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The effect of emotional context on cognitive inhibition and attentional processing in dissociative identity disorder

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Abstract

In light of previous research, the current study tested the hypothesis that dissociative identity disorder (DID) would be characterised by effective cognitive inhibitory functioning when tested in a neutral context, but weakened inhibition when tested in an emotionally negative context. Using a negative priming task (i.e. the flanker task) to assess inhibitory ability 11 DID, 11 depressed, and 11 general population participants were tested in the two differing experimental contexts. The contexts were manipulated by instructions and word stimuli, and following the completion of this task participants completed the Dissociative Experiences Scale and the Schizotypal Personality Scale. DID participants displayed a greater degree of self-reported anxiety in the negative context and as expected displayed a reduction in inhibition in this context but not in the neutral context. The degree of negative priming for the depressed and general population samples remained stable across contexts as did their anxiety levels. The DID sample displayed slower response times to negative compared to neutral words but this attentional bias was not evident for the two comparison groups. The relationship between increased arousal, inhibitory functioning, dissociation and information processing in DID is discussed.

Keywords: Cognitive inhibition; Attentional bias; Emotional context; Dissociative identity disorder

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1. Introduction

Being broadly characterised as breakdowns in integrated psychobiological processing and operating (American Psychiatric Association, 2000; Nijenhuis, van der Hart, & Steele, 2002), episodes of dissociation (e.g., dissociative symptoms) would be expected to have an impact on executive functioning in working memory. Executive functions are involved in attention, coordination of cognitive systems, planning, volition and action (Baddeley, 1996; Lezak, 1995). A fundamental question is whether pathological dissociative symptoms, and those people with a dissociative disorder, display generalised and stable anomalies in executive functioning, or whether given the association between trauma and dissociative symptoms anomalous executive functioning is more state dependent, vacillating between typical and atypical functioning depending on variables such as emotional state or emotional context.

Previous work has shown a relationship between aspects of executive functioning in working memory and dissociation when tested with neutral (Freyd, Martorello, Alvarado, Hayes, & Christman, 1998) and emotional stimuli (e.g., DePrince & Freyd, 1999; Waller et al., 1995). This work has utilised an incongruent colour-word task (i.e., Stroop, 1935) and word naming tasks to examining interference and attentional bias in information processing in non-clinical dissociators. Initial findings showed evidence of general and stable deficits in executive functioning in high non-clinical dissociators in the form of greater Stroop processing interference (using traditional neutral Stroop stimuli) and more attentional bias (i.e., slower processing) to threat words. In a later study of Stroop interference it was revealed that high non-clinical dissociators displayed less interference compared to low dissociators when performing two simultaneous tasks (i.e., dividing attention), and thereby loading working memory (DePrince & Freyd, 1999). Together (see Freyd & DePrince, 2001, for review) these findings suggest that while dissociation may be related to executive deficits when tested under selective attention conditions, it is related to enhanced performance when tested under divided attention conditions. In short, interference effects in high and low non-clinical dissociators display state-like characteristics that are dependent on environmental demands.

Studies with dissociative identity disorder (DID) samples examining cognitive inhibition, an executive process involved in selective attention, have demonstrated differing performances using differing experimental stimuli. With reference to cognitive inhibition, Baddeley (1996) argues that "one important role of the central executive should be to act as an attentional controller, selecting certain streams of incoming information and rejecting others" (p. 8). In line with this function, cognitive inhibition refers to the ability to withhold the mental representations of distracting stimuli from attention so that target stimuli can be fully processed with only limited interference from competing information (Neill, 1977; Tipper, 1985). Cognitive inhibition is a central process in the ability to engage in selective attention. Johnson and Dark (1986, p. 44) describe selective attention as the "differential processing of simultaneous sources of information". For differential processing of information at least two processes are required: the activation of relevant information and the inhibition of irrelevant information (Kane, May, Hasher, Rahhal, & Stoltzfus, 1997). In the laboratory cognitive inhibitory ability is often assessed via tasks of negative priming. Negative priming refers to the retardation in response time compared to baseline for a target stimulus presented as a distractor in the previous trial.

Using a negative priming task (the flanker task—see method for overview) to infer cognitive inhibitory ability, Dorahy, Irwin, and Middleton (2002, study 2) found no evidence of negative priming (i.e., weakened cognitive inhibition) in a sample of DID participants when words were used as experimental stimuli. However, in studies that used single digit numbers as test stimuli (Dorahy, Irwin, & Middleton, 2004; Dorahy, Middleton, & Irwin, in press), DID samples displayed significant negative priming (i.e., effective cognitive inhibition). Dorahy, Irwin, and Middleton (in press) suggest that word stimuli may create a more anxiety provoking experimental context than number stimuli because of the uncertainty surrounding the possible threatening quality of even emotionally neutral words for individuals with DID. The currently study was designed to directly address this issue by presenting participants with a single digit number negative priming task in two distinct emotional contexts. Single digit numbers were used in the negative priming task because, as mentioned above, DID samples have shown effective cognitive inhibition when using them. The emotional contexts were manipulated through specific experimental instructions and the use of neutral and emotionally charged negative words. In the first test session participants were told they would see neutral words and were presented with a single neutral word between a set of negative priming trials. In the second test session participants completed the same task but half the neutral stimuli were replaced with emotionally charged words and they were told that negative words would be presented. Along with the DID sample, a control sample and non-dissociative psychiatric sample were utilised to provide more experimental control. Given the theoretical and empirical link between reduced negative priming and both dissociation (Dorahy et al., 2002) and schizotypy (e.g., Beech & Claridge, 1987), these constructs were also assessed.

The study aimed to examine cognitive inhibitory ability in both a neutral and emotionally aversive experimental context. From the suggestive but inconclusive indications of previous studies, it was predicted that the DID sample would display significant negative priming (i.e., effective cognitive inhibition) in the neutral context, but no evidence of negative priming (i.e., weakened inhibition) in the negative context. In addition, following the results from Waller et al. (1995) in a non-clinical sample, it was expected that the DID group would display an attentional bias (i.e., slower response times) to negative words compared to neutral words.

2. Method

2.1. Participants

The DID sample comprised 11 participants (10 females; 1 male) with an Axis I diagnosis of DID from both a psychiatrist and an independent structured clinical interview assessment (i.e., Dissociative Disorders Interview Schedule; Ross et al., 1989). Ten of the 11 participants had taken part in at least one other study of information processing conducted several months before. Participants were aged between 20 and 46 years of age ($M = 33.7$ years, $SD = 9.1$) and had been in treatment for DID from between 2 weeks and 8 years. All participants completed both test sessions. The mean number of days between sessions was 7.7 (range 5–10). At the time of testing, 10 of the 11 participants were taking some form of psychotropic medication. The average daily dose of psychotropic medication for this sample was 148.72 mg.

The psychiatric comparison group was made up of 11 participants (10 females; 1 male) with an Axis I diagnosis of major depressive disorder. This diagnosis was supported by confirmatory results on the major depressive episodes section of the DDIS. Administration of aspects of the DDIS dissociative disorders section identified no participant in this sample as positive for a dissociative disorder. The sample ranged in age from 26 to 61 years ($M = 39.0$ years, SD = 11.6) and participants had been in treatment for depression from between 6 weeks and 15 years. All participants completed both test sessions. The mean number of days between test sessions was 8.6 (range 6–16). Ten of the 11 participants were taking psychotropic medication at the time of testing and the average daily dose for this sample was 152.63 mg.

The non-clinical sample had 11 participants (10 female, 1 male) ranging in age from 19 to 58 years ($M = 30.09$ years, SD = 13.7). Participants were undergraduate or postgraduate students in psychology ($n = 6$) and administrative staff in a psychology department ($n = 5$). No participant self-reported a history of psychotropic drug use or psychiatric illness and all completed both test sessions. The mean number of days between testing was 9.45 (range 6–17).

2.2. Materials and procedure

The experimental tool for measuring negative priming was the flanker task. The flanker task requires participants to name the middle stimulus of three horizontally presented stimuli. The first presentation is referred to as the prime trial and the second presentation, displayed shortly after a response to the prime trial (e.g., 500 ms), is referred to as the probe trial. In the baseline condition there is no association between prime and probe stimuli. However, in the ignored repetition trial, the prime distractor stimulus becomes the probe target stimulus. The difference in reaction time to probe target stimuli between the baseline and ignored repetition conditions is a measure of negative priming ability. Single digit numbers between 1 and 9, with the omission of the two syllabled 7, were used as flanker stimuli. A flanker set contained the presentation of a prime and probe trial. Participants were randomly presented with 12 baseline sets and 12 ignored repetition sets. To minimise the likelihood of episodic memory (i.e., non-inhibitory) effects on task performance (see Kane et al., 1997), the probe trial presentation time was set slightly longer than that of the prime trial (see Table 1).

Table 1
Conditions, stimuli and timing parameters for the Flanker task

	Neutral condition	Negative condition	Timing (ms)
Fixation point	+	+	500
Prime (example)	1 2 1	3 1 3	100
Probe (example)	4 1 4	2 4 2	150
Blank screen			3000
Fixation point	+	+	500
Single word stimulus (example)	Book	Hell	100
Blank screen			3000
Fixation point	+	+	500
Prime (example)	3 4 3	2 1 2	100
Probe (example)	2 1 2	3 2 3	150

Following each flanker set a single 4 or 5 letter emotionally neutral or negative word was presented. As well as being partly responsible for the manipulation of emotion across neutral and negative experimental contexts, the placement of these words was designed to minimise any cognitive 'leakage' effects that may otherwise impact on a continually presented stream of flanker trials. Stimuli in this word-naming task for the neutral context were all neutral, everyday words; in the negative context, the word stimuli comprised half negative and half neutral words (see Appendix A for word stimuli used in each context). A composite list was used in the negative context so as not to overwhelm participants with negative stimuli that may lead to dissociative episodes and thereby reduce the quantity of valid experimental data. Also, it was deemed that the instructions given to participants before the second (negative) session regarding the emotional valence of the list would have the principal impact on anxiety levels, and the use of some negative words would serve largely to verify this information. To minimise dissociative episodes (e.g., identity alterations, freezing) during the experimental procedure all negative words were non-abuse related words, such as 'death', 'pain', and 'evil'.

The words used in each context were taken from larger lists of neutral and negative words accrued from the Oxford English dictionary. A likert-type scale ranging from (1) very aversive through (4) neutral to (7) very positive was constructed, and words were rated for their emotional valence by 9 independent non-clinical raters. Words with mean ratings of 2.5 or less were classified as emotionally negative, words with mean ratings between 3.5 and 5 were deemed neutral. The negative word list did not differ from the neutral word list in terms of frequency of use in the English language (Francis & Kucera, 1982).

Before the presentation of flanker prime trials and word-naming stimuli a fixation point was presented in the centre of the screen to identify the exact location of the to-be-named target stimulus. Participants were assessed in two separate, emotionally distinct test sessions. Across test sessions the flanker sets remained constant in terms of stimuli and presentation order so that the only difference between the two sessions for the flanker task was the emotional valence of the experimental context (i.e., instructions given and word stimuli presented between flanker sets). In the first test session participants received the neutral word list and were told beforehand that all non-number stimuli would be neutral everyday words, such as 'book', 'make', or 'note'. Following the completion of this session, each participant was invited to return approximately one week later to complete the flanker task again. At this point, each participant was told that the flanker task would remain the same but that some of the words presented would be emotionally negative, like 'death', 'hurt', or 'harm'. This information was repeated before the participant completed the consent form at the beginning of the second session. Consequently, both the information given before testing and the word stimuli utilised during testing accounted for the manipulation of emotion in the study. DID participants were requested to complete the study in both contexts using their ''host'' personality.

Table 1 summarises the conditions, stimuli and timing parameters for the study. The response-stimulus interval between a prime response and a probe presentation was set at 500 ms.

All participants were instructed to say the target (middle) number in each flanker trial and the single intervening word as quickly but as accurately as possible. Moreover, they were told that mistakes would be reported following the computer task, thus focusing attention towards response accuracy and thereby allow inhibition of distractor stimuli time to develop. The procedure was outlined pictorially on the information sheet and practice trials were given before commencement.

Before commencing the flanker task each participant was asked to rate their level of anxiety for doing the task. A Subjective Units of Distress Scale (SUDS) was adopted where 1 represented "no anxiety" and 10 represented "unable to be involved in the study due to my anxiety".

Following completion of the flanker task in the first session participants completed the Schizotypal Personality Scale (STA; Claridge & Broks, 1984) and the Dissociative Experiences Scale (DES; Carlson & Putnam, 1993). In addition, the relevant sections of the DDIS were administered. That is, the DID group was given the sections assessing dissociative symptoms as well as amnesia and DID diagnoses, and the depressed group was administered the section assessing an Axis 1 diagnosis of major depression and sections assessing dissociative disorders. The second session (negative context) required participants to only complete the flanker task and to rate their level of anxiety before commencement. All participants were debriefed about their experience of the study at the end of both test sessions.

With reference to the survey measures, the STA contains 37 items designed around the DSM-III criteria for schizotypal personality disorder (Claridge & Broks, 1984). It contains a dichotomous yes/no response format. The STA was designed on the basis of both personality and clinical accounts of psychotic traits and assesses the positive symptoms of schizophrenia (Mason, Claridge, & Williams, 1997). Claridge and Hewitt (1987) report an alpha coefficient of .86. Factor analytic work has suggested that the STA has three factors that are relatively orthogonal (i.e., correlations from .21 to .46 between factors) and contain 8 items each (Hewitt & Claridge, 1989). The factors or subscales are described as magical ideations (items 1, 18, 20, 22, 28, 30, 32, 34), unusual perceptual experiences (items 4, 9, 11, 13, 19, 23, 26, 32), and paranoid ideation and suspiciousness (items 2, 12, 14, 15, 16, 25, 27, 29).

The DES is the most widely used and researched self-report measure of dissociation (Carlson, 1997) and comprises 28 self-report items tapping both pathological and non-pathological types of dissociation (Waller, Putnam, & Carlson, 1996). Items assess dissociative alterations in identity, cognition, and awareness (Carlson & Putnam, 1993). Respondents are required to indicate on an 11-point scale ranging from 0% (never) to 100% (always) how often they experience each item when *not* under the influence of alcohol or drugs. Collectively, eight items of the DES (known as the Dissociative Experiences Scale-Taxon; DES-T) have been shown to index pathological dissociative tendencies (Waller et al., 1996). The total DES score is the mean of the 28 items (DES-T total score is the mean of its eight items); thus scores range between 0 and 100. The psychometric properties of the DES have been well supported (See Van IJzendoorn & Schuengel, 1996).

The DDIS is a structured clinical interview designed to assess dissociative disorders and related symptoms and conditions; for example, subscales assess Schneiderian symptoms, depression, and borderline personality disorder. The DDIS comprises 132 items and has displayed good sensitivity for detecting true cases of DID (Ross, 1995). Moreover, Kappa coefficients for detecting agreement between clinical judgement and DDIS indications for the presence or absence of DID have been reported at over .9 (e.g., Ross, Heber, Norton, & Anderson, 1989).

For the purpose of psychotropic medication quantification, antipsychotics were converted to their chlorpromazine equivalent, anti-depressants were bought to their amitriptyline equivalent, and anxiolytics and sedative were bought to their diazepam equivalent.

2.3. Research design

The statistical model for the flanker task was a 2 (context: neutral/negative) × 2 (condition: baseline/ignored repetition) × 3 (group: DID/psychiatric/non-clinical) design with the first two variables being repeated measures. The design for response speed was a 3 (word/context: neutral words in neutral context/neutral words in negative context/ negative words in negative context) × 3 (group: DID/psychiatric/non-clinical model) with the first variable being repeated measures.

3. Results

There were no significant differences between groups for age [$F(2,30) = 1.64$] or days between testing [$F(2,30) = .96$]. In addition, the total daily dosage of psychotropic medication did not differ for the DID and psychiatric comparison samples [$t(20) = .07$]. A two-way mixed ANOVA (context by group) on anxiety scores showed no main effect for context [$F(1,30) = .94$] or group [$F(2,30) = .07$]. However, the interaction between context and group was significant [$F(2,30) = 6.84$, $p < .01$]. Post-hoc analyses show that the DID sample were more anxious in the negative context than the neutral context [$t(10) = 2.83$, $p < .05$]. The psychiatric [$t(10) = 1.11$] and non-clinical [$t(10) = 2.02$] groups displayed no significant variation in anxiety between the neutral and negative contexts.

Table 2 displays the means and standard deviations across samples for the DES, DES-T, STA, STA Magical Thinking subscale, STA Unusual Perceptual Experiences subscale and the STA Paranoid Ideations and Suspiciousness subscale. One way between subject ANOVA's show a significant differences between groups for the DES [$F(2,30) = 21.5$, $p < .001$], DES-T [$F(2,30) = 24.3$, $p < .001$], STA [$F(2,30) = 18.5$, $p < .001$], Magical Thinking [$F(2,30) = 7.9$, $p < .01$], Unusual Perceptual Experiences [$F(2,30) = 20.2$, $p < .001$] and Paranoid Ideations and Suspiciousness [$F(2,30) = 15.8$, $p < .001$]. Post-hoc Tukey's HSD tests show that the DID sample produced significantly higher scores than the psychiatric and non-clinical samples on all measures except the Paranoid Ideation and Suspiciousness subscale. The DID and psychiatric samples did not differ on this measure but produced higher scores than the non-clinical group. With this exception, the psychiatric and non-clinical samples did not differ on all surveys.

Table 2
Means and standard deviations (in parenthesis) across groups for the DES, DES-T, STA and STA subscales

	DID	Psychiatric	Non-clinical
DES	55.1 (18.3)	20.3 (17.7)	14.9 (8.9)
DES-T	51.5 (22.7)	14.3 (15.0)	6.6 (6.4)
STA	30.3 (5.3)	19.6 (7.9)	14.1 (5.6)
Mag. Think.	6.1 (1.6)	3.5 (2.3)	3.5 (1.3)
Un. Percep. Exp.	6.9 (1.2)	3.5 (2.3)	2.4 (1.6)
Par. Id. & Susp.	6.7 (1.7)	4.7 (1.7)	2.1 (2.4)

Table 3
Descriptive statistics for each experimental condition and context, and the priming effects in both neutral and negative contexts for each group

	Neut.base	Neut.IR	Negat.base	Negat.IR	Neut.PE	Negat.PE
DID	667.71 (114.7)	693.25 (132.2)	633.74 (110.3)	639.19 (91.9)	−25.54 (40.2)	−5.45 (43.1)
Psychiat.	592.12 (148.8)	593.37 (147.9)	563.47 (64.2)	557.86 (57.1)	−1.25 (25.6)	5.61 (19.8)
Non-clin.	534.73 (46.8)	547.48 (46.9)	537.71 (59.0)	553.80 (63.8)	−12.75 (19.7)	−16.09 (19.9)

Neut.base = Baseline condition in neutral context; Neut.IR = Ignored repetition condition in neutral context; Negat.base = Baseline condition in negative context; Negat.IR = Ignored repetition in negative context; Neut.PE = -priming effect (baseline−ignored repetition) for the neutral context; Negat.PE = priming effect (baseline−ignored repetition) for the negative context.

Table 4
Means and standard deviations (in parenthesis) for word naming reaction times

	Neut. in neutral	Neut. in negative	Neg. in negative
DID	682.45 (148.29)	671.84 (115.18)	736.48 (157.43)
Psychiatric	645.06 (133.57)	636.59 (83.24)	646.01 (85.12)
Non-clinical	550.12 (42.63)	550.64 (49.90)	551.53 (43.41)

With reference to the priming effect, Table 3 shows the means and standard deviations for each group across context and condition. The priming effects in both the neutral and negative contexts are also displayed. Non-parametric tests were performed to assess the main effects of context, condition and group due to the heterogeneity of variance between groups. There was no main effect for context [$Z = 1.37$; Wilcoxon test], suggesting that reaction times did not differ across the neutral and negative contexts. The condition main effect reached significance [$Z = 1.99$, $p < .05$; Wilcoxon test], indicating an overall negative priming effect (−9.25 ms). In addition, the main effect for group was significant [$\chi^2(2) = 10.44$, $p < .01$; Kruskal-Wallis test] with the DID sample producing significantly slower reactions times than the control group ($p < .01$).

Because the priming effects of central importance to the current paper were unidirectional (i.e., negative), one-tailed z-tests were performed on the priming effects for the DID and non-clinical samples in each context (see Table 3 for priming effects in each condition). A significant negative priming effect was evident for the DID sample in the neutral context [$z = 2.11$, $p < .05$] but not the negative context [$z = .42$], while the non-clinical group displayed a significant negative priming effect in both the neutral [$z = -2.14$, $p < .05$] and negative contexts [$z = 2.68$, $p < .05$]. As evident from an inspection of Table 3 the psychiatric sample failed to produce a negative priming effect in either context.

Response speed to neutral words in the neutral context, neutral words in the negative context and negative words in the negative context are presented in Table 4. Again the large variance in the DID and psychiatric groups compared to the non-clinical groups indicated the use of non-parametric procedures. The main effect for word/context [$\chi^2(2) = 3.15$; Friedman test] fell short of significance. However, the main effect for group reached significance [$\chi^2(2) = 12.93$, $p < .01$;

Kruskall–Wallis], with the DID sample showing significantly slower response times than the control group ($p<.01$). The DID sample were significantly slower to respond to negative words (in the negative context) than neutral words in the negative context [$z=2.76$, $p<.01$]. As evident on inspection of Table 4, the psychiatric and non-clinical samples showed no difference in response time for neutral and negative words in the negative context. With reference to between group differences in the differing word/contexts, the DID sample were slower than the non-clinical group to respond to neutral words in the neutral context ($p<.05$), neutral words in the negative context ($p<.01$) and negative words in the negative context ($p<.01$).

Notwithstanding the small sample size ($N=33$), non-parametric partial-correlational analysis showed that word response speed was related to the measures of dissociation when controlling for schizotypy (i.e., STA scores). This finding however was only evident in the negative context and for negative stimuli. Under these conditions response speed was significantly related to DES ($r=.46$, $p<.01$) and DES-T ($r=.40$, $p<.02$) scores. The relationships between response speed and dissociation measures in the negative context for neutral words fell marginally short of significance (DES: $r=.34$; DES-T: $r=.30$), and there was no association between these variables in the neutral context. Finally, neither dissociation nor schizotypy were related to negative priming in either context.

4. Discussion

It was predicted that cognitive inhibitory processes in DID would display state-like characteristics when tested under differing emotional contexts. More specifically, it was expected that a DID sample would display effective inhibitory performance in a neutral, non-threatening context, but when tested in an emotionally negative context inhibitory ability would weakened. Support for this hypothesis was found in the form of significant negative priming in the DID sample in the neutral context, but non-significant negative priming in the negative context. Consistent results were found across contexts for the comparison groups with the control sample displaying significant negative priming in both neutral and negative contexts and the psychiatric group displaying no evidence of negative priming in both contexts. Support was also found for the hypothesis that the DID sample would display an attentional bias to negative stimuli, with response speed to emotionally charged words being significantly slower than to neutral words in the negative context. This finding is consistent with Waller et al.'s (1995) in a non-clinical (high versus low dissociator) sample. The psychiatric comparison sample displayed no difference in response speed to neutral and negative words, and the fact that the non-clinical sample displayed essentially the same response times to the three word naming conditions indicates that there was no inherent differences in processing or reaction time for the neutral and negative lists.

With reference to the negative priming results, the significant effect found in the non-clinical sample validated the effectiveness of the procedure for examining cognitive inhibition. However, the finding of no self-reported differences in anxiety across the two contexts for the psychiatric and control samples impedes the generalizability of results and suggests the stimulus words were not arousing enough to increase anxiety in the negative context for the comparison groups. Thus, *in this study* the negative priming results for the psychiatric and non-clinical groups may not effectively represent true comparison groups for the negative priming result of the DID sample in

the negative context. The DID sample self-reported more anxiety in the negative context and their ability to engage in cognitive inhibition was markedly reduced. There is evidence that individuals with depression display a general reduction in cognitive inhibitory ability (e.g., MacQueen, Tipper, Young, Joffe, & Levitt, 2000), so anxiety may have little impact on inhibitory processes in the psychiatric comparison sample used in this study. However, had the control samples displayed more anxiety in the negative context they *may* have also demonstrated reductions in negative priming. Comparative to the neutral context state anxiety may have been higher in the comparison samples when presented with negative words, but the methodology did not allow for a sensitive on-going assessment of anxiety during both contexts. Thus, as it currently stands the results do not provide a basis for suggesting that reductions in cognitive inhibitory functioning are specific to DID in threat contexts because of the lack of difference in anxiety scores across contexts for the comparison samples and the indication that the psychiatric comparison group (i.e., participants with depression) displayed no evidence of inhibition in the neutral context. What can be stated with some confidence is that DID is characterised by a weakening of inhibitory functioning in anxiety-provoking environments. Future work will need to determine if this is a specific feature of DID or whether, and perhaps more probably, weakened inhibition is directly related to increased anxiety and this better accounts for the current priming results.

Turning specifically to the attentional bias finding, two issues are pertinent. Firstly, previous studies of attentional bias, mainly in anxiety disorder groups, have demonstrated this bias only to stimuli that is consistent with fear schemas. For example, Foa et al. (1991) reported an attentional bias in a rape-related PTSD sample for rape-related words but not general threat words. This finding has also been reported in other anxiety disorders (e.g., Watts, McKenna, Sharrock, & Trezise, 1986). The stimuli used in the current task were not schema specific threat words, but rather more general negative words (e.g., death, agony, hell, gloom, hurt). Nonetheless, the DID sample displayed the attentional bias effect which tends to be reserved for schema specific stimuli in other samples. Foa et al. (1991) suggest that fear schemas are more elaborate and therefore require more processing resources, thus creating slower responsive actions for fear schema consistent stimuli. One interpretation of the current finding is that childhood abuse and neglect, an unpredictable and frightening core attachment relationship, and regular ongoing environmental stresses which evoke dissociative responses and create a continual sense of danger and hypervigilance may have lead to the development of broad, 'all-purpose' schemas which represent a generic negative appraisal of the world and are therefore sensitive to 'low-grade' aversive stimuli. If this is true future work should demonstrate attentional bias in DID both to idiosyncratic threat words (e.g., abuse related) and also to general emotionally negative stimuli. Both methodologically and in terms of understanding the psychobiological underpinnings of DID a finding such as this is important because in DID samples idiosyncratic, schema specific threat words are likely to be overwhelming and lead to dissociative episodes during testing. However, non-specific negative stimuli reduce the likelihood of dissociative episodes, while still being able to produce apparent effects on cognitive processing. Consequently, the use of generic negative stimuli allows the collection of data relevant to the elucidation of the underpinnings of DID while not neglecting the centrality of affect on cognitive processing.

Another interpretation of the attentional bias finding, and one directly related to the conceptualisation of DID, is based on Nijenhuis, van der Hart, and Steele's (in press) theory of structural dissociation of the personality. In this model DID is understood as a division in

psychobiological action systems which represent the management of everyday activites (Apparently Normal Personality, ANP) and defensive systems involved in the protection of the individual (Emotional Personality, EP). To engage successfully in the management of daily activities the psychobiological systems represented by ANPs tend to be detached from traumatic memories by way of partial or complete amnesia and emotional numbing. However, the psychobiological systems represented by EPs remain connected to traumatic memories and due to their defensive function are oversensitive to threat stimuli. With reference to the functioning of cognitive inhibitory mechanisms, ANP psychobiological systems would be expected to display effective inhibitory operations. But EP psychobiological systems, characterised by hypervigilance and hyperarousal, would be expected to display a generalised weakening in inhibitory functioning. Utilising the structural dissociation of the personality model, the effective inhibition evident in the neutral context may represent the dominant functioning of an ANP system. However, the weakened inhibitory performance in the negative context may represent the dominance of an EP system. Given the structural dissociative nature of DID, future work may benefit from examining the underlying cognitive architecture of discrete psychobiological action systems (i.e., ANPs and EPs).

The second finding of interest related to the word naming task was the significant positive correlation between dissociation and response speed to negative stimuli. This finding indicates that higher dissociation scores (on DES and DES-T) are related to slower negative word naming. Interestingly, there was no significant association between dissociation and neutral words in both the negative and neutral contexts. One interpretation of these findings is that dissociation has its primary impact on processing at the sematic (word meaning) level, so that the effects of dissociation have their most detrimental impact on processing once the meaning of a stimulus becomes evident, and is judged to be threatening. If dissociation was related to processing before the semantic level (e.g., perceptual), significant correlations would be expected between dissociation and the neutral stimuli in both contexts. Of many questions that remain is whether disruption at the semantic level is the only point where dissociation has an effect on information processing or whether dissociation has deleterious effects at other stages along the perception-cognition-behavioural response pathway. Dissociative behaviours such as freezing during threat exposure suggest that while dissociation may impact on processing at the semantic level it may also disrupt the conversion from cognitive representations to behavioural action. A more thorough theoretical and empirical investigation of this issue is a matter for future investigation.

As displayed by the DID sample in the negative context, weakened inhibitory functioning may be an adaptive response to anxiety-provoking situations as well as a concomitant cognitive reaction to hyperarousal. In non-anxiety provoking situations inhibition aids cognition by reducing the selection of peripheral, distracting stimuli that would drain essential processing resources away from target or focal stimuli. However, in potentially threatening situations, that may be characterised by hyperarousal and/or hypervigilence in individuals with DID, it becomes important to detect threatening stimuli quickly so they can be defended against. Consequently an adaptive cognitive imperative is the processing of both focal and peripheral stimuli lest information outside the focus of attention is threatening. This strategy is facilitated by weakened cognitive inhibition. Thus, in DID weakened inhibition may be an adaptive response in anxiety-provoking situations which allows peripheral stimuli to be processed more rapidly than if inhibitory processes were operating effectively. Stated in a more concrete way, reduced inhibition

may characterise the state of hypervigilance. However, the benefit in peripheral stimuli processing time gained from weakened inhibition is lost once a dissociative individual judges the stimuli to be aversive and this retardation of response or defensive action is related to dissociation (as inferred from the correlational findings and attentional bias result in the DID sample).

Initial support was found for the hypothesis that DID would be characterised by effective cognitive inhibition when tested in a neutral context but weakened cognitive inhibition when tested in an emotionally charged context. In addition, DID participants displayed a slower response time to negative words compared to neutral words in the negative context and slower responding to negative stimuli was related to heightened degrees of dissociative experience. In short these findings demonstrate a relationship between executive functioning and emotional experience in DID, and highlight the centrality of emotion in understanding the cognitive underpinnings of DID.

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Appendix A

Word stimuli for word-naming task in neutral and negative contexts

Neutral words (neutral context)	Negative & neutral words (negative context)
Open	Hell
Each	Rage
Make	Hurt
Next	Evil
Time	Guilt
Copy	Death
Keep	Grief
Year	Gloom
Turn	Agony
Link	Pain
Book	Fear
Crop	Harm
Panel	Fatal
Local	Cruel
Store	Shame
Stay	Awful

Other	Upset
Guide	Panic
Delay	Deck
Ship	Work
Unit	Seat
Move	Draw
Sent	Shop
Sign	Radio
Most	Point
Bring	Paper
Again	Know
Input	Start
Build	Post
Store	Keep
Track	Catch
Drift	Pick
Level	Cost
Paint	Meet
Extra	Range
Sound	Long

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