THE EFFECT OF CONTEXT ON DISGUST HABITUATION:

IMPLICATIONS FOR THE TREATMENT OF

BLOOD-INJECTION-INJURY PHOBIA

By

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[1] Standard errors are shown in error bars in all figures unless otherwise stated.

CHAPTER I

INTRODUCTION

Disgust has been recognized as a basic emotion since Darwin first described it as "…something revolting, primarily in relation to the sense of taste, as actually perceived or vividly imagined; and secondarily to anything which causes a similar feeling, through the sense of smell, touch and even of eyesight" (1872/1965). Like most basic emotions, disgust is recognizable across cultures (Eckman, 1992) with distinct facial expressions and specific cognitive, physiological, and behavioral manifestations (Eckman & Friesen, 1975; Izard, 1971). Early theories of disgust focused on food rejection (Angyal, 1941; Tomkins, 1963), and thus it has been suggested that disgust may function primarily as a guardian of the mouth (Rozin & Fallon, 1987; Rozin, Haidt, & McCauley, 2000). However, in addition to its evolutionary function of food rejection, disgust can be observed in response to a vastly heterogeneous array of aversive stimuli (Haidt, McCauley, & Rozin, 1994).

Given the range of disgust elicitors, such as rotting foods, smells, body products, insects, and vomiting, it seems intuitive that disgust would be an auspicious emotion to study. However, until fairly recently, research examining disgust was sparse at best. It was not until the emergence of Matchett and Davey's (1991) disease-avoidance model that disgust's potential implications for psychopathology began to surface. According to the disease-avoidance model, certain stimuli (e.g. small animals, blood) have acquired an association with the spread of disease or contamination. This association leads to heightened disgust towards the object and subsequent avoidance. However, researchers

expanding from the rather narrow scope of the disease-avoidance model have found that disgust plays a key role in the etiology and maintenance of several anxiety-related disorders including spider phobia (Matchett & Davey, 1991), snake phobia (Klieger & Siejak, 1997), blood-injection-injury (BII) phobia (Olatunji, Lohr, Sawchuk, & Westendorf, 2005), obsessive-compulsive disorder (Tolin, Worhunsky, & Maltby, 2006), health anxiety (Olatunji, 2009), and eating disorders (Davey, Buckland, Tantow, & Dallos, 1998). For example, self-report measures of disgust sensitivity, the propensity to experience disgust to a wide range of aversive stimuli, have consistently been found to positively correlate with measures of OCD (David et al., 2009; Thorpe, Patel, & Simonds, 2003), spider phobia (de Jong & Merckelbach, 1998; Mulkens, de Jong, & Merckelbach, 1996; Thorpe & Salkovskis, 1998) and BII phobia (Matchett & Davey, 1991; Olatunji, Williams, Sawchuk, & Lohr, 2006). Additionally, when compared to nonanxious controls, individuals with anxiety-related disorders report significantly greater disgust sensitivity(Koch, O'Neill, Sawchuk, & Connolly, 2002; Merckelbach, de Jong, Arntz, & Schouten, 1993; Olatunji, Lohr, Sawchuk, & Tolin, 2007; Olatunji, Lohr, Smits, Sawchuk, & Patten, 2009)

Of the anxiety disorders, disgust appears to be an especially prominent feature in BII phobia (Page, 1994). BII phobia is marked by an intense and irrational fear at the sight or anticipation of blood, wounds, syringes, injuries, mutilation, and similar stimuli (DSM-IV, American Psychiatric Association, 2000; Marks, 1988). The disorder, experienced by approximately 3% of the population (DSM-IV, American Psychiatric Association, 2000; Fredrikson, Annas, Fischer, &Wik, 1996), is the second most common specific phobia for which people seek treatment (Kleinknecht & Thorndike,

1990). BII phobia may also be considered life-threatening given that, in severe cases, phobic individuals may delay or even avoid seeking necessary medical care despite potentially negative health consequences (Kleinknecht & Lenz, 1989; Page, 1998).

Experimental research has found ample evidence supporting the role of disgust in BII phobia. For example, exposure to BII related stimuli is often accompanied by the experience of nausea and production of a disgust facial expression (Lumley & Mclamed, 1998). Indeed, although BII phobic individuals express both fear and disgust during exposure to threat-relevant stimuli (Olatunji, et al., 2005; Page, 2003), disgust is the dominant response (Sawchuk, Menuier, Lohr, & Westendorf, 2002; Tolin, Lohr, Sawchuk, & Lee, 1997). Additionally, it has been hypothesized that the unique fainting response that is observed in 75-80% of BII phobics may be attributed to parasympathetic activation that is characteristic of disgust(Levenson, 1992; Page, 1994). However, this notion has not been consistently observed in the literature. Gerlach and colleagues (2006) failed to find evidence for increased parasympathetic activation among BII phobics or even an association between disgust levels and parasympathetic activation, suggesting that disgust sensitivity may not directly explain the fainting response. Further, although Page (2003) found that highly disgust sensitive individuals reported more symptoms of faintness during exposure to BII stimuli compared to participants low in disgust sensitivity, other research has found that disgust sensitivity does not contribute unique variance to the prediction of BII-related fainting symptoms above the variance accounted for by fear and anxiety levels (Kleinknecht, Kleinknecht, & Thorndike, 1997; Olatunji, et al., 2006).

Despite conflicting findings regarding the causal role of disgust in BII-related fainting, research has found that individuals with BII phobia are characterized by a heightened disgust sensitivity, responding to both phobia-relevant and phobia-irrelevant aversive stimuli with more disgust than nonphobics (de Jong & Merckelbach, 1998; Koch, et al., 2002; Tolin, et al., 1997)and anxious controls(Sawchuk, et al., 2002; Tolin, Sawchuk, & Lee, 1999).For example, Sawchuk, Lohr, Tolin, Lee, and Kleinknecht(2000) found that BII phobics reported more disgust to stimuli related (e.g. injections, mutilation/death, envelope violations) and unrelated to their phobic concerns (e.g. odors, rotting foods, body products) compared to spider phobics and nonphobic controls. Additionally, Schienle, Schafer, Stark, Walter, and Vaitl (2005) found that while viewing disgust-related images unrelated to their phobic concerns, individuals with BII phobia reported greater disgust sensitivity, experienced greater disgust responses, and showed greater activation of the visual association cortex, suggesting a possible attention bias for disgust-evoking stimuli (Schienle et al., 2003). Taken together, these studies appear to be consistent with the notion that BII phobia is characterized by a generalized disgust proneness that is above and beyond disgust experienced towards threat-relevant stimuli. However, there remains a paucity of research examining the role of disgust in treatment of BII phobia.

Cognitive-behavioral models posit that BII phobia is maintained by overestimation of perceived harm during contact with and avoidance of the disgust-evoking features of threat-relevant stimuli(Cisler, Olatunji, & Lohr, 2009; Woody & Teachman, 2000).   Accordingly, exposure-based treatments are typically employed to weaken the association between cognitions regarding the feared stimulus and behavioral

avoidance. Although exposure-based treatments have been shown to be efficacious for the treatment of BII phobia (Ayala, Meuret, & Ritz, 2010), 20% – 60% of individuals with BII do not achieve clinically significant improvement (Ost, 1992; Ost, Fellenius, & Sterner, 1991; Ost, Hellstrom, & Kaver, 1992) with 33% - 50% experiencing a relapse of fear at follow-up (Boschen, Neumann, & Waters, 2009). These less than optimal outcomes may be partially due to the observation that exposure-based interventions are designed to solely target fear and not disgust. Given important differences in acquisition (e.g. learned experiences, cognitive processes, biological mechanisms, and sociocultural influences), disgust is an emotion that is easily learned but not easily forgotten (Rozin & Fallon, 1987; Rozin, et al., 2000; Woody & Teachman, 2000). Furthermore, Olatunji and colleagues (2007) found that while BII phobic individuals showed significant declines in both fear and disgust during repeated exposure, the decay slope for fear was significantly greater than for disgust. This finding suggests that disgust may be more resistant to extinction than fear in BII phobia. Therefore, the inclusion of exposure trials designed specifically to desensitize disgust may yield better treatment outcomes for BII phobia.

Very few studies have examined whether directly targeting disgust in the context of exposure-based treatment facilitates better outcomes in BII phobia. In a study by Hirai and colleagues (2008), subclinical BII phobic individuals were assigned to one of two single-session exposure protocols: one targeting fear alone and the other targeting both fear and disgust. Both groups received a single exposure session involving a hypodermic needle and vial of artificial blood and psychoeducation regarding fear, anxiety, and exposure to fear-provoking stimuli. However, the disgust condition received additional disgust-related psychoeducation about universal safety precautions when handling

hypodermic needles and blood and how to avoid infection, contamination, and exposure to diseases and viruses. The disgust condition also included three additional exposure steps which increased the salience of potential contamination associated with the behavioral task (e.g. "touch the arms with the hand that held the open vial of blood"). Results revealed larger treatment effect sizes at follow-up for analogue BII fearful individuals that underwent the combined fear and disgust exposure intervention compared to the fear alone exposure intervention. In a recent study (Olatunji, Ciesielski, Wolitzky-Taylor, Wentworth, & Viar, in press), BII phobics were repeatedly exposed to blood draws, with disgust (vomit) or neutral (waterfall) videos presented intermittingly. Results revealed that although experiencing disgust resulted in higher initial fear levels to the blood draws, the disgust activation did not facilitate habituation during exposure. These findings illustrate that experiencing disgust does influence the experience of fear among those with BII phobia. However, the therapeutic benefit of targeting disgust in the context of exposure therapy remains unclear.

Targeting disgust more efficiently during treatment may require some consideration of its renewal effect. Renewal refers to the phenomenon in which a change of context after extinction can cause a robust return of conditioned responding (Boschen, et al., 2009; Bouton & Bolles, 1979; Bouton & King, 1983). For example, Bouton and Ricker (1994) found that when acquisition and extinction took place in the same context, introduction of the conditioned stimuli in a novel context resulted in a return of conditioned responding. This finding suggests that the retrieval of extinction is context-dependent such that simply leaving the therapeutic context may be sufficient to evoke a return of phobic responding even after successful exposure. To prevent the renewal of

fear, researchers have begun to employ exposure of the conditioned stimulus in different

contexts during extinction. It has been posited that conducting exposure in multiple

contexts maximizes the generalizability of habituation (Bouton, 2002). It is now widely

accepted that repeated exposure to a stimulus does not simply overwrite or destroy the

original fear learning (Bouton, Garcia-Gutierrez, Zilski, & Moody, 2006; Rescorla,

2001). Instead, individuals learn new meanings of the feared stimulus (Lang, Craske, &

Bjork, 1999) or how to inhibit or suppress fear itself (Bouton, 2002; Bouton, et al., 2006).

Thus, by varying the context in which exposure takes place, "inhibition learning" is

strengthened by promoting the learning of multiple retrieval cues for coping. In support

of this notion, Rowe and Craske (1998) showed that while spider phobics that were

exposed to a single spider during exposure had a return of fear when presented with a

novel spider, this return was reduced when multiple stimulus examples were used during

exposure.

Although studies continue to accumulate showing that conducting exposure in

multiple contexts buffers against the renewal of fear (Vansteenwegen et al., 2007), it is

unclear how conducting exposure in multiple contexts impacts the renewal of disgust in

general and in BII phobia.   Given ample research implicating heightened generalized

disgust sensitivity in BII phobia, exposure-based interventions which provide multiple

retrieval cues that promote maximal generalizability to disgust could potentially result in

better outcomes. Accordingly, the present study examines the effects of repeated disgust

exposure in multiple contexts versus a single context on reductions in disgust, fear,

behavioral avoidance, and physiological arousal in an unselected sample (Study 1). It

was predicted in Study 1 that repeated exposure to a disgusting stimulus (e.g. person

vomiting) in a single context or multiple contexts would reduce disgust, fear, behavioral

avoidance, and physiological arousal. However, when confronted with a novel disgust

stimulus, renewal would be observed for the single context group but not in the multiple

context group.   Additionally, it was hypothesized that these effects would be observed at

a one week follow-up. The present investigation also examined the effects of repeated

disgust exposure in multiple contexts versus a single context on phobic responding in BII

phobia (Study 2). It was predicted in Study 2 that repeated exposure to disgust in a single

context or multiple contexts would result in reduction of fear, disgust, behavioral

avoidance, and physiological arousal among analogue BII phobics. It was also

hypothesized that renewal would be observed for the single context group but not the

multiple context condition when confronted with a novel threat-relevant stimulus.

CHAPTER II

STUDY 1: CONTEXT EFFECTS ON DIGUST HABITUATION

Method

Participants

A total of 52 undergraduates (90% female), with a mean age of 19.83 (SD = 1.28; range = 18-24), were recruited to participate. Participants were 73% Caucasian, 11% African American, 2% Asian/Pacific Islander, 10% Hispanic, and 4% identified themselves as Multi-ethnic.

Self-Report Measure

The *Disgust Propensity and Sensitivity Scale-Revised* (DPSS-R; van Overveld et al., 2006) is a 16-item measure designed to assess the frequency of disgust experiences (Disgust Propensity) and the emotional impact of disgust experiences (Disgust Sensitivity). Participants rate their agreement with each item on a scale ranging from 1 ("never") to 5 ("always"). The disgust propensity subscale, with alpha coefficients ranging from .71 - .73, was used in the present study.

Behavioral Avoidance Task

A *Behavioral Avoidance Task* (BAT) was administered to assess the emotional and behavioral features relating to disgust. The BAT consisted of two steps which participants were encouraged to complete. The first asked the participant to spit into a paper cup and the second step asked the participant to consume the spit from the cup. The experimenter recorded whether or not participants refused any steps and asked

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participants to verbally rate their fear and disgust on a 0 – 10 scale (0 – "no fear/disgust at all", 5 = "moderate fear/disgust", and 10 = "extremely intense fear/disgust").

Physiological Assessment

Galvanic Skin Conductance. Skin conductance was used to measure arousal responses during the exposure phase of the present experiment. Skin conductance was measured using unshielded 8 mm Ag-AgCl electrodes filled with isotonic gel and attached to the middle phalanx of the index and middle fingers of the right hand. Signals were recorded at 200 Hz using the Biopac MP35 system with Acknowledge software (BIOPAC Systems Inc., 2007). The skin conductance responses were also analyzed using Acknowledge software.

Exposure Stimuli

Five clearly distinguishable videos containing people vomiting were selected to serve as disgust stimuli in the experiment.

Procedure

Following the informed consent process, participants completed the propensity subscale of the DPSS-R and were randomly assigned to a single context ($n = 26$) or multiple context ($n = 26$) condition. All participants received 14 presentations of a 30s video clip with intertrial intervals (ITI) of 30s (blank screen). Participants were instructed to carefully watch the videotapes. During the ITI, participants had to indicate on two 100-point rating scales how anxious the video made them feel and how disgusted the video made them feel. For all participants, the first presentation included a person vomiting in context A (pre-test trial). Then the single context group received 11

presentations of the same context A video, while participants in the multiple context group received three presentations of context A video, four context B videos, and four context C videos.   Presentation order was equal for all participants in the multiple context condition (BBACBACCCBA). Following the exposure trials, all participants were presented with the context A video (post-test trial) and then a novel context D video. Skin conductance was collected during presentation of the video clips. An overview of the course of the exposure phase as well as a scheme of the course of one trial is presented in [Appendix 1](#).

Following the exposure phase, participants completed a post-exposure assessment of disgust propensity and the BAT. Participants then returned to the laboratory one week later and were presented with the novel context D video from Visit 1 for 30s (retention trial). Following the video presentation, participants again completed the propensity subscale of the DPSS-R and the BAT.

Results

Participant Characteristics

As shown in Table 1, there were no significant group differences in age, gender, ethnicity, or self-report measures.

Table 1. Study 1 group means (standard deviations) of study measures among single context and multiple context participants.

Variable	Single Context ($n = 26$)	Multiple Context ($n = 26$)	p
Demographics			
Age	19.96 (1.08)	19.69 (1.46)	.45
Ethnicity (% Caucasian)	77%	69%	.74
Gender (% Female)	86%	92%	.64
Disgust Propensity			
Baseline	12.96 (3.31)	14.42 (3.59)	.13
Post Exposure	14.54 (3.67)	14.38 (3.80)	.88
Visit 2	15.12 (3.40)	14.31 (4.03)	.44
Behavioral Avoidance			
Visit 1	1.31 (.55)	1.38 (.50)	.60
Visit 2	1.31 (.62)	1.50 (.51)	.23

Habituation Manipulation Check

Illustration of emotion ratings (fear, disgust) for each condition over the course of exposure are presented in Fig. 1. Consistent with previous research (Vansteenwegen, et al., 2007), the single context condition was expected to report a steady decrease in emotion ratings over the course of the exposure manipulation trials (trials 2 - 12) due to habituation of a single context (i.e. context A). The multiple context condition, however, was expected to experience a less linear decrease in emotion ratings given that in addition to the process of habituation, renewal should be experienced with each presentation of a difference context. To ensure the success of habituation during the exposure

manipulation, an 11 (time: 11 Exposure Manipulation Trials) x 2 (condition: Single context versus Multiple context) mixed-model ANOVA was conducted separately for each emotion (fear and disgust). For fear ratings, results revealed a significant main effect of time [$F(10, 490) = 6.98$, $p < .001$, partial $\eta^2 = .13$] that was qualified by a significant time by condition interaction [$F(10, 490) = 6.33$, $p < .001$, partial $\eta^2 = .11$]. Follow-up analyses revealed a main effect of time for the single context condition [$F(10, 240) = 15.07$, $p < .001$, partial $\eta^2 = .39$] but not for the multiple context condition [$F(10, 250) = 1.83$, $p = .06$, partial $\eta^2 = .07$].

Examination of disgust ratings showed a significant main effect of time [$F(10, 490) = 8.87$, $p < .001$, partial $\eta^2 = .15$] and a significant time by condition interaction [$F(10, 490) = 4.49$, $p < .001$, partial $\eta^2 = .08$]. Follow-up analyses revealed a significant main effect of time for the single context condition [$F(10, 240) = 14.40$, $p < .001$, partial $\eta^2 = .38$] that was stronger than that of the multiple context condition [$F(10, 250) = 3.48$, $p < .001$, partial $\eta^2 = .12$]. These findings suggest a stronger decrease of fear and disgust in the single context condition that was not observed among the multiple context group.
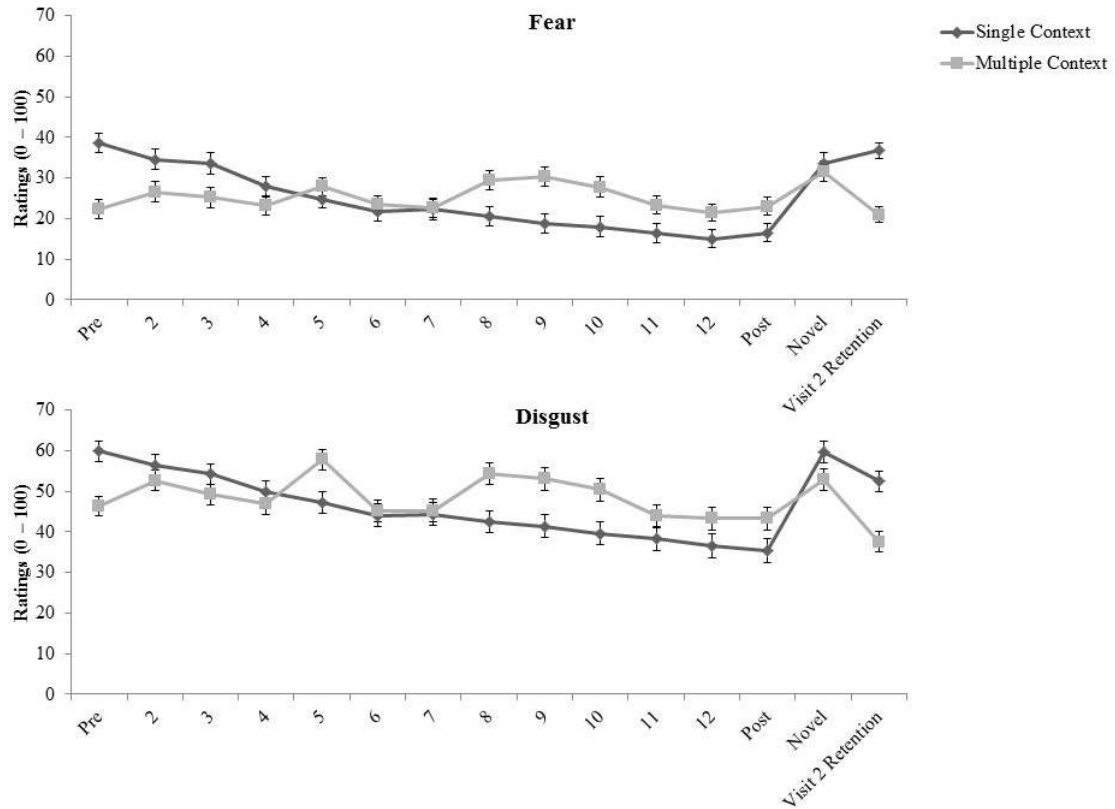
Figure 1. Study 1 mean emotion ratings separately during course of exposure among single context and multiple context conditions.

Effect of Context on Affect Reduction

Affect reduction was defined by group differences at post exposure. Given significant group differences in fear ratings during the pre-test trial and a trend ($p = .10$) for pre-test trial disgust ratings, pre-test trial emotion ratings were entered as a covariate. An analysis of covariance (ANCOVA) revealed significantly lower fear ratings among the single context group ($M = 16.47$, $SD = 21.97$) at post exposure compared to the multiple context condition ($M = 22.96$, $SD = 23.11$); $F(2,48) = 9.92$, $p = .003$, partial $\eta^2 = .17$. Similar results were found for disgust ratings with the single context group ($M = 35.32$, $SD = 28.36$) reporting significantly less disgust at

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post exposure compared to the multiple context group (M = 43.27, SD = 30.07);

$F(2,48) = 10.21$, $p = .002$, partial $\eta^2 = .18$.

Effect of Context on Affect Renewal

Affect renewal was defined by the change in emotion ratings from post-test (video context A) to a novel context (video context D). A 2 (time; Visit 1 post versus Visit 1 novel) x 2 (condition: Single context versus Multiple context) mixed model ANCOVA was then conducted separately for fear and disgust with pre-test trial ratings as a covariate[2]. As depicted in Fig. 2, results for disgust ratings yielded a significant main effect of time ($F(1,48) = 9.08$, $p = .004$, partial $\eta^2 = .84$) and condition ($F(1,48) = 5.50$, $p = .02$, partial $\eta^2 = .63$) that was qualified by a significant time by condition interaction ($F(1,48) = 6.59$, $p = .01$, partial $\eta^2 = .71$). Follow-up tests revealed that renewal of disgust was significantly greater among the single context group compared to the multiple context condition, $t(49) = 2.51$, $p = .02$, $d = 1.62$. Only a significant main effect of condition ($F(1,48) = 8.66$, $p = .005$, partial $\eta^2 = .82$) was found for fear ratings.

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[2] Pre-test trial was entered as a covariate due to significant group differences at baseline for fear ratings ($p = .02$) and trending group differences for disgust ratings ($p = .12$).
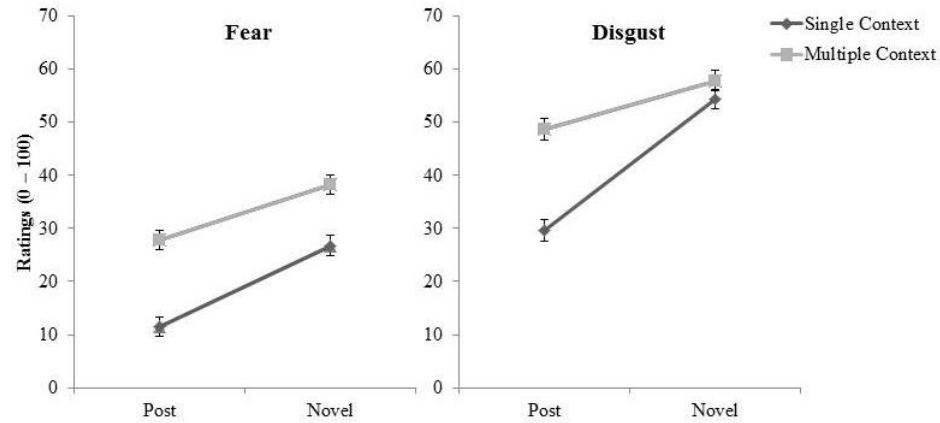
Figure 2. Study 1 post-test trial to novel exposure emotion ratings among single context and multiple context participants with pre-test trial emotion ratings (fear and disgust respectively) as a covariate.

Effect of Context on Affect Retention

Affect retention was defined by the change in emotion ratings from Visit 1 novel trial (video context D) to Visit 2 retention trial (video context D). A 2 (time; Visit 1 novel trial versus Visit 2 retention trial) x 2 (condition: Single context versus Multiple context) ANOVA was then conducted separately for fear and disgust ratings[3]. Results for disgust ratings yielded only a significant main effect of time ($F(1,49) = 12.78$, $p = .001$, partial $\eta^2 = .94$) with a significant reduction in disgust ratings from Visit 1 to Visit 2 for both groups. Results for fear ratings revealed a significant time x condition interaction ($F(1,49) = 7.80$, $p = .007$, partial $\eta^2 = .78$), but no main effect of time ($F(1,49) = 2.26$, $p = .14$, partial $\eta^2 = .32$) or condition ($F(1,49) = 2.21$, $p = .14$, partial $\eta^2 = .31$). As depicted in Fig. 1, follow-up tests revealed a significant reduction in fear ($p = .007$) for the multiple context group but not the single context group ($p = .35$) from Visit 1 to Visit 2.

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[3]Pre-test trial was not entered as a covariate in these analyses because there was no significant difference in the results with and without it as a covariate.

Effect of Context on Physiological Arousal

Skin conductance responses were visually inspected and corrected for artifacts before they were analyzed statistically. The 'tonic' skin conductance (SC) value, the average SC across full exposure presentation (~ 810 seconds), was calculated for each participant to serve as a baseline (SC_0). In order to calculate phasic fluctuations of SC as a function of exposure (e.g. Galvanic Skin Conductance; GSR), the baseline (SC_0) was subtracted from the mean SC of each 30s trial (SC_1). This raw GSR was range-corrected using the largest and smallest responses observed during all video presentations (Lykken, Rose, Luther, & Maley, 1966; Lykken & Venables, 1971) by means of the formula:

$$\Delta\varphi = \frac{SC_1 - SC_0}{SC_{i(max)} - SC_{i(min)}} \quad\quad [1]$$

The corrected responses were then subjected to a square root transformation in order to normalize the distribution prior to statistical analysis.

Six participants (three from each group) were excluded from the skin conductance analysis due to technical problems leaving 23 participants in both the single and multiple context groups. Skin conductance response (SCR) means are shown in Fig. 3.Skin conductance responses were then analyzed using a 4 (time; Visit 1 pre-test, Visit 1 post-test, Visit 1 novel, Visit 2 retention) x 2 (condition: Single context versus multiple context) mixed-model ANOVA. While, the analyses did not show a significant main effect for condition ($F(3,43) = 1.84$, $p = .18$, partial $\eta^2 = .26$), the effect of time was marginally significant ($F(3,43) = 2.54$, $p = .06$, partial $\eta^2 = .62$). Furthermore, planned comparisons comparing only Visit 1 post-test trial to Visit 1 novel trial by condition revealed a significant main effect of time ($F(1,44) = 4.69$, $p = .04$, partial $\eta^2 = .56$), suggesting a general increase in physiological arousal in response to the novel context,

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and a main effect of condition $(F(1,44) = 4.76, p = .04,$ partial $\eta^2 = .57)$, suggesting that

the single context group experienced more physiological arousal overall compared to the

multiple context group.
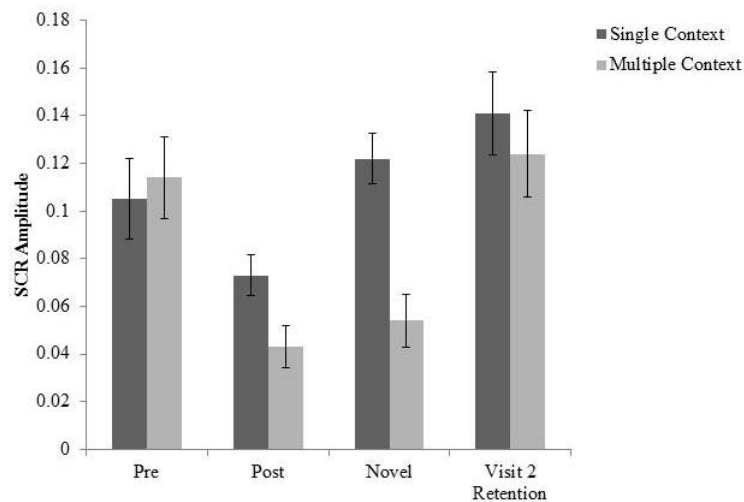
Figure 3. Study 1 mean amplitudes of the skin conductance responses to the disgust
exposure at pre-test, post-test, novel context, and follow-up retention trial at Visit 2
separately for the single context and multiple context groups.

Effects of Context on Disgust Propensity

A 3 (time; pre-exposure, post-exposure, Visit 2 follow-up) x 2 (condition: Single

context versus multiple context) mixed model ANOVA with the propensity subscale of

the DPSS-R as the outcome variable was conducted to assess change in disgust proneness

as a function of the exposure manipulation. The results yielded a significant main effect

of time $(F(2,50) = 4.97, p = .009,$ partial $\eta^2 = .80)$ that was qualified by a significant time

x condition interaction $(F(2,50) = 6.01, p = .003,$ partial $\eta^2 = .87)$. Follow-up tests

revealed a significant increase in disgust propensity for the single context group from

pre-exposure (M = 12.96, SD = 3.32) to post-exposure (M = 14.54, SD = 3.67); $t(25) = -$

3.05, $p = .005$, $d = .45$. However, the multiple context group showed no change in disgust propensity from pre-exposure (M = 14.42, SD = 3.59) to post-exposure (M = 14.38, SD = 3.80); ps> .05.

Effect of Context on Behavioral Avoidance

A 2 (time; Visit 1, Visit 2) x 2 (condition: Single context versus Multiple context) mixed-model ANOVA was then conducted to examine the effect of context on behavioral avoidance. Results did not yield a significant main effect of time ($F(1,50) = 1.30$, $p = .26$,partial$\eta^2 = .03$) or condition ($F(1,50) = .89$, $p = .35$,partial $\eta^2 = .02$). However, a trend was observed such that individuals in the multiple context condition completed more steps on the BAT at follow-up ($t(25) = -1.81$, $p = .08$, $d = .24$), while individuals in the single context condition showed no differences in behavioral avoidance at follow-up ($t(25) = .00$; $p = 1.00$, $d = 0$).

Discussion

The present study found that varying context during repeated disgust exposure did not lower emotion ratings immediately following exposure among an unselected sample. However, the multiple context group experienced less physiological arousal when presented with a novel stimulus. Additionally, the multiple context condition demonstrated signs of benefit at a one-week follow-up. Specifically, the multiple context group showed decreased fear and disgust ratings, behavioral avoidance, and disgust propensity. These results offer preliminary support for the notion that use of multiple contexts during repeated exposure may decrease disgust responding. Given ample

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empirical evidence that BII phobia is characterized by a 'generalized' disgust sensitivity (Sawchuk et al., 2000), Study 2 sought to extend the findings of Study 1 using an analogue sample of BII phobics to examine whether habituation to disgust in general would result in improvement in phobic responding. Moreover, Study 2 further investigated whether presenting disgust in multiple contexts during repeated exposure would facilitate habituation.

CHAPTER III

STUDY 2: CONTEXT EFFECTS ON DIGUST HABITUATION IN BII PHOBIA

Method

Participants

Participants were selected from undergraduate psychology courses based the following criteria: scoring ≥ 32 on the Injection Phobia Scale-Anxiety (IPS-Anx; Öst, Hellstrom, & Kaver, 1992); endorsement of a history of fainting and/or avoidance of medical procedures. The final sample consisted of 30 participants with a mean age of 19.07 (SD = 1.11, range = 18 − 21) and were 90% female. Of the sample, 67% were Caucasian, 20% African American, and 13% Multiethnic.

Measures

The *Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV*; Brown, DiNardo, & Barlow, 1994) is an empirically supported structured interview developed specifically for a diagnostic assessment of anxiety and related mental disorders. The specific phobia section was used to determine the presence/absence of BII phobia.

The Disgust Propensity subscale of the *Disgust Propensity and Sensitivity Scale-Revised* (DPSS-R; van Overveld et al., 2006) from Study 1 was also used in Study 2. The alpha coefficient for the propensity scale ranged from .82 - .85 in the current study.

Behavioral Avoidance Task

A *Behavioral avoidance task* (BAT) was administered to assess the emotional and behavioral features relating to BII fears. Participants were encouraged to complete five

steps: (1) look at a hypodermic needle and syringe without the cap on, (2) touch the

hypodermic needle and syringe without a cap, (3) hold the hypodermic needle and

syringe without the cap, (4) touch the tip of the hypodermic needle to the bare skin of the

inner elbow, and (5) inject a sponge against the inner elbow with water from the syringe.

The experimenter recorded whether or not participants refused any steps and asked

participants to verbally rate their current fear and disgust on a $0 - 10$ scale ($0 -$ "no

fear/disgust at all", $5 =$ "moderate fear/disgust", and $10 =$ "extremely intense

fear/disgust").

Physiological Assessment

   Galvanic Skin Conductance. Skin conductance was used to measure arousal

responses during the exposure phase of the present experiment. Skin conductance was

measured using unshielded 8 mm Ag-AgCl electrodes filled with saline-based gel (Sigma

Gel) and attached to the middle phalanx of the index and middle fingers of the right hand.

Signals were recorded and stored for off line for analysis using the Biopac MP150 system

at 200 Hz with AcqKnowledge version 3.9 software (BIOPAC Systems Inc., 2007).

Exposure stimuli

   Three clearly distinguishable videos containing people vomiting and two

intravenous blood draw videos were selected to serve as exposure stimuli in this

experiment.

Procedure

   Following the informed consent process, clinical phobic status was determined

using a diagnostic interview adapted from the specific phobia section of the Anxiety

Disorders Interview Schedule for DSM-IV (ADIS-IV; Brown et al., 1994). Participants were randomly assigned to a single context or multiple context condition and then completed the propensity subscale of the DPSS-R and the BAT. All participants received 14 presentations of a 30s video with intertrial intervals (ITI) of 30s (blank screen). Participants were instructed to carefully watch the videotapes. During the ITI, participants had to indicate on two 100-point rating scales how anxious the video made them feel and how disgusted the video made them feel. For all participants, the first presentation included a blood draw I video clip (BII pre-trial). Then the single context group received 12 presentations of a person vomiting in context A, while participants in the multiple context group received four presentations of vomiting in context A video, four context B vomit videos, and four context C vomit videos. Presentation order was equal for all participants in the multiple context condition (ABBACBACCCBA). Following the exposure trials, all participants were presented with the blood draw I video (BII post-trial) and then a novel blood draw video (BII novel trial). Skin conductance was collected during presentation of the video clips. An overview of the course of the exposure phase as well as a scheme of the course of one trial is presented in Appendix 2.

Following the exposure phase, participants completed the BAT and a post-exposure measure of disgust propensity.

Participant Characteristics

The single context condition (n = 15) had a joint mean age of 19.07 (SD = 1.03, range = 18 – 21) and were 87% female. The multiple context group (n = 15) had a joint mean age of 19.07 (SD = 1.22, range = 18 – 21) and were 93% female. The majority of the analogue participants in the multiple context group (80%) and the single context group (93%) met diagnostic criteria for BII phobia, with no significant differences between the two groups in diagnostic status. Table 2 shows that the two groups also did not significantly differ in age, gender, ethnicity, or self-report measures.

Table 2. Study 2 group means (standard deviations) of study measures among single context and multiple context participants.

Variable	Single Context (n = 15)	Multiple Context (n = 15)	p
Demographics			
Age	19.07 (1.03)	19.07 (1.22)	1.00
Ethnicity (% Caucasian)*	80%	53%	.18
Gender (% Female)*	87%	93%	.54
Diagnostic Classification (% positive) *	93%	80%	.28
Disgust Propensity			
Baseline	19.20 (4.36)	18.53 (4.27)	.68
Post Exposure	19.47 (3.89)	19.47 (5.45)	1.00
Behavioral Avoidance			
Baseline	4.47 (.83)	4.40 (1.12)	.86
Post Exposure	4.60 (.74)	4.60 (1.12)	1.00

Habituation Manipulation Check

Emotion ratings (fear, disgust) are presented separately for each condition over the course of exposure in Fig. 4. Similar to Study 1, individuals in the single context condition were expected to report a continual decrease in emotion ratings during the disgust exposure manipulation (vomit trials 1 – 12), while individuals in the multiple context condition were expected to report a less extreme slope in emotion ratings. To ensure that the disgust habituation manipulation was successful, a 12 (time: 12 Disgust Trials) x 2 (condition: Single context versus Multiple context) mixed-model ANOVA was conducted for each emotion (fear and disgust). For fear ratings, results revealed a significant main effect of time $[F(11,308) = 12.79, p < .001,$ partial $\eta^2 = .31]$ that was qualified by a significant time by condition interaction $[F(11,308) = 3.63, p < .001,$ partial $\eta^2 = .12]$. Follow-up analyses revealed a main effect of time for the single context condition $[F(11,154) = 9.33, p < .001,$ partial $\eta^2 = .40]$ that was stronger than that of the multiple context condition $[F(11,154) = 6.10, p < .001,$ partial $\eta^2 = .30]$.

Disgust ratings also revealed a significant main effect of time $[F(11,308) = 14.65, p < .001,$ partial $\eta^2 = .34]$ and a significant time by condition interaction $[F(11,308) = 8.07, p < .001,$ partial $\eta^2 = .22]$. Follow-up analyses revealed a significant main effect of time for the single context condition $[F(11,154) = 16.05, p < .001,$ partial $\eta^2 = .53]$ that was stronger than that of the multiple context condition $[F(11,154) = 3.17, p = .001,$ partial $\eta^2 = .19]$. These findings suggest a stronger decrease of fear and disgust among the single context condition compared to the multiple context condition.
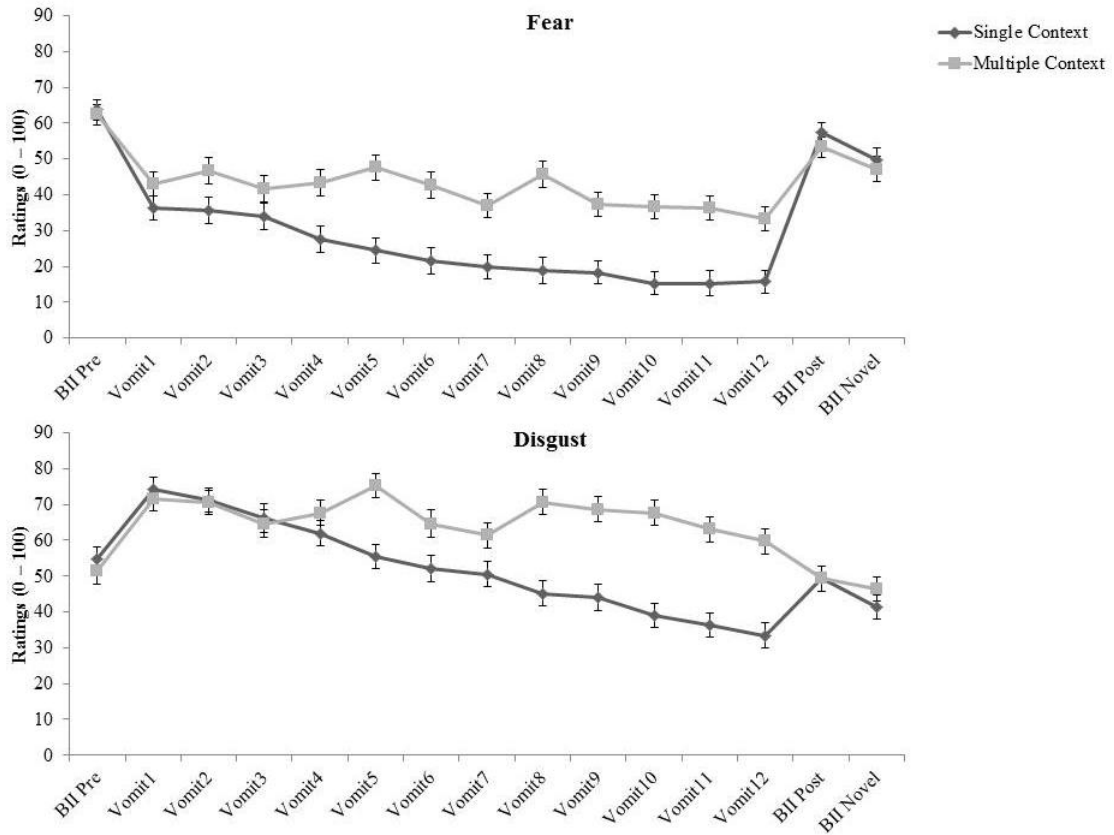
Figure 4. Study 2 mean emotion ratings separately during course of exposure among single context and multiple context conditions.

Effect of Context on Affect Reduction and Renewal

Fig. 5 illustrates fear and disgust ratings separately for the single context and multiple context groups for BII pretrial, BII post-trial, and BII novel trial. No significant differences were found at any of the time points for fear or disgust between groups (p's > .05). A 3(time: BII Pre-trial, BII Post-trial, BII Novel trial) x 2 (condition: Single context versus Multiple context) mixed-factor ANOVA was then conducted for each emotion. Results revealed a significant main effect of time for fear [$F(2,56) = 9.37$, $p< .001$, partial $\eta^2 = .25$] and disgust [$F(2,56) = 3.76$, $p = .03$, partial $\eta^2 = .29$] ratings. Follow-up

planned pairwise comparisons show that, for fear ratings, BII pre-trial (M = 63.13, SD =

21.62) was rated as more fearful than BII post-trial (M = 55.33, SD = 21.69; p = .01) and

BII novel trial (M = 48.43, SD = 26.51; p = .002). BII post-trial was also rated more

fearful that BII novel trial (p = .02). Analysis of disgust ratings showed that BII pre-trial

(M = 53.03, SD = 25.76) and BII post-trial (M = 49.33, SD = 27.28) were rated

significantly higher overall compared to the BII novel trial (M = 43.83, SD = 26.25); ps =

.02.
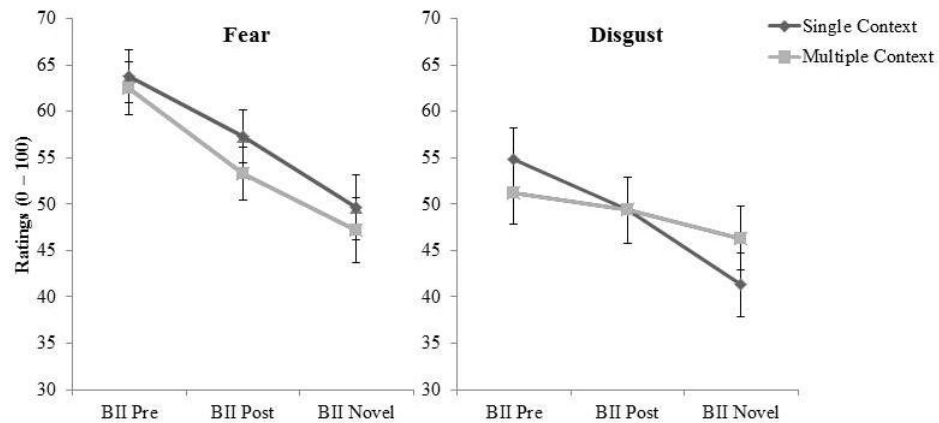
Figure 5. Study 2 mean emotions ratings during phobic-relevant stimuli at pre-test, post-test, and novel context separately for single context and multiple context conditions.

Effect of Context on Physiological Arousal

Skin conductance levels were visually inspected and corrected for artifacts prior

to analysis. One person was excluded due to technical difficulties leaving a final sample

of n = 15 in the single context group and n =14 in the multiple context group. Skin

conductance responses (SCR) were calculated using the same Formula [1] from Study 1

(see p. 23). A 3 (time: BII pre-trial, BII post-trial, BII novel trial) x 2 (condition: Single

27

context versus Multiple context) mixed-factor ANOVA on SCR found no significant effects. However, planned comparisons revealed greater physiological arousal at post-trial for those in the single context (M = .215, SD = .132) compared to those in the multiple context (M = .082, SD = .095), $t(27) = 3.09$, $p = .005$, $d = 1.16$.
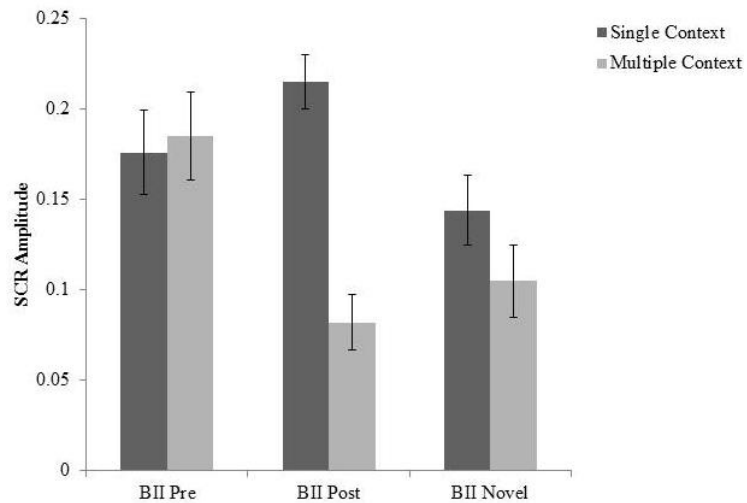
Figure 6. Study 2 mean amplitudes of the skin conductance responses to exposure at pre-test, post-test, and novel context (new) separately for the single context ($n = 15$) and multiple context ($n = 14$) groups.

Effects of Context on Disgust Propensity

A 2 (time; Pre-exposure, Post-exposure) x 2 (condition: Single context versus Multiple context) mixed model ANOVA was then conducted to assess change in disgust propensity as a function of exposure. The analysis yielded no statistically significant findings ($p > .05$).

Effect of Context on Behavioral Avoidance

A 2 (time; Pre-exposure, Post-exposure) x 2 (condition: Single context versus Multiple context) mixed model ANOVA was then conducted to examine the effect of context on behavioral avoidance. The analysis yielded only a marginally significant main effect of time ($F(1,28) = 3.80$, $p = .06$, partial $\eta^2 = .12$), with both groups completing more steps at post-exposure.

Discussion

The results of Study 2 failed to find a significant effect of varying context for the reduction of phobic responding. However, planned comparisons showed that the multiple context group was less physiologically aroused at post-trial suggesting that varying the context of disgust during exposure may facilitate arousal reduction when presented with threat-relevant stimuli in BII phobia. The present study also found that the single and multiple context groups reported a reduction in fear responding from pre-trial to post-trial and a reduction of fear and disgust responding when presented with a novel blood draw video. However, the absence of a control group that did not involve exposure to disgust makes it difficult to attribute these reductions to repeated exposure to disgust stimuli.

CHAPTER IV

GENERAL DISCUSSION

Although a generalized disgust sensitivity has been implicated in the etiology and maintenance of BII phobia (Sawchuk et al., 2000), much remains unknown about how disgust operates in the context of exposure-based treatments. Prior research has shown that disgust may be less resistant to extinction than fear during repeated exposure to threat among BII phobics (Olatunji et al., 2007), potentially making it more likely to return even after successful treatment. There is experimental evidence suggesting that exposure to the conditioned stimulus in different contexts during extinction may prevent the renewal of fear by maximizing the generalizability of habituation (Bouton, 2002). However, it is unclear if varying the context of exposure during extinction may also prevent the renewal of disgust. To address this gap in knowledge, the present investigation first examined the effect of varying the context in which disgust stimuli is presented during repeated exposure on habituation in an unselected sample.

The findings revealed significantly lower ratings of fear and disgust at post-test for the single context condition compared to the multiple context condition. This finding is not particularly surprising given that the single context group is presented with 12 30s trials of the target stimulus whereas the multiple context condition is exposed to only 4 30s trials of the target stimulus. With the presentation of different stimuli during extinction, the multiple context group may also be experiencing some renewal of disgust. This interpretation is supported by the quadratic pattern of disgust habituation observed in the multiple context condition compared to the stronger, more linear pattern of

habituation within the single context condition. As Fig. 1 shows, the multiple context group reports an increase in fear and disgust with the introduction of each new stimulus (trials 2 and 5)which consequently reduces the general rate of habituation.

Despite less emotional reactivity to the disgust stimulus at post-test, the present study hypothesized that the single context condition would experience more renewal (a return of the original affective response), compared to the multiple context condition, when confronted with a novel disgust stimulus. The findings revealed that while both groups reported an increase in fear and disgust ratings when presented with a novel disgust stimulus, those in the multiple context condition showed less renewal than those in the single context condition. This finding is consistent with previous research on animals and humans examining the effectiveness of utilizing multiple contexts to reduce fear renewal (Bouton, 2002; Vansteenwegen, et al., 2007). Animal models and preliminary work with humans(Bouton & Ricker, 1994; Rowe & Craske, 1998) posit that learning which takes place during extinction may not generalize to occasions outside the therapeutic context. Accordingly, Bouton and Swartzentruber (1991) encourage an expanded view of "context" by including any background event or stimulus in which target learning and memory events are embedded (e.g. time, location, stimulus features). This definition implies that the stimulus itself may serve as a contextual retrieval cue such that when the stimulus itself changes, renewal can occur (Rowe & Craske, 1998). For example, although an individual may learn to be less afraid of riding an elevator throughout treatment, when another elevator is encountered outside the therapist's office, retrieval of the original fear response may occur. Therefore, by including multiple contexts and stimuli within the extinction process, the generalizability of learning is

increased. The present findings complement previous research on fear renewal by offering preliminary evidence that renewal of disgust can also be attenuated by conducting extinction in multiple contexts.

Although individuals in the single context condition experienced greater disgust renewal to a novel context compared to those in the multiple context condition, there were no significant differences in fear or disgust ratings between the groups for the novel context trial. However, the present study found that those in the multiple context condition showed decreased levels of fear and disgust during presentation of the same novel video at a one-week follow-up, whereas those in the single context condition showed no change in their emotion ratings. According to Schmidt and Bjork (1992), variables that retard learning during training (as evidenced by slower habituation during exposure) can often aid long-term retention. In reviewing the motor learning and cognitive literature, they conclude that the effectiveness of the learning is dependent on how well the learning is retained over time and how well the learning can be generalized to related contexts. Although added difficulty during extinction often curbs performance within the session, the learner is better prepared for later shifts in contexts. This is because context variation results in better retention and transfer of learning at follow-up by requiring retrieval and organization of different information with the presentation of each new stimulus. This view may partially explain the finding that the benefit of varying the context in which disgust stimuli is presented is largely observed after extinction learning. The reduction in emotion ratings among the multiple context condition at follow-up may also be explained by means of reconsolidation. The reconsolidation hypothesis suggests that memories are strengthened each time they are

retrieved making the memory easier to recall (Dudai, 2006; Sara & Hars, 2006). In the current study, the use of multiple contexts during extinction provides multiple retrieval cues following exposure. Thus, each time one of these multiple cues is encountered in a different context, the new inhibitory memory may be retrieved and reconsolidated, reinforcing the newly learned pathway.

The current study also examined the effect of context variation on disgust propensity, or how easily one is disgusted to a range of situations. While disgust propensity is generally conceptualized as a personality trait that is relatively stable (Olatunji & Cisler, 2009; Olatunji, Cisler, Deacon, Connolly, &Lohr, 2007; van Overveld, de Jong, Peters, Cavanagh, & Davey, 2006), the present study found that those in the single context condition reported an increase in disgust propensity following the exposure manipulation whereas the multiple context condition reported no change. Although these findings suggest that disgust propensity may be variable under some circumstances, the mechanisms that may account for this effect are unclear. For example, it is unclear in the present study whether exposure to disgust stimuli in a single context increases disgust proneness or whether exposure to disgust stimuli in multiple contexts protects against an increase in disgust propensity. The decreased physiological reactivity among the multiple context group coupled with slightly better emotion ratings during exposure and at follow-up compared to the single context group, lend some evidence that the latter explanation may be more viable. If this assumption is correct, and context variation during exposure does in fact protect against an increase in disgust propensity, it may be possible to provide early interventions that prevent the emergence or exacerbation of disorders in which disgust propensity has been implicated.

Participants in the multiple context condition also showed a trend to be less behaviorally avoidant of disgust stimuli at a one-week follow-up compared to those in the single context condition. This finding suggests that variation of the context in which disgust is presented during exposure may facilitate one's ability to approach disgust-relevant stimuli. The generalization of the beneficial effects of context variation during exposure to behavior may be interpreted as an increase in disgust toleration. That is, those in the multiple context condition may be attributing less distress to the experienced disgust compared to those in the single context condition. As discussed previously, the use of multiple disgust contexts allows the conditioned response (e.g. decreased disgust) to generalize and this generalization also appears to be observed at the behavioral level.

Results from Study 1 provide some support for the use of context variation during exposure for preventing the renewal of disgust in general. Given the central role of disgust in the etiology and maintenance of BII phobia (Olatunji & Sawchuk, 2005; Olatunji, et al., 2006), Study 2 examines the effects of context variation during disgust extinction on phobic responding among analogue BII phobics. The results found no support for the hypothesis that varying the context in which disgust stimuli was presented would facilitate the reduction in phobic responding. This finding is inconsistent with those of Study 1 and previous research (Vansteenwegen et al., 2007). One possible explanation is that, by not including a follow-up in Study 2, there was not sufficient time for the newly learned inhibitory pathways to have the desired effect. Indeed, significant group differences in emotion ratings during the videos were not observed in Study 1 until the follow-up visit one week later. This suggests that some time may be necessary in order for consolidation of what is learned during extinction to take place.

Despite the largely null findings across self-report and behavioral measures of phobic responding in Study 2, the physiological data offered a slight indication that exposure to multiple disgust contexts may have some therapeutic benefit in BII phobia. That is, although there was no difference in the verbal emotion ratings between the conditions at post-trial, BII phobics in the multiple context condition did show decreased physiological responding at post-trial compared to those in the single context condition. This finding suggests that varying the context in which disgust stimuli is presented during repeated exposure may reduce physiological arousal during exposure to threat-relevant stimuli, The findings of Study 2 also revealed affect reduction towards a phobic relevant stimulus (e.g. video of a blood draw) from pre-trial to post-trial in both conditions. Both groups also experienced a reduction in fear and disgust ratings when presented with phobic-relevant stimuli in a novel context compared to emotion ratings taken at post-trial. Additionally, both conditions showed a reduction in behavioral avoidance of phobic relevant stimuli with the single and multiple context groups completing significantly more steps of the BAT following exposure. These findings suggest that repeated exposure alone reduces phobic responding at the self-report and behavioral level. While one might attribute these effects to differential exposure to disgust stimuli, the mechanism that may account for these findings is unclear given the absence of a control condition that was not exposed to disgust stimuli.

Although the current study advances research on the nature of disgust habituation, there are several notable limitations. One such limitation is the inclusion of a restricted scope of contexts within the multiple context condition. Within both studies, the variation between contexts A, B, and C is minimal at best with each of the videos

containing all young adult males vomiting in toilets. Future studies should employ a wider range of contexts with greater diversity in order to optimize the effects of varying contexts. Although the use of BATs offers a more subjective assessment of phobic responding, both studies in the current investigation showed some ceiling effects at baseline. That is, participants completed nearly all the steps of the BATs at pre assessment making it difficult to gauge if the exposure had a meaningful effect on behavioral avoidance. Future research should include BATs with a larger number of steps as well as several steps which very few people would complete as this may allow for greater variability in the sample and greater power to observe even small effects.

As Woody and Teachman (2000) observe, the interaction between fear and disgust hold significant treatment implications for anxiety disorders, specifically BII phobia where disgust is more pronounced. They, and others (e.g. Hepburn and Page, 1999), suggest that by ignoring emotions such as disgust, clients may be left with disturbing images and cognitions related to their disorder. The current investigation is among the first to examine whether varying context facilitates habituation to disgust. Although results among a nonselected sample show promising results for the use of multiple contexts during repeated exposure to a disgusting stimulus, results among a sample of analogue BII phobics are more ambiguous. To the extent that targeting disgust may be therapeutic in the treatment of BII phobia, there may be some value in directing efforts towards tolerance of the experience of disgust by enhancing the consolidation and retrievability of inhibitory learning over time and context.

Appendix 1.

Group	VISIT 1														VISIT 2
	Pre test trial	Exposure trials											Post test trial	Novel test trial	Retention trial
Single	**A**	A	A	A	A	A	A	A	A	A	A	A	A	**D**	**D**
Multiple	**A**	B	B	A	C	B	A	C	C	C	B	A	A	**D**	**D**

Screen	Video montage 30 s: single or multiple disgust context	Blank screen: 30 s
Measures	Registration of skin conductance	Verbal rating: Fear Disgust

Context A   Context B   Context C   Context D

Appendix 2.

Group	BII pre trial	Exposure trials												BII test trial	BII novel trial
Single	**B1**	A	A	A	A	A	A	A	A	A	A	A	A	**B1**	**B2**
Multiple	**B1**	A	B	B	A	C	B	A	C	C	C	B	A	**B1**	**B2**

Screen	Video montage 30 s: single or multiple disgust context	Blank screen: 30 s
Measures	Registration of skin conductance	Verbal rating: Fear Disgust

BII Stimuli   Disgust Stimuli

B1   B2   Context A   Context B   Context C

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