsivity, submission and perception of emotions I applied T-tests, Mann-Whitney U tests and Chi-square tests when appropriate. To investigate whether and how the patient groups performed differently on the EST a Multivariate Analysis of Variance (MANOVA) was applied. Groups (aggressive patients versus depressed patients) were entered as between-subjects factors whereas the different conditions of the Emotional Stroop Task (conscious and unconscious condition; neutral, happy and angry facial expression) were entered as within-subjects factors. In case of significant main or interaction effects, post-hoc analyses were performed to further investigate these effects. To investigate whether and how patients characteristics are associated with the subjects' performance on the EST I applied

Pearson Correlations. First I computed scatter plots to identify possible outliers in the data of the questionnaires. In cases of outliers in the data Spearman Rank Order correlations were applied. To investigate whether the associations between patients' characteristics and the subjects' performance on the EST differ between the two patient groups Linear Regression Analyses were performed. In these analyses the response latency to either the conscious or the unconscious version of the EST was predicted by level of education, group, patient characteristics (self-reported levels of aggression, depression, impulsivity and submission) and the interaction between group and patient characteristics. To compute the interaction term I calculated the product of the constituting variables. To avoid problems of multicollinearity the variables were centred (Xnew = Xold - Xmean) before calculating the interaction-terms (Aiken and West, 1991).

3. Results

3.1 Group characteristics

Twenty-seven outpatients of the Mental Health Care Friesland participated in this study. They were seven men and six women with MDD and fourteen men with IAD. Table 1 (Appendix 2) presents the demographical characteristics of the depressed and the aggressive participants. The two groups did not differ with respect to age ($t= 1.44$, $df= 25$, $p>.05$) or previous experienced other psychiatric disorders ($Chi^2 = 3{,}16$, $df = 1$, $p>.05$). Furthermore, both groups did not differ in the duration of the current symptoms. Sixty-nine percent of the depressed patients experienced the present symptoms for more than two years, 23% experienced the symptoms between one and two years and 8 % experienced the symptoms between six months and one year. In addition, 50 % of the aggressive patients experienced the symptoms for more than two years, 14 % experienced the symptoms between one and two years, 7 % experienced the symptoms between six months and one year and 29 % experienced the symptoms between one and six months ($U= 65.0$, $p>.05$). However, sixty-two percent of the depressive patients have experienced the same symptoms previously, in contradiction to 21 % of the aggressive patients ($Chi^2 = 4.33$, $df = 1$, $p<.05$). Both groups did also differ with respect to the highest achieved level of education ($U= 51.5$, $p<.05$). Depressed patients reported a higher level of education.

3.2 Data Questionnaires

Table 2 (Appendix 2) presents the mean scores on the questionnaires that measured the level of impulsivity (BIS); the severity of the depression (BDI); the level of hostility and tendency for aggressive behaviour (BDHI); and the level of submissive behaviour (GSS) for the two participants groups. In line with hypothesis one depressed patients reported higher levels of submission than aggressive patients ($t= 2.30$, $df= 19.7$, $p<.05$). Limited support was found for hypothesis two. Patients with IAD tended to report higher levels of hostility and aggressive behaviour than those with MDD ($t= -1.99$, $df= 25$, $p= .058$). Both groups did not differ in the severity of depression and impulsivity. These findings cannot be explained by the depressed women. Analyses on the male participants only did not lead to different results.

3.3 Data Emotional Stroop Task

Responses with answer errors were excluded from the data. Also, responses shorter than 300 ms and longer than 3000 ms were considered outliers, reflecting anticipatory and delayed responding. Latencies that were more than three standard deviations above each participant's mean were removed (Bradley et al., 1995). The error state for the depressed group was 1.7 % and for the aggressive group was 1.5 %.

To check successfully masking an awareness check was administrated. None of the participants reported to be able to identify the expressions of the faces. Only 34.2 % of overall responses was correct (chance performance = 33.3 %). The cut-off score of the awareness check was 15 correct responses. None of the participants scored above this limit; two participants scored exactly 15 correct responses. This indicates that the masking was successful.

Table 3 and figure 2 (Appendix 2) presents the response latencies for both conditions of the EST on all emotions and for both groups. To investigate whether the two conditions (conscious and unconscious presentation of the faces) and the emotional content of the face (angry, neutral and happy) affected the response latency of the subjects a Multivariate Analysis of Variance (MANOVA) was performed. The two conditions and the three emotions were entered as within subjects variables. Table 4a (Appendix 2) presents the findings. There was a main effect for condition ($F(1,25)= 14.71$, $p <.05$). As can be seen in table 3 and figure 2 (Appendix 2), the response latencies were significantly higher to the conscious (unmasked) condition than to the unconscious (masked) condition. There was no main effect on emotion. In addition, no interaction effects between condition and emotion were found. This indicates that the response latencies were not affected by the emotional content of the presented faces. I investigated whether response latencies are associated with the level of education. However, no significant associations were observed (unconscious condition: $R = -.243$, $p=.222$; conscious condition: $R = -.299$, $p=.129$).

3.4 Hypotheses testing

The findings on hypothesis 1 and 2 are already presented above. To further investigate the assumption that patients with MDD and patients with IAD are opposite in terms of the fight – flight system I tested a series of related hypothesis on the association between psychopathology and the decoding of social stimuli.

3.4.1 Hypothesis 3: Submissive behaviour is positively correlated with the response latency time on the EST.

To test this third hypothesis I conducted a Pearson Correlation. However, no significant associations between submission and the response latency time on the conditions of the EST were observed (unconscious condition: $r = -.016$, $p=.937$; conscious condition: $r = -.052$, $p=.798$).

To investigate for possible group differences of the associations between the response latencies of the EST and self-reported submission I applied Multiple Regression Analyses. The response time latencies of the conscious and unconscious conditions of the EST were entered as the dependent variables, level of education, self-reported submission, and the interaction between self-reported submission and patient groups were entered as the independent variables. The interaction effect between group and submissive

behaviour was significantly associated with the response latency to the unconscious condition. For the conscious condition a tendency in the same direction was observed. Table 5 and figure 3 (Appendix 2) presents these findings. This indicates that the association between self-reported submission and the response latencies to the EST differ between depressed patients and patients with impulsive aggressive disorder. Separated analyses on the depressed patients and on the aggressive patients revealed that self-reported submission is positively associated with response latency to the unconscious EST in aggressive patients, but not in depressed patients. Hence, the third hypothesis received only partial support from the findings.

3.4.2 Hypothesis 4: Compared to depressed men and women, patients with impulsive aggressive disorder show a shorter response latency time on the EST.

A Multivariate Analysis of Variance (MANOVA), with group (depressed patients vs. aggressive patients) as between-subjects variables and condition and emotions entered as within-subjects variables revealed no significant main effects on group (see table 4b (Appendix 2)). The effect size (D^2= .26) indicates a small effect. Also, the interaction effects between groups and condition, between groups and emotion, and between groups, condition, and emotions were non significant. Hence, depressed patients and impulsive aggressive patients did not perform differently on the EST. Based on these findings the fourth hypothesis has to be rejected.

3.4.3 Hypothesis 5: Subjects with impulsive aggressive disorder show a shorter response latency time to the unconscious (masked) condition of the EST than to the conscious (unmasked) condition of the EST.

A MANOVA with condition as within-subjects variables and the different emotions entered as within-subjects variables as well revealed a significant main effect on condition. This effect hold when only aggressive patients are investigated: the response latencies to the conscious condition of the EST are higher when compared to those to the unconscious condition ($F(1,13)= 9.29$, $p< .05$). This result supports the fifth hypothesis.

3.4.4 Hypothesis 6: Severity of depression is positively correlated to the response latency time to the EST.

The Pearson Correlation coefficients between severity of depression and response latency turned out to be non-significant (unconscious condition: r = .113, p=.575; conscious condition: r = .077, p=.703). To investigate whether these associations differ between the patient groups Stepwise Multiple Regression Analyses were performed. In these analyses the response latencies to the conscious and to the unconscious conditions of the EST were entered as dependent variables, whereas the level of education, patient group, severity of depression, and the interaction between severity of depression and patient group were entered as independent variables. The interaction effect did not predict the response latencies to the conscious and the unconscious EST. Hence, the sixth hypothesis has to be rejected.

3.4.5 Hypothesis 7: Aggression and impulsiveness are negatively correlated to the response latency time to the EST.

Because the depressed group showed a few outliers on the scores of the impulsiveness scale Spearman Rank Order Correlations were computed between impulsiveness and the response latency time to the EST. No significant association between impulsivity and the response latency time to the EST were observed (unconscious condition: R = .125, p=.535; conscious condition: R = .300, p=.128). In addition, I found no significant correlation between aggression and the response latency time to the EST (unconscious condition: r = -.004, p=.986; conscious condition: r = .231, p=.246). Table 6 (Appendix 2) presents these findings. I also investigated if there are any group differences in associations between aggression and impulsiveness and the response latencies to the EST. However, regression analyses did not reveal that the interaction effect between aggression and impulsivity on one hand and patient group on the other hand contributed to the prediction of the response latencies to the EST (see tables 5 (Appendix 2)). These results do not support hypothesis seven.

3.4.6 Hypothesis 8: Depressed women show a shorter response latency time to the EST when compared to depressed men.

A MANOVA with gender (men vs. women) as between-subjects variables and condition and emotions entered as within-subjects variables revealed a main effect for condition (see table 4c (Appendix 2)) As can be seen in figure 4 (Appendix 2), the response latencies were significantly higher to the conscious condition of the EST than to the unconscious condition for the men only. Furthermore, I found a interaction effect between condition and gender. This indicates that the response latencies were affected by gender. Figure 5 presents this effect. The main effect on condition was confined to the depressed men only. In line with hypothesis eight, depressed women demonstrate shorter response latency to the conscious condition of the EST when compared to depressed men.

4. Discussion

4.1 The overall assumption and related hypotheses

In this study I investigated the assumption that major depression and impulsive aggression are opposites in terms of the fight – flight system. According to Harmon-Jones & Allen (1998) is anger, during social conflict is associated with heightened approach and lowered withdrawal tendencies and makes offensive forms of aggression to others more likely (Lemeris & Dogde, 1993). Depression, on the other hand, is associated with withdrawal and submissive behaviours (Price et al., 1994 & Sloman et al., 1994). One could thus argue that depression and impulsive aggression are opposites in terms of fight – flight responses to social stressors. To investigate this assumption I tested a series of related hypotheses on the association between psychopathology and the decoding of social stimuli.

In line with this assumption I found that depressed patients reported higher levels of submission than aggressive patients. Also, patients with impulsive aggressive disorder tended to be more hostile and aggressive than depressed patients. To further support this assumption a series of hypotheses on the perception of facially expressed emotions in depressed patients and in patients with impulsive aggression were tested. For this purpose patients' response latencies were registrated from a series of consciously and unconsciously presented facial expressions. Partial support was found for the hypothesis that submissive behaviour is positively associated with the response latency time and the patient's response to the facial expressions. In patients with impulsive aggression, but not in depressed patients, self-reported submission is positively correlated with the response latency time to the unconscious condition of the EST. In contrast to the fourth hypothesis I found no difference in the response latency time between patients with impulsive aggression and depressed patients. In line with the fifth hypothesis, patients with impulsive aggression demonstrated longer response latency times to consciously presented faces than to unconsciously presented faces. However, one may note that this was also found for depressed patients. In contrast to the sixth hypothesis, no association was observed between the severity of depressive symptoms and the response latency time. Also, the seventh hypothesis that levels of self-reported aggression and impulsivity are associated with the response latency time was not supported by the results. In sum, since only a few hypotheses are supported by the data there is limited support for the assumption that patients with major depression and patients with impulsive aggressive disorder are processing emotional stimuli differently.

4.2 The fight – flight system and decoding of social stimuli

Adequate perception and interpretation of social stimuli are necessarily for an optimal functioning defence mechanism. Current research shows that decoding of social stimuli is impaired in patients with MDD as well as in patients with IAD. Van Honk et al. (2001) have shown that subjects who scored high on trait anger show attentional biases for negative information on the conscious and unconscious condition of the EST. According to for instance Mogg et al. (1995) patients with a major depression show an attentional bias for negative information. However an early automatic attentional bias has not been demonstrated in these patients. In this study, I compared both groups on decoding of social stimuli. I hypothesized that in

terms of the fight – flight response, impulsive aggressive patients process social threatening stimuli by the direct (bottom-up) pathway of the amygdala in contrary to depressed patient who process threatening facial stimuli by the indirect (top-down) pathway of the amygdala. The results of this study indicate that both patients with IAD as those with MDD process unconscious perceived emotional stimuli faster than conscious perceived stimuli. This finding is in line with the suggestion that unconscious social threatening stimuli are processed by the 'bottom-up' (direct) pathway for both groups. However, I did not found a difference between the two groups in response latencies for both conditions of the EST. In other words, the data show that unconscious perceived social stimuli are processed faster than conscious perceived stimuli. This difference accounts for both groups. In contrast to the assumption that IAD and MDD are opposites in terms of functioning of the fight – flight system, the present findings do not indicate that depressed and aggressive patients process social stimuli differently. One may note that I tested the processing of social stimuli and not the patients' response to these stimuli. Hence, it remains possible that a similar way of processing social stimuli does result into different responses between patients with MDD and those with IAD. In line with this suggestion, I found that the association between self-reported submission and the latency time on the unconscious condition of the EST differs between patients with impulsive aggressive disorder and patients with major depressive disorder. In patients with IAD, high levels of self-reported submission were associated with higher response latencies to the unconscious condition of the EST. One could suggest that in these patients, high levels of submission reduce the risk of an aggressive outburst in response to unconsciously perceived threatening stimuli. It is possible that masked or unconscious exposure conditions may reveal underlying tendencies uncontaminated by conscious control, experimenter expectations, or demand characteristics (Van Honk et al., 2001).

4.3 Gender effects

The fight – flight response is less likely to appear in women than in men (Taylor et al., 2000). In line with this assumption, the present study shows that depressed women show a shorter response latency time to the conscious condition of the EST than depressed men. Results seem to confirm the hypothesis, but based on the present findings it cannot be concluded that women and men show different innate defence mechanisms. According to Mufson and Nowicki (1991) and Hall (1978) are women more accurate and sensitive decoders than men. This could indicate that there is a possible gender difference in information processing. The present study demonstrates that this is in particularly true for conscious presented stimuli.

4.4 Comparison of the present findings to previous research

Van Honk et al. (2001) showed a significant relation between trait anger and selective attention to angry faces. In their research, high trait anger subjects slowed significantly down when colour naming angry faces. In the present study I could not replicate this finding in patient with IAD. Hostility and aggression only tended to be associated with the latency time on the EST. In both studies different questionnaires to determine the level of aggression and different populations were used. Instead of psychiatric patients, Van Honk et al. (2001) used healthy students as participants in their study. Hence, results of their research can

not be easily generalized to a clinical population: the results of research conducted with healthy students may not applicable to psychiatric patients.

Furthermore, the EST was administrated differently. I could not use a voice level detector to record the reaction time, instead I used the keyboard. The latter method could cause a delay and a higher error state. Responses with colour-naming errors are rare in Emotional Stroop tasks, but the use of a keyboard could facilitate more errors. In comparison, the error state in the study of Van Honk et al. (2001) was 1.1 % and the error state in this research was 2.2 %. However, a replication of the association between aggression and latencies on the EST as can be seen in the research of Van Honk et al. (2001) cannot be seen in this study.

4.5 Critical remarks and recommendations

Finally, some important limitations and drawbacks of this study should be discussed. First of all, the present findings are based on a small population-size. I compared 14 patients with IAD to 13 patients with MDD. Moreover, when only male participants were investigated the sample size is reduced considerably. Indeed, a larger sample size may improve the ability to discriminate the two patient groups on the basis of their response to the EST. Further research may demonstrate in how far the sample size hampered the detection of differences between the two patient populations.

Secondly, the groups did not differ in severity of depression, in severity of aggression or in severity of impulsiveness. One may therefore argue that even though the groups meet the diagnostic criteria to participate in the study, the lack of differences in aggression and depression between the groups hampered the finding of significant differences. There is an empirical basis for an interest in the link between depression and aggression. There are several studies that have found high levels of aggression in depressed patients (e.g. Riley, Triber & Woods, 1989; Swanson, Holzer, Ganju & Jono, 1990). Perhaps the fact that I used total scores of the questionnaires instead of subscores can explain these results. The BDHI consist of two subscales, namely covert and overt aggression. A study of Wolfersdorf and Kiefer (1999) show significantly higher scores of BDHI-sum scores in depressed patients when compared to healthy controls. The significantly higher scores on the BDHI for depressed patients were especially found in subscores called ‘inhibited aggression’ (covert aggression). No differences were found in open physical and verbal aggression (overt aggression) scores (Wolfersdorf & Kiefer, 1999). In other words, depressed patients and aggressive patients do not differ in sumscores on the BDHI, but possible that both groups differ in the way they express their anger.

Thirdly, patients with IAD and MDD reported different levels of submission, but not in terms of opposites. When one investigates this difference one may notice that neither the mean score of aggressive patients nor those of depressed patients are located near the ranges of the Gilbert Submissive Scale. They are opposites on the midrange of this scale (see table 2, Appendix 2). This limitation could also considerably reduce the findings.

Furthermore, another remark that should be discussed is that the two groups did differ in two aspects that are of relevance for social cognitive functioning: the highest achieved level of education and previous

episodes of the disorder. Both arguments are of importance with respect to social cognitive functioning (Mathews, MacLeod, 1994).

Another critical remark should be that in the unconscious condition the interference elements, the emotional faces, do not appear on a conscious level, this in contrast to the elements in the conscious condition. Therefore, one can argue that despite the emotional content of the interference faces patients show a longer response time to the conscious condition than to the unconscious condition. This could be a possible explanation for the difference in response latencies to the conscious and unconscious conditions. A recommendation for further research is that participants perceive emotional as well as non-emotional stimuli at an unconscious level to identify possible interference effects of emotional stimuli on an unconscious level.

Finally, one should notice that this research concentrates on response latencies only. Since the response latencies are no indicators for how emotional stimuli are being processed, the results in this study cannot provide any information about the manner of processing and the impact of the emotional stimuli on patients. In other words, by using a response latency task it remains impossible to fully explore the pattern of attentional processing during the presentation of emotional faces.

4.6 Conclusions and implications

The findings of the present study tend to refute the assumption that patients with MDD or IAD reflect opposites on the dimension of the fight – flight response system. However, findings do indicate that the relationship between the fight – flight response system and the decoding of social stimuli does differ between patients with IAD and those with MDD. There was no significant difference in response latencies to the Emotional Stroop Task for the aggressive and the depressed group, but it seems that different mechanisms predict the response latencies for both groups. Self-reported submission is positively associated with response latency to the unconscious condition of the EST in aggressive patients.

In how far mental disorders and psychopathology are a manifestation of maladaptive functioning of the fight-flight response system is still subject for future research. A recommendation for further research is to investigate whether and how patients with major depressive disorder and patients with impulsive aggressive disorder differ in the way they process emotional stimuli. No differences were found in the decoding of emotional stimuli for both groups, but perhaps in a later stage of emotional processing the two patient groups are opposites. Insight in the mechanisms of cognitive processing that underlie psychopathology enhances the possibilities to increase the efficacy of therapeutic interventions.

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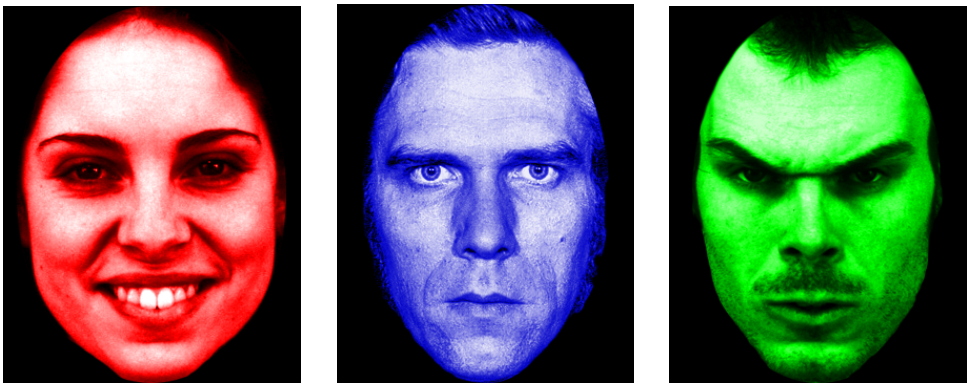
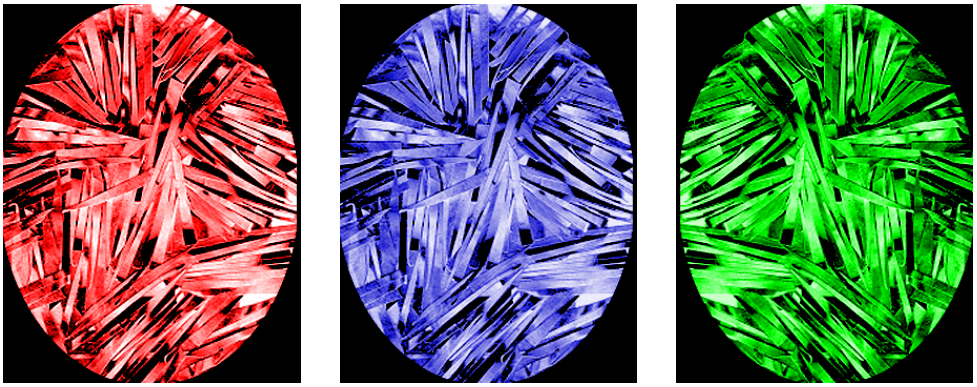
Appendix 1



a.



b.

Fig. 1 Figure 1a presents examples of Ekman and Friesen's Pictures of Facial Affect. Figure 1b shows examples of the masks in the masked (unconscious) condition of the EST.

Appendix 2

Table 1. Demographical characteristics of patients with major depressive disorder (MDD) and patients with impulsive aggressive disorder (IAD)

	Group	
Variable	**MDD (n= 13)**	**IAD (n= 14)**
Mean Age	39.6 (SD= 7.6)	34.9 (SD= 9.3)
Highest achieved level of education*	Mode = MBO	Mode = VMBO
Previously experienced same symptoms*	62 %	21 %
Other experienced psychiatric symptoms in the past	46 %	14 %

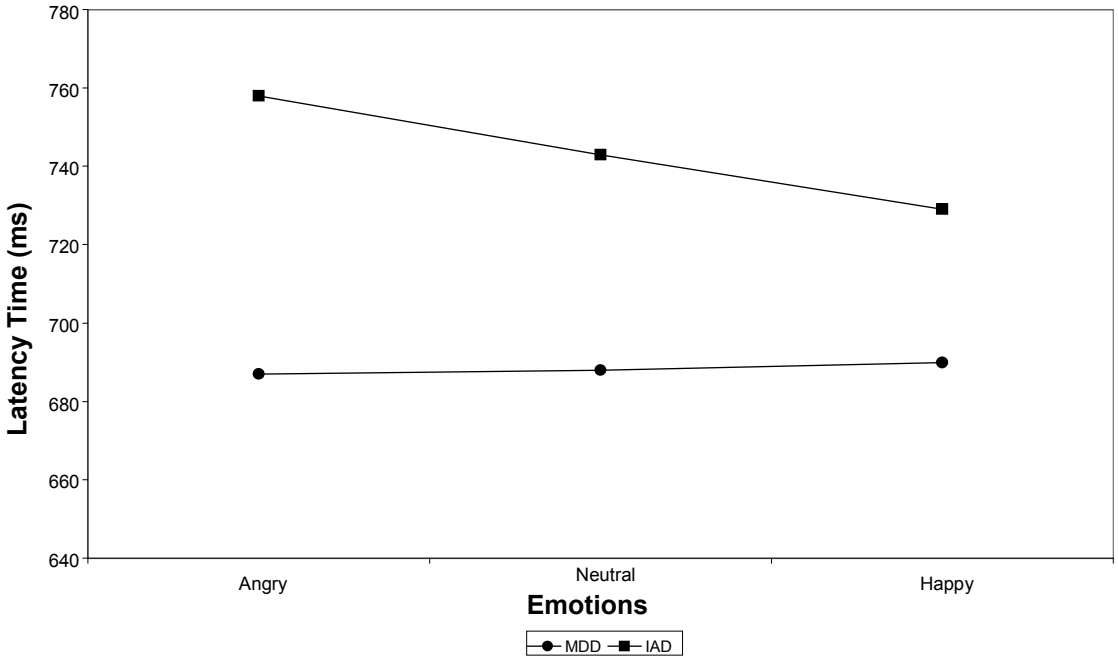
* indicates a significant difference between the two groups ($p<.05$)

Table 2. Group characteristics of patients with major depressive disorder (MDD) and patients with impulsive aggressive disorder (IAD)

	Group			
	MDD (n= 13)	**IAD (n= 14)**	**t(df)**	**p**
Variable	*Mean (SD)*	*Mean (SD)*		
Total BIS score	64.92 (8.21)	69.50 (9.26)	-1.35 (25)	.188
BDI score	24.62 (12.49)	17.50 (14.34)	-1.37 (25)	.183
Total BDHI score	72.77 (22.36)	90.14 (22.95)	-1.99 (25)	.058
Total GSS score	32.54 (10.74)	24.71 (6.63)	2.30 (19.7)	.035

Table 3. Means and standard deviations of the unconscious and conscious conditions of the EST for patients with major depressive disorder (MDD) and those with impulsive aggressive disorder (IAD).

	Group	
	MDD (n= 13)	**IAD (n= 14)**
	Mean (SD)	*Mean (SD)*
Conscious condition	688 ms (150)	743 ms (153)
Angry	687 ms (147)	758 ms (195)
Neutral	688 ms (154)	743 ms (151)
Happy	690 ms (153)	729 ms (130)
Unconscious condition	641 ms (114)	653 ms (125)
Angry	643 ms (111)	651 ms (120)
Neutral	650 ms (123)	652 ms (134)
Happy	632 ms (114)	656 ms (123)



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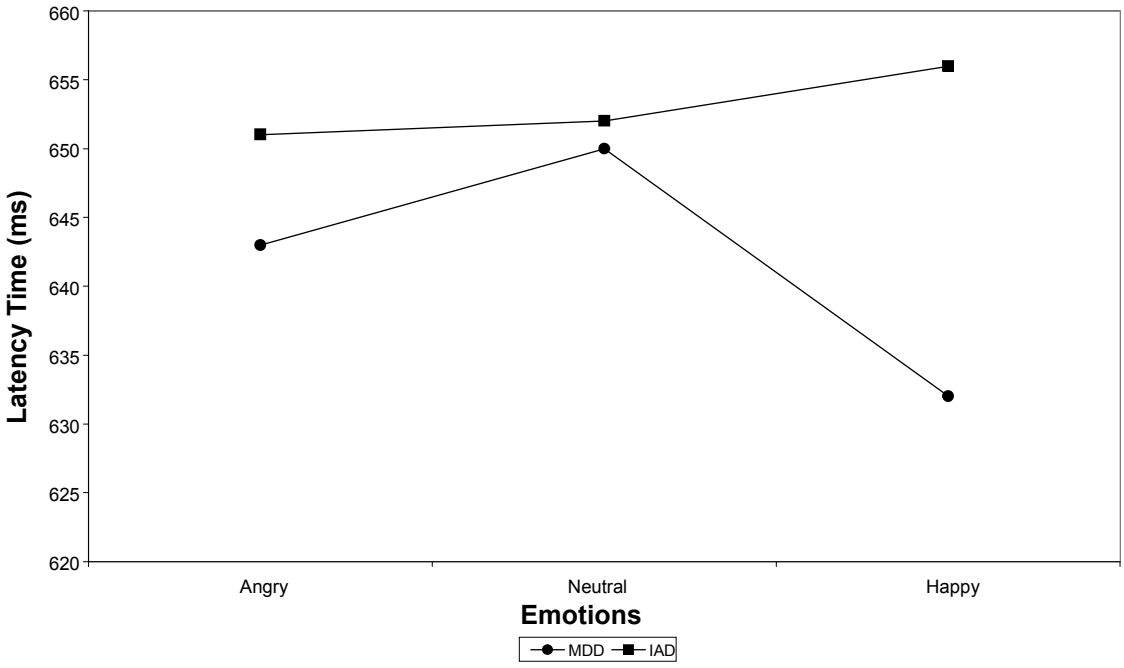


b.

Fig. 2 Figure 2a presents the mean response latencies for the conscious (unmasked) condition of the EST for patients with major depressive disorder (MDD) and patients with impulsive aggressive disorder (IAD). Figure 2b presents the mean response latencies for the conscious (unmasked) condition of the EST for patients with MDD and those with IAD. There is a main effect for condition MANOVA: F(1,26)= 14.78, p= .001. There is no main effect for emotions or group.

Table 4a. Multivariate Analysis of Variance (MANOVA) with *(unconscious vs. conscious) and emotions (angry, neutral and happy) entered as within-subjects variables. See text (§ 3.3) for a detailed explanation.*

Source	**F(df)**	**p**
Condition	F(1,26)= 14.78	.001
Emotions	F(1,26)= 1.08	.308
Condition x Emotions	F(1,26)= .499	.486

Table 4b. Multivariate Analysis of Variance (MANOVA) *with Group (depressed patients vs. aggressive patients) as between-subjects variables and condition (unconscious vs. conscious) and emotions (angry, neutral and happy) entered as within-subjects variables. There is one significant main effect for condition.*

Source	**F(df)**	**p**
Group	F(1,25)= .065	.805
Condition	F(1,25)= 14.71	.001
Condition x Group	F(1,25)= 1.51	.231
Emotions	F(1,25)= 1.01	.325
Emotions x Group	F(1,25)= .446	.510
Condition x Emotions	F(1,25)= .499	.486
Condition x Emotions x Group	F(1,25)= 2.59	.120

Table 4c. Multivariate Analysis of Variance (MANOVA) with Gender (men vs. women) as between-subjects variables and condition (unconscious vs. conscious) and emotions (angry, neutral and happy) entered as within-subjects variables. There are two significant effects: one main effect for condition and one interaction effect for condition x gender.

Source	**F(df)**	**p**
Gender	F(1,11)= 1.70	.204
Condition	F(1,11)= 8.15	.016
Condition x Gender	F(1,11)= 7.31	.021
Emotions	F(1,11)= .198	.665
Emotions x Gender	F(1,11)= .394	.543
Condition x Emotions	F(1,11)= 2.33	.155
Condition x Emotions x Gender	F(1,11)= .414	.533

Table 5a. Summary of Multiple Regression Analyses: The Gilbert Submissive Scale (GSS).

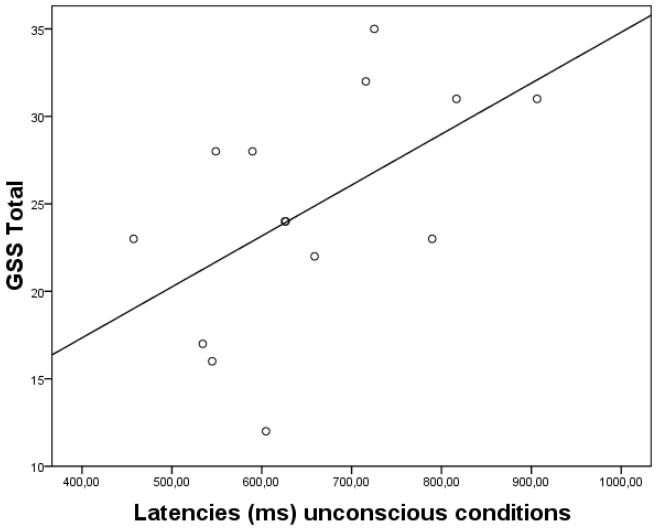
Model	Predictors	b-value	t(df)	p	Dependent variable
1	- Level of education	-.306	t(2,24)= 8.12	.145	*Latency time conscious condition*
	- GSS	.036	t(2,24)= .177	.861	
2	- Level of education	-.204	t(4,22)= -.978	.339	*Latency time conscious condition*
	- GSS	.272	t(4,22)= 1.189	.247	
	- Group	.201	t(4,22)= .908	.374	
	- Group x GSS	.431	t(4,22)= 2.04	.053	
1	- Level of education	-.207	t(2,24)= -.992	.331	*Latency time unconscious condition*
	- GSS	.043	t(2,24)= .207	.837	
2	- Level of education	-.129	t(4,22)= -.623	.539	*Latency time unconscious condition*
	- GSS	.281	t(4,22)= 1.234	.230	
	- Group	.096	t(4,22)= .437	.666	
	- Group x GSS	.521	t(4,22)= 2.488	.021	

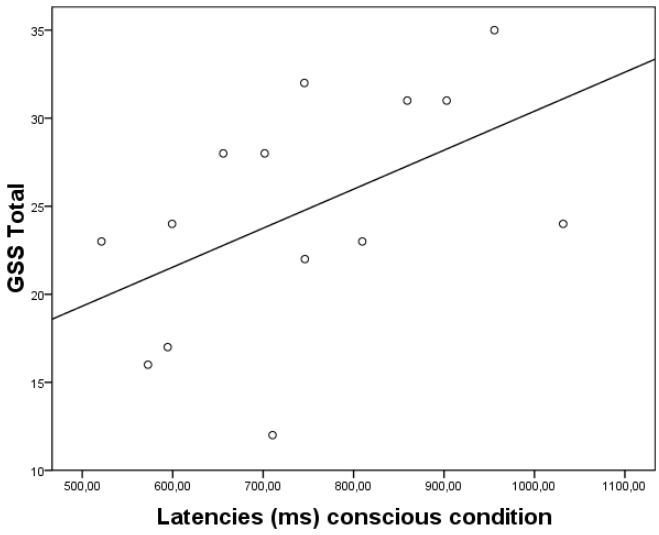
Table 5b. Summary of Multiple Regression Analyses: The Beck's Depression Inventory (BDI)

Model	Predictors	b-value	t(df)	p	Dependent variable
1	- Level of education	-.296	t(2,24)= -1.523	.141	*Latency time conscious condition*
	- BDI	.076	t(2,24)= .392	.699	
2	- Level of education	-.258	t(4,22)= -1.192	.246	*Latency time conscious condition*
	- BDI	.137	t(4,22)= .662	.515	
	- Group	.122	t(4,22)= .541	.594	
	- Group x BDI	-.226	t(4,22)= -1.141	.266	
1	- Level of education	-.194	t(2,24)= -.977	.338	*Latency time unconscious condition*
	- BDI	.113	t(2,24)= .566	.576	
2	- Level of education	-.201	t(4,22)= -.898	.379	*Latency time unconscious condition*
	- BDI	.141	t(4,22)= .660	.516	
	- Group	.009	t(4,22)= .041	.968	
	- Group x BDI	-.207	t(4,22)= -1.010	.324	

Table 5c. Summary of Multiple Regression Analyses: The Barratt Impulsivity Scale (BIS) and the Buss-Durkee Hostility Inventory (BDHI)

Model	Predictors	b-value	t(df)	p	Dependent variable
1	- Level of education	-.096	t(2,24)= -.442	.663	*Latency time conscious condition*
	- BIS	.371	t(2,24)= 1.700	.102	
2	- Level of education	-.066	t(4,22)= -.242	.881	*Latency time conscious condition*
	- BIS	.381	t(4,22)= 1.631	.117	
	- Group	.061	t(4,22)= .289	.775	
	- Group x BIS	-.050	t(4,22)= -.250	.805	
1	- Level of education	-.144	t(2,24)= -.606	.550	*Latency time unconscious condition*
	- BIS	.095	t(2,24)= .402	.691	
2	- Level of education	-.141	t(4,22)= -.525	.605	*Latency time unconscious condition*
	- BIS	.113	t(4,22)= .448	.658	
	- Group	-.038	t(4,22)= -.169	.868	
	- Group x BIS	-.062	t(4,22)= -.287	.777	
1	- Level of education	-.278	t(2,24)= -.953	.350	*Latency time conscious condition*
	- BDHI	.024	t(2,24)= .082	.936	
2	- Level of education	-.204	t(4,22)= -.638	.530	*Latency time conscious condition*
	- BDHI	.051	t(4,22)= .165	.870	
	- Group	.080	t(4,22)= .359	.723	
	- Group x BDHI	-.128	t(4,22)= -.612	.547	
1	- Level of education	-.443	t(2,24)= -1.517	.142	*Latency time unconscious condition*
	- BDHI	-.334	t(2,24)= -1.143	.265	
2	- Level of education	-.380	t(4,22)= -1.191	.246	*Latency time unconscious condition*
	- BDHI	-.283	t(4,22)= -.913	.371	
	- Group	-.006	t(4,22)= -.025	.980	
	- Group x BDHI	-.164	t(4,22)= -.788	.439	





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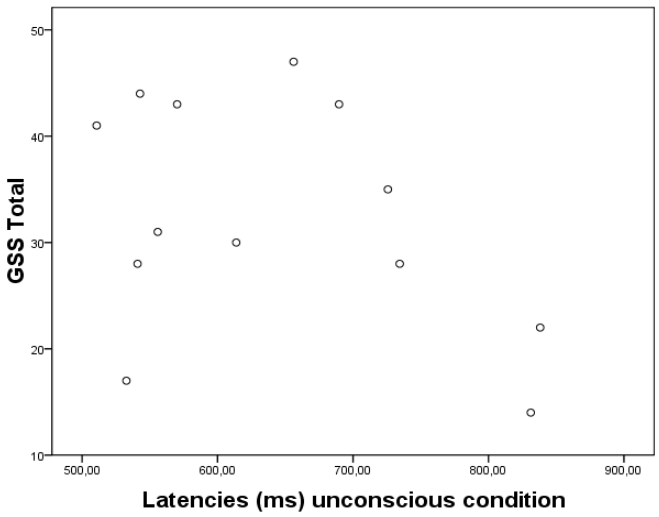
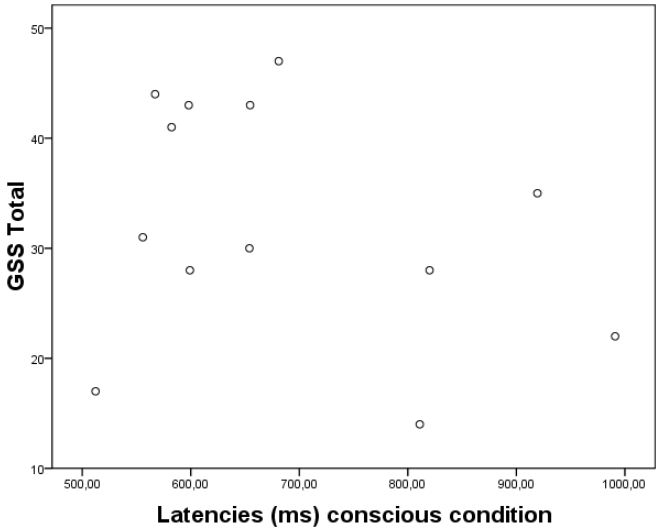




b.

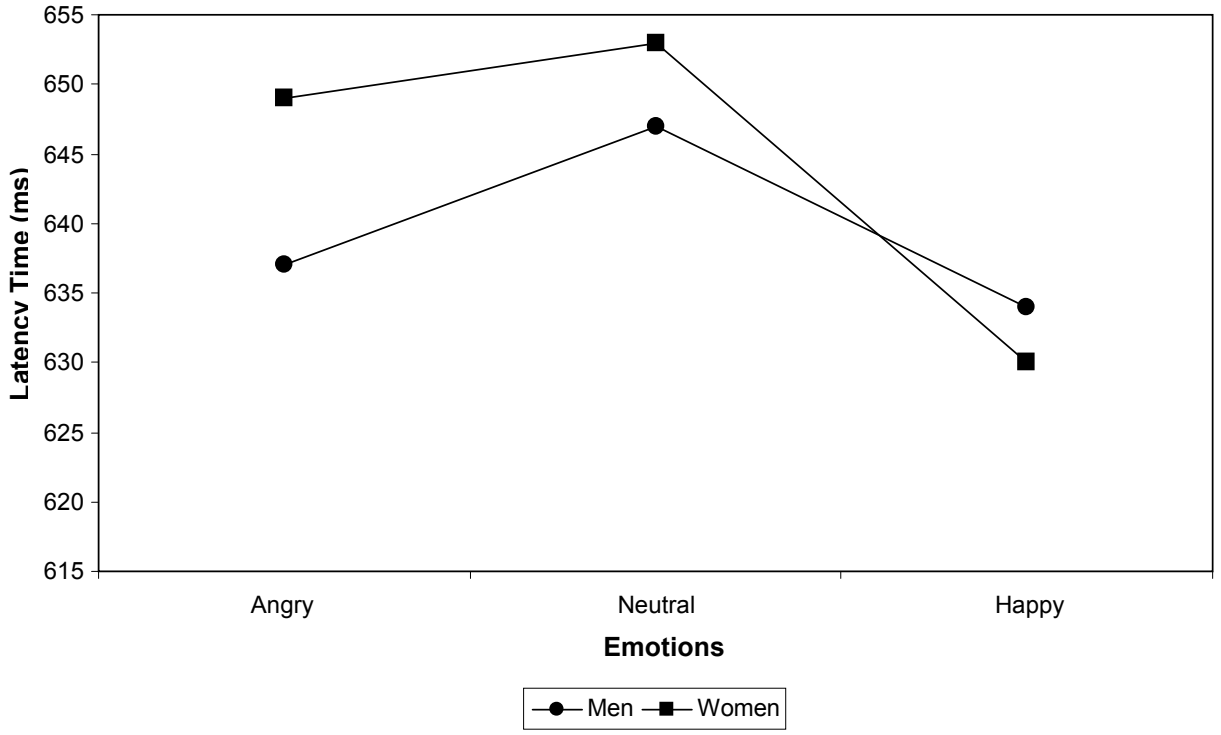
Fig. 3 Figure 3a presents scatter plots for patients with impulsive aggressive disorder and figure 3b presents scatter plots for patients with major depressive disorder. These plots indicate that for the aggressive group the unconscious condition of the EST was positively associated with self-reported submission whereas this association in depressed patients was non-significant.

Table 9. Pearson (r) and Spearman Rank Order (R) correlations. Significant correlations are presented in bold.

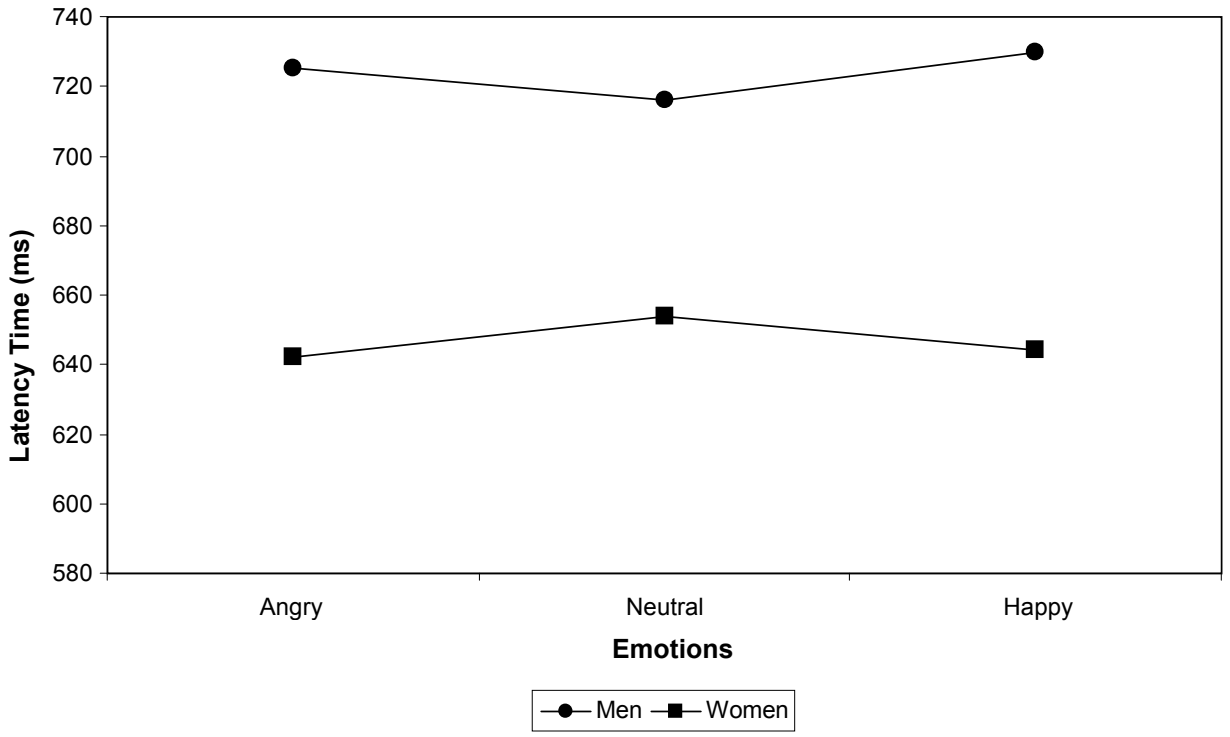
Correlations	*Latency time unconscious condition*	*Latency time conscious condition*	*BIS*	*BDHI*	*BDI*	*GSS*
Latency time unconscious condition						
Latency time conscious condition	**r= .787** **p= .000***					
BIS	R= .125 p= .535	R= .300 p= .128				
BDHI	r= -.004 p= .986	r= .231 p= .246	**R= .648** **p= .000***			
BDI	r= .113 p= .574	r= .077 p= .703	R= .302 p= .125	r= .167 p= .405		
GSS	r= -.016 p= .937	r= -.052 p= .789	R= .131 p= .516	r= -.208 p= .298	r= .335 p= .088	

Table 10. Means and standard deviations of the unconscious and conscious conditions of the EST for depressed men and depressed women.

	Gender	
	Men (n= 7)	**Women (n= 6)**
	Mean (SD)	*Mean (SD)*
Conscious condition	724 ms (182)	647 ms (103)
Angry	724 ms (174)	642 ms (107)
Neutral	716 ms (187)	654 ms (112)
Happy	730 ms (188)	644 ms (95)
Unconscious condition	639 ms (125)	644 ms (110)
Angry	637 ms (120)	649 ms (111)
Neutral	647 ms (124)	654 ms (134)
Happy	634 ms (138)	630 ms (92)



a.



b.

Figure 4. Figure 4a presents the mean response latencies for the unconscious (masked) condition of the EST for depressed men and depressed women. Figure 4b presents the mean response latencies for the conscious (unmasked) condition of the EST. The men scored significantly higher on the conscious condition of the EST than on the unconscious (masked) condition of the EST. This indicates a main effect for condition. This main effect cannot be found for the women.

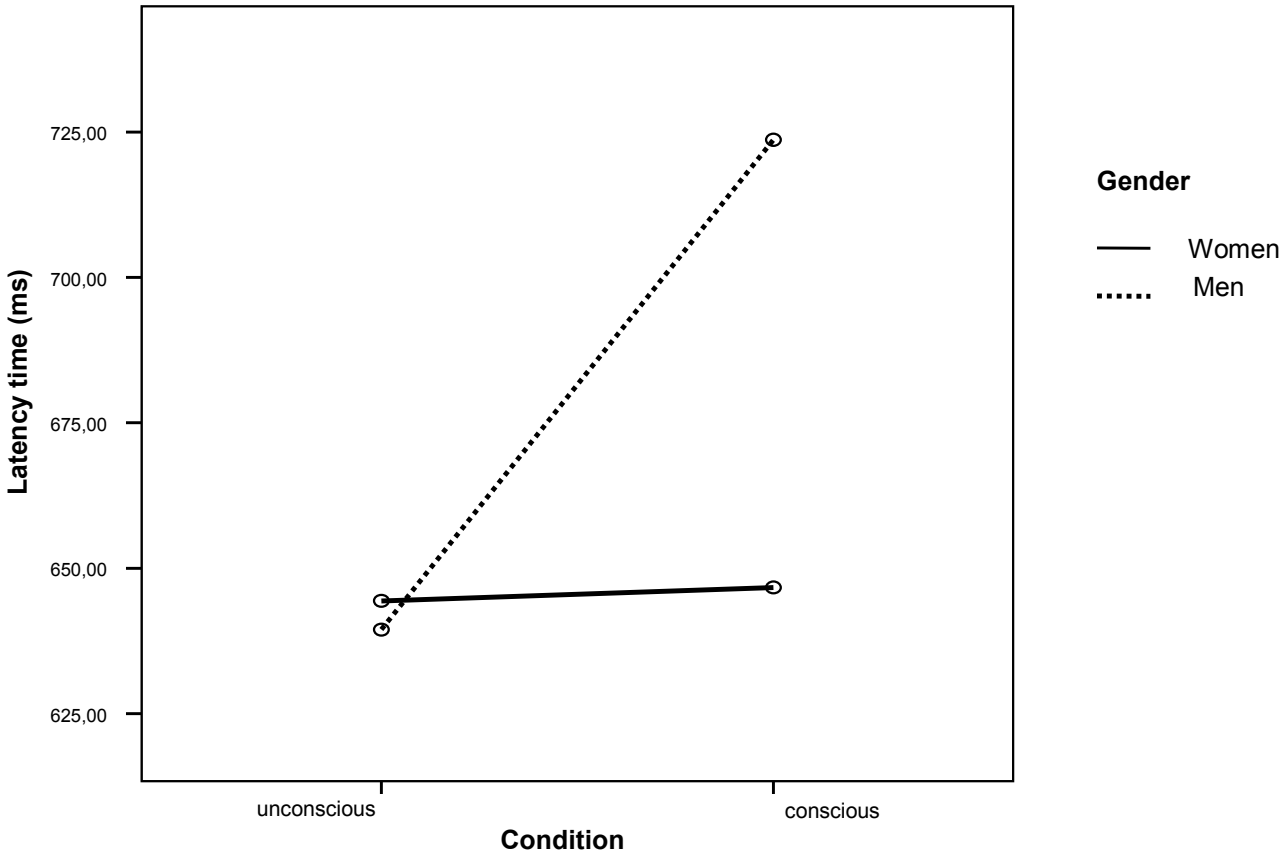


Fig 5. Interaction effect (condition x gender) MANOVA: F(1,11)= 7.31, p= .021.