THE IMPACT OF FADING RESTORATIVE SAFETY BEHAVIORS ON SYMPTOMS OF CONTAMINATION FEAR DURING A SINGLE SESSION EXPOSURE INTERVENTION: AN EXPERIMENTAL INVESTIGATION

by

Amy Rachel Goetz

A Dissertation Submitted in

Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

in Psychology

at

The University of Wisconsin-Milwaukee

August 2017

ABSTRACT

THE IMPACT OF FADING RESTORATIVE SAFETY BEHAVIORS ON SYMPTOMS OF CONTAMINATION FEAR DURING A SINGLE SESSION EXPOSURE INTERVENTION: AN EXPERIMENTAL INVESTIGATION

by

Amy Rachel Goetz

The University of Wisconsin-Milwaukee, 2017
Under the Supervision of Associate Professor Han-Joo Lee, PhD

Safety behaviors are actions taken to prevent, escape from, or reduce the severity of a perceived threat. Cognitive-behavioral theorists posit that safety behaviors interfere with important exposure processes and should be removed from therapy. However, there is a growing accumulation of data suggesting that some safety behaviors may not be detrimental, and those that allow for full confrontation with a core threat, may not interfere with meaningful indicators of successful exposure. Therefore, it is important to examine parameters associated with restorative safety behaviors under conditions of use and then later removal. The current study examined the continuous (RSB) versus faded use (F-RSB) of restorative safety behaviors during a single session of exposure, as compared to exposure with no safety behaviors (NSB). Participants completed 15 trials of exposure, with or without safety behaviors as well as behavioral approach tasks at pretreatment, post-treatment, and two-week follow-up. Results showed that pre to post-treatment as well as pretreatment to follow-up, all three groups showed similar rates of reduction on clinical symptoms and rates of behavioral approach. Ratings obtained during repeated exposure trials indicated that participants in F-RSB and RSB had greater and more rapid reductions on relevant process measures, relative to NSB. Moreover, F-RSB resulted in greater reductions following safety

behavior removal, indicating that safety behavior use and later withdrawal may be facilitative of continued improvement. Overall, no reliable drawbacks were associated with safety behaviors, and findings are in line with the benign and/or beneficial role of restorative safety behaviors in exposure protocols. The theoretical and clinical implications of these findings are discussed, and future directions in the investigation of safety behaviors are suggested.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

I would like to acknowledge my major professor, Dr. Han-Joo Lee, for his support, wisdom, and guidance throughout this manuscript. Dr. Lee has been an excellent mentor and professional role model and I am forever grateful for his mentorship. Furthermore, I would like to thank my dissertation committee members, Drs. Shawn Cahill, Bonnie Klein-Tasman, Christine Larson, and Christopher Martell, for their very helpful comments, insight, and advice that have only enhanced this project. A special thank you is extended to my friends and colleagues in the Anxiety Disorders Laboratory and the Department of Psychology at the University of Wisconsin-Milwaukee. Finally, I would like to thank my family for their unwavering love and encouragement.

Introduction

Safety behaviors, as described by Telch and Lancaster (2013; p. 315) are "unnecessary actions taken to prevent, escape from, or reduce the severity of a perceived threat." Traditional cognitive-behavioral models of anxiety argue that safety behaviors play a role in maintaining clinical levels of anxiety and should therefore be discarded in therapy (Clark, 1999; Clark & Wells, 1995; Rapee & Heimberg, 1997; Salkovskis, 1991; Salkovskis, Clark, Hackmann, Wells, & Gelder, 1999). Consequently, elimination of safety behaviors is one of the most commonly utilized cognitive-behavioral techniques by clinicians (Hipol & Deacon, 2012). Researchers and clinicians may thus perceive safety behavior use (within or outside of therapy) as associated with detrimental outcomes. For example, safety behaviors may prevent or weaken the ability to gain corrective information and/or inhibit the gathering of evidence regarding the dangerousness of a situation. Furthermore, clients and participants may (mis)attribute their perceptions of safety to the use of the safety behavior. However, these claims may not adequately capture the usefulness of *specific* types of safety behaviors when used judiciously in exposure therapy.

Exposure-based behavior therapies are arguably one of the most empirically-supported classes of psychological treatment available for the anxiety disorders and obsessive-compulsive disorder (OCD; Deacon & Abramowitz, 2004). However, a sizable number of individuals fail to initiate treatment or terminate treatment due to the overwhelming emotional arousal they fear or experience. For example, Foa and colleagues (2005) found that out of 521 individuals who potentially met criteria for OCD, approximately 10% of the sample refused exposure-based intervention. It stands to reason that clients may prefer less demanding and more palatable intervention options. Difficulties with exposure, however, are not a client-

specific problem. Many clinicians fail to use exposure treatment for anxiety disorders, with Olatunji and colleagues (2009) surmising that exposure suffers from a "public relations problem" (p. 172). Clinicians may refuse to deliver exposure for multiple reasons including (negative) beliefs that exposure: (a) provokes distress (as opposed to a reduction in distress), (b) results in high rates of attrition, and (c) is perceived as unethical and damaging to the client-therapist relationship (Deacon et al., 2013; Olatunji, Deacon, & Abramowitz, 2009).

Modifications to exposure treatments that increase efficacy and tolerability for clients have the potential to reduce attrition and add to the number of individuals who may derive benefit from treatment. Furthermore, from a provider perspective, it may be important to modify protocols in order to increase intervention utilization and delivery of exposure-based treatments. For example, modifications to exposure that decrease therapist reservations and distress about use of exposure may be very important, given the number of providers who do not use these treatment techniques (Deacon et al., 2013; Olatunji et al., 2009). One way to achieve a more tolerable exposure procedure, for both client and therapist, may be to permit the use of safety behaviors in the early stages of treatment.

Previous findings regarding the effect of safety behaviors in exposure are mixed in terms of whether safety behaviors are benign, facilitative, or harmful. There is a growing abundance of research evidence to suggest that their usage may not always lead to negative outcomes and instead may facilitate therapeutic gains, prompting Rachman and colleagues (2008) to call for a "reconsideration" of their use (p. 163). However, the term safety behavior suffers from much ambiguity and it is difficult to distinguish between what is considered a safety behavior versus an adaptive coping strategy (e.g., use of a seat belt while traveling in an automobile), compulsion, mental ritual, habit, escape, or avoidance. Due to the abundant

number of strategies that are considered safety behaviors, there may be significant differences among them, specifically in regard to whether they are benign, beneficial, or problematic. Safety behaviors continue to remain poorly defined and efforts have been undertaken to understand their functional qualities and how they may differentially impact treatment outcomes (Goetz, Davine, Siwiec, & Lee, 2016; Helbig-Lang & Petermann, 2010).

Functional Classification of Safety Behaviors

The current classification system is overwhelmingly focused on topographical manifestations of safety behaviors, and their functional impact is not as well understood. One proposed system by Helbig-Lang and Petermann (2010) is to classify safety behaviors based on whether they are preventive or restorative in function. Goetz and Lee (2015) elaborated upon this definition in an effort to understand the use of functional types of safety behaviors and their immediate effects on the core threat, rather than their long-term, negative outcomes.

Preventive safety behaviors are used to reduce the strength or intensity of contact with a core threat in the immediate threat-provoking context. For example, an individual who is fearful of contamination may use a paper towel to open the door to a public restroom rather than touch the door with a bare hand. During exposure, preventive safety behaviors attenuate exposure intensity. More simply, confrontation with the exposure stimulus or experience is blunted. On the other hand, restorative safety behaviors are used to "remedy" a situation back to a desired state and restore safety from the occurrence of a perceived core threat. An individual with contamination aversion concerns may apply sanitizer to the hands after discarding an object in the wastebasket of a public restroom. Thus, the use of sanitizer reduces anxiety and discomfort and assists the individual in returning to a state of relative and perceived safety.

Some key differences should be noted about prevention and restoration. First, safety behaviors may serve different preventive or restorative purposes as a function of their influence on the immediate core threat (e.g., Rachman, 1976; Rachman, de Silva, & Röper, 1976). In contamination fear and excessive washing, active avoidance of contaminated objects (e.g., avoidance of public restrooms and drinking fountains) is a preventive strategy, whereas washing following exposure to a contaminant (e.g., use of hand wipes or sanitizer) is restorative. As recommended by Goetz and Lee (2015), the immediate threat-provoking environment is an important context with which to examine the functional value of safety behaviors, as opposed to longer-term, anticipated negative outcomes. Safety behaviors are often thought of as being used to avoid or avert future-oriented perceived negative outcomes (e.g., "I avoid public restrooms and wash my hands thoroughly, after coming into contact with something dirty, so that I may not develop a serious chronic illness and die."). The difficulty with this assertion is that it would imply that all safety behaviors should be regarded as preventive given that they are used to avoid a dreaded future-oriented negative event. Furthermore, it does not allow researchers and clinicians the opportunity to examine the functional role of safety behaviors in the current threat-potentiating context; for example, as an adjunct for early exposure work. Second, the time course of preventive and restorative safety behaviors tends to differ. Preventive safety behaviors are likely used *shortly before or during confrontation* with the core threat whereas restorative safety behaviors typically *follow confrontation* with the core threat.

Preventive and Restorative Safety Behaviors in the Context of Exposure-Based Therapy

Goetz et al. (2016) conducted a thorough review of the safety behavior literature from the last three decades in order to examine findings in light of the preventive-restorative

distinction. A range of clinical and non-clinical samples were included in their investigation. To this end, they compiled all relevant safety behavior studies and categorized studies into whether they utilized: (a) preventive safety behaviors, (b) restorative safety behaviors, or (c) a combination of the two. Eligible studies compared an exposure only (no safety behaviors) control condition to at least one exposure plus safety behavior condition. Two clinical psychology doctoral students independently rated all studies to determine whether the study met criteria as (a) primarily preventive, (b) primarily restorative, or (c) combination. The doctoral students also rated the cumulative effect of safety behavior use, or whether exposure with safety behaviors evidenced a benign/beneficial or negative impact, compared to conventional exposure.

Regarding preventive safety behaviors, Goetz and colleagues (2016) located twenty-three studies that met their established criteria. Approximately 52% of studies demonstrated benign or beneficial findings whereas 48% resulted in negative outcomes. Drawing from this, it appears likely that preventive safety behaviors may exert some harmful outcomes when used, although these effects were not consistently demonstrated across studies. The authors located nine studies that met criteria for exposure with restorative safety behaviors, and found that all studies resulted in either a benign or facilitative relationship compared to exposure with no safety behaviors. Goetz and colleagues (2016) suggested that clients' use of restorative safety behaviors may allow for perceptions of greater control over therapy (Rachman et al., 1986; van den Hout et al., 2011).

In general, the systematic review concluded that restorative safety behaviors do not seem to confer any disadvantage – at least in the studies that they were able to locate. They were unable to locate any studies that explicated a relationship between restorative safety

behaviors and negative outcomes. However, preventive safety behaviors resulted in findings that were mixed, and did not yield a consistent pattern of findings.

One study attempted to disentangle the effects of preventive and restorative safety behaviors, as compared to conventional exposure with no safety behaviors (Goetz and Lee, 2015). Non-clinical participants were randomly assigned to one of the following contamination exposure conditions: (1) exposure with preventive safety behaviors (i.e., touch a contaminant with a tissue), (2) exposure with restorative safety behaviors (i.e., touch a contaminant and then use hand-sanitizer), or (3) exposure with no safety behaviors (i.e., exposure only). Participants completed 15 trials of exposure, with or without safety behaviors based on the assigned condition. Both prior to and following condition completion, participants completed a behavioral approach task (BAT) to assess their level of behavioral approach and subjective fear/disgust. These two assessments precluded the use of safety behaviors. Goetz and Lee (2015) found that restorative safety behaviors evidenced more favorable outcomes compared to preventive safety behaviors and exposure without safety behaviors. The authors found greater reductions in fear and behavioral avoidance for the restorative condition, as compared to prevention, and the gains made by those who engaged in restorative safety behaviors generalized to other anticipated sources of contamination. Outcomes for exposure with no safety behaviors tended to fall in-between those of the preventive and restorative conditions (Goetz & Lee, 2015).

Notably, detrimental outcomes may be specific to preventive safety behaviors and not restorative. Although preventive safety behaviors do appear to impact exposure in some deleterious ways, they do not exert these effects consistently or across *all studies* that had participants use preventive safety behaviors. For example, some studies included by Goetz et

al. (2016) examined physical barriers to contact with phobic stimuli, such as snakes and spiders. Across these investigations, researchers randomly assigned individuals to undergo exposure with or without safety gear; for example, gloves and goggles. Results revealed similar degrees of reduction in avoidance, self-reported fear, and negative beliefs about spiders and snakes amongst groups that used preventive safety behaviors and those that did not (Hood et al., 2010; Milosevic & Radomsky, 2008; 2013). Thus, some preventive safety behaviors may not be entirely detrimental.

Altogether, Goetz and colleagues (2016) suggest that preventive safety behaviors should likely be dropped (given their mixed picture of adverse and benign/beneficial outcomes) or removed as quickly as possible during exposure trials. Conversely, greater examination into restorative safety behaviors as an adjunct to treatment is needed. That is to say, restorative safety behaviors should be considered appropriate candidates for use during exposure, with their eventual gradual fading or removal.

The Impact of Fading Safety Behaviors

In Rachman, Radomsky, & Shafran's (2008) reconsideration of safety behaviors, a call for research that examines the "judicious use of safety behaviors" was recommended. According to Rachman, judicious use means "the careful use of safety behaviour, with an emphasis on the early stages of treatment" (p. 169), with recommendations that safety behaviors should be gradually faded over the course of exposure. Rachman and colleagues supposed that safety behaviors may facilitate treatment via a number of different avenues. Safety behavior utilization in early treatment sessions may allow clients to feel a greater sense of control over therapy without sacrificing treatment gains. However, few studies have yet to examine the judicious use of safety behaviors, although the results of several studies appear

promising (e.g., Deacon et al., 2010; Levy & Radomsky, 2014; Milosevic & Radomsky, 2013a; Taylor & Alden, 2011). Furthermore, multiple empirical investigations and theory-driven arguments call for safety behaviors to be eliminated or dropped during exposure; however, these investigations do not provide a solid test of safety behavior impact *unless* they are examined under conditions wherein they are recommended, instructed, or encouraged and *then* subsequently faded or removed. Recently, Taylor and Alden (2011) examined safety behavior removal among individuals diagnosed with generalized social phobia. Participants completed a conversation with a confederate and were then randomly assigned to one of two conditions: (a) exposure with safety behavior reduction or (b) graduated exposure. In the reduction condition, participants were told to reduce their safety behaviors as a way to test whether their feared outcomes would be confirmed. Those in the graduated exposure condition were told to simply remain in their anxiety-provoking situation in order to observe what happens to their anxiety. This group was not discouraged from using safety behaviors. The exposure task consisted of a second conversation with a confederate. Moreover, Kim (2005) supplied similar instructions to participants who delivered a presentation. Participants in two of the conditions were told to discontinue use of safety behaviors and a third condition was simply told to remain in the situation and observe what happens to their anxiety over time. Unfortunately, Taylor and Alden (2011), Kim (2005), and many similar investigations, do not allow for a *true test* of the impact of safety behaviors. Specifically, safety behaviors were examined under conditions of disuse and it is unknown to what extent safety behaviors were actually engaged in or the impact of such engagement (i.e., detrimental, benign, or facilitative) prior to removal.

As a result, safety behavior fading should likely involve the use of restorative strategies and then the *subsequent elimination or gradual removal* of the aids. The aforementioned studies did not assess the frequency or duration of safety behavior use (e.g., safety behavior was used for 2 minutes of exposure "conversation" and then the safety behavior was discontinued). Importantly, several studies have investigated safety behavior fading or removal, and will be described hereafter. Notably, these studies have traditionally utilized preventive, and not restorative, safety behaviors.

Grayson and his colleagues (1982) randomly assigned individuals with OCD and washing concerns to exposure and attention focusing on the first day and exposure with distraction on the second day of treatment, or the reverse order. Each day included a 90-min exposure session in which participants were asked to hold a contaminant. Exposure with distraction entailed having the participant hold the contaminant while playing video games (i.e., distraction, in this case, is considered a preventive safety behavior given its ongoing attenuation of the intensity of exposure). For exposure with attentional focus, participants engaged in conversation with the experimenter about the contaminant and the distress it provoked. If conversation extended to unrelated topics, the experimenter redirected the conversation back to the contaminated object. Thus, attentional focus was not simply the "removal or preclusion of distraction," the condition allowed for full confrontation and discussion about contamination fear. Given that one condition experienced exposure with distraction first and then exposure with attentional focus on the second day, this may be *loosely* considered a study that examined safety behavior fading. In the study, Grayson and colleagues found comparable declines across both groups regarding their level of reported fear, although when attentional focus was conducted on day 1, the level of anxiety at the end

of the session was maintained (i.e., a proxy for between-session habituation) going into the second day which consisted of distracted exposure.

A more recently conducted study by Deacon and colleagues (2010) assigned individuals with claustrophobia to one of several exposure-based protocols, including exposure with safety behavior vs exposure without safety behaviors. Safety behaviors included the opportunity to open a small window in a claustrophobia chamber to allow air inside, check a chamber door latch to see that it was unlocked during the exposure trials, and talk with an experimenter via intercom. Individuals were told to use their safety behaviors for the first four exposure trials and then were asked to discontinue safety behavior use for the remaining two trials. Deacon et al. (2010) found that exposure without safety behavior was as effective as exposure with the judicious use of safety behaviors. Deacon and his colleagues found comparable reductions and improvements on cognitive change variables, self-control, duration of time spent within claustrophobia chamber, and peak fear levels.

Exploring the Impact of Preventive and Restorative Safety Behaviors within Cognitive Behavioral Theories

A few theories provide helpful frameworks to aid researchers in understanding the effects of restorative safety behaviors on exposure outcomes, and perhaps why preventive safety behaviors may exert adverse outcomes. Such theories include emotional processing, cognitive/misattribution, and inhibitory learning theories.

Emotional processing theory. According to emotional processing theory, activation of the fear structure is a necessary component for anxiety reduction to occur in exposure. Fear structures are cognitive networks of maladaptive thoughts that become activated when fear or anxiety are experience (Foa & Kozak, 1986). For example, an individual with panic disorder

may think “I'm going to die” when they notice internal cues such as shortness of breath or rapid heartbeat. When the individual begins to notice bodily cues, they rely on safety-seeking strategies such as benzodiazepine medication to help reduce the impact of these sensations. Thus, the overarching goal of emotional processing is to modify the fear structure and cognitive network. For this to occur, two conditions are necessary: (1) elicitation of the fear and (2) the provision for corrective information. Foa and Kozak (1986) argue for three indicators that may help infer emotional processing: (a) initial fear activation (i.e., fear arousal), (b) within-session habituation (i.e., fear gradually decreases during exposure session), and (c) between-session habituation (i.e., fear gradually diminishes across exposure sessions). Safety behavior use may impact initial fear activation, although it should be noted that the literature on initial fear arousal in predicting overall exposure outcomes has received only modest levels of support (Craske et al., 2008) [1].

Preventive safety behaviors may interfere with initial arousal as individuals do not adequately confront their core threat, effectively blunting or attenuating the overall procedure. Moreover, less than optimal fear level (i.e., not only initial arousal, but also subjectively experienced fear throughout exposure trials) may significantly reduce the potency of exposure. Preventive safety behavior use both procedurally and behaviorally blocks full confrontation with the threat. Still, restorative safety behaviors may allow for initial fear activation given full confrontation with the threatening experience will be achieved and fear is presumably activated to the same extent as conventional exposure. This may yield a more

[1] However, initial fear activation may hold some predictive value towards understanding the differential effect of restorative vs preventive safety behaviors. Preventive safety behaviors led to impaired or interrupted fear arousal, per Goetz and Lee (2015). Restorative safety behaviors did not interrupt initial fear activation.

potent context for acquiring corrective emotional experiences. Furthermore, it would seem that restorative safety behaviors would not preclude the formation of a non-fearful structure, a structure that "competes" with the original fear network (Foa & McNally, 1996).

Cognitive theory. Cognitive theory has received the most attention and scrutiny for understanding the value of safety behaviors. Misattribution and cognitive theories suggest that individuals are unable to test their faulty negative predictions regarding how threatening an experience/stimulus actually is when utilizing safety behaviors. The theory suggests that, when safety behaviors are used, individuals (mis)attribute the non-occurrence of a feared outcome to the use of the safety behavior (Salkovskis, 1991). Unfortunately, this theory is problematic as it tends to predict equally worse outcomes for both preventive and restorative safety behaviors (Goetz & Lee, 2015; Goetz, Davine, Siwiec, & Lee, 2016). That is to say, all safety behaviors, no matter if they are preventive or restorative, are expected to be harmful and disrupt threat disconfirmation. For example, preventive safety behavior use inhibits an individual's ability to adequately confront the core threat, leaving them to lose the opportunity for disconfirmatory learning. Restorative safety behaviors may block the opportunity to learn about the benign consequences of contacting the core threat as remedy immediately follows confrontation.

In general, cognitive theory may not be helpful in understanding why different safety behaviors may facilitate or hamper outcomes given the abundance of findings suggesting the benign and facilitative effects of restorative safety behaviors (Abramowitz & Moore, 2007; de Silva & Rachman, 1984; Goetz & Lee, 2015; Goetz et al., 2016; Lickel et al., 2013; Rachman et al., 1986, 2011; van den Hout et al., 2001, 2002, 2011, 2012). Overall, an inhibitory learning based approach may be the most appropriate mechanism for understanding the

functional role of safety behaviors and how they may optimally be used in clinical practice. However, it should be noted that the three theorems (emotional processing, cognitive, inhibitory learning) are not mutually exclusive and do possess substantial overlap.

Inhibitory learning theory. At the core of inhibitory learning theory is the notion that the original pairing of conditioned stimulus (CS) and unconditioned stimulus (US) during fear conditioning (CS - US) is not "erased" or "forgotten." Instead, it remains relatively intact as secondary associative learning in which the CS does not predict the US (CS- no US; Bouton, 1993; Bouton & King, 1983). Following extinction learning, the CS possesses two meanings: its original excitatory meaning (CS – US) and an additional inhibitory meaning (CS – no US). In order to provide some context for understanding this theorem, the CS may be thought of as a neutral stimulus (e.g., a neutral picture) and the US is the aversive stimulus (e.g., an electric shock). Over time, the CS and US are repeatedly paired together and eventually the simple presentation of the CS is enough to elicit the feared conditioned response (CR). Extinction, a proxy for conventional exposure therapy, involves repeated presentations of the CS in the absence of the aversive US. Within an inhibitory learning approach, the new secondary inhibitory association (CS does not predict US) disrupts inherent Pavlovian CS-US responses, and inhibitory learning is optimized when individuals learn that fear is tolerable. In inhibitory learning, instead of fear *reduction* (as in habituation and emotional processing theory), the emphasis is placed on fear tolerability, a process closely linked to distress tolerance (Craske et al., 2008). Exposure is therefore enhanced when individuals undergo inhibitory learning wherein expectancy for the risk and likelihood of the US are violated.

The general goal of inhibitory learning is to experience situations in a way that permit new learning rather than systematic fear reduction. For this to occur, exposure should be

geared towards violating negative expectancies. Violation of negative expectancies may entail having participants complete lengthier or massed exposure trials, in which the trials maximize the ability to directly impede violation of fear-based expectancies. For example, a compulsive washer may believe that they will immediately fall ill if they are to utilize a public restroom. Further assessment and detailed information gathering allow the therapist to learn that sitting on a toilet seat for 1 minute in a public restroom is predictive, for this client, of contracting a dreaded illness. The client is then given exposure assignments that aim to have her approach the situation and closely monitor the outcomes. Furthermore, this client may be challenged to spend an extra minute (i.e., 2 minutes in total) sitting on the toilet, with skin-to-skin contact, to provide a more rigorous test of her hypothesis that she will contract an illness from sitting on the toilet. For maximization of inhibitory learning, other parameters of the exposure should be varied. For example, exposure may be augmented to include multiple contexts (e.g., have her sit on several toilets in different environments) that are particularly relevant (i.e., those that may be functionally interfering with her daily life).

From an inhibitory learning perspective, safety behaviors prevent an individual from acquiring or developing inhibitory associations or safety signals of conditioned fear stimuli (i.e., CS-no US; Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014) and that safety behaviors should be faded and removed over the course of treatment (Hermans, Craske, Mineka, & Lovibond, 2006). In behavioral terms, the absence of the expected aversive outcome is (mis)attributed to the use of conditioned inhibitory stimuli[2] (i.e., safety behaviors) and that use of the safety behavior impedes development of new and non-threatening learned associations. From this point of view, all safety behaviors may be an obstacle for the

[2] This is also a feature of mistattribution theory.

formation of inhibitory learning, although this may be more applicable for certain safety behaviors than for others.

Due to the attenuated exposure procedure, preventive safety behaviors may block the opportunity for inhibitory learning of safety for the core threat. Preventive safety behaviors may present themselves as salient safety signals that are likely to prevent the formation of a secondary inhibitory association. Consequently, an individual may fail to learn that the object or situation associated with the conditioned fear is benign or non-threatening. Further, the use of preventive safety behaviors may make the extinction context more restrictive and result in a greater risk for fear return (Craske et al., 2014; Vervliet, Craske, & Hermans, 2013). Exposure with preventive safety behaviors is completed in a limited context (i.e., it is always in the presence of an aid that attenuates the exposure procedure and substantially limits confrontation with the exposure stimulus or experience) and fear may be likely to return when the stimulus or experience is encountered in a different context. Preventive safety behaviors may also limit the ability to violate expectancies and lead to a less varied context with which to obtain new secondary, inhibitory learning.

Restorative safety behaviors likely continue to allow an individual to fully engage in exposure to the feared object/situation without preventing the occurrence of inhibitory learning *during* extinction trials. Furthermore, restorative safety behaviors may aid in maximizing violation of expectancies and allow for variation across the exposure context. Inhibitory learning suggests that variability throughout exposure may optimize new learning and that retention of material is enhanced by variation, which may also help in making retrieval of past learning easier (Lang & Craske, 2000). For example, the fading of restorative safety behaviors may lead to greater generalization effects, and does not instill a restrictive

exposure context. Preventive safety behaviors are likely to instill a limited and less potent context that makes it difficult to generalize newly formed safety signals to other contexts. Furthermore, restorative safety behaviors allow for variability in fear level during exposure whereas preventive safety behaviors may significantly limit the range of fear experienced during exposure trials, and subsequently undermine formation of the inhibitory association. Moreover, the removal of safety behaviors during repeated exposure trials may allow for varied practice which may lead to better outcomes as compared to continued use of safety behaviors for the duration of all exposure trials.

Context renewal effects also deserve some mention. For example, greater return of fear is found when participants are assessed in contexts that are fundamentally distinct from the context in which exposure treatment was conducted (Rodriguez, Craske, Mineka, & Hladek, 1999). Craske and colleagues (2008) suggest that exposure conducted in multiple contexts may be helpful. The fading of restorative safety behaviors during repeated exposure trials may be one way of instilling multiple contexts as this would entail two "contexts:" (a) safety behavior are utilized and (b) safety behaviors are removed and client proceeds through unaided exposure. Although this does not entail multiple physical contexts per se (i.e., exposure is not physically conducted in multiple locations), it may allow for multiple internal contexts (see Mystkowski, Mineka, Vernon, & Zinbarg, 2003). Overall, fading and continuous use of restorative safety behaviors will likely allow for increased procedural variability and violation of expectancies.

Summary of cognitive-behavioral theories. Why might preventive safety behaviors demonstrate greater deleterious effects relative to restorative safety behaviors? Moreover, why may the fading of restorative safety behaviors promote greater benefit than the

continuous use of restorative safety behaviors? First, emotional processing theory suggests that preventive safety behaviors may blunt (initial) fear activation, which ceases to allow for an adequately potent and fearful context by which to obtain corrective learning. Second, the opportunity to disconfirm a perceived threat is lost when preventive safety behaviors are used; although misattribution theory would also predict that restorative safety behavior use is associated with an equally detrimental inability to disconfirm anticipatory negative consequences. Third, from an inhibitory learning theory perspective, preventive safety behaviors may act as salient safety signals that significantly interfere with the formation of new, non-threatening learned associations. Indeed, restorative safety behavior use is unlikely to negate the formation of the secondary learning associations. Furthermore, the fading of restorative safety behaviors allows for multiple contexts which may promote new learning. Fading of restorative safety behaviors may additionally allow for greater variability within the exposure procedure, as well as optimized expectation violation.

The Current Investigation

The current study examined the continuous versus faded use of restorative safety behaviors, as compared to exposure with no safety behaviors. In an attempt to increase the generalizability and clinical relevance of the findings, a sample of participants with subclinical washing and contamination fear were recruited. Although the use of a subclinical sample may still limit the relevance of our findings (and a diagnosed sample of clinical hand-washers who meet criteria for OCD would arguably be optimal), one review stated that symptoms and cognitions are comparable amongst OCD and non-clinical samples (Gibbs, 1996). Likewise, taxometric analyses indicated that OCD symptoms and related cognitions

are dimensional and occur on a spectrum (Olatunji, Williams, Haslam, Abramowitz, & Tolin, 2008).

Participants (*N*= 51) in the current study were randomly assigned to one of three conditions during a single-session experimental intervention using an ideographically selected exposure stimulus: (a) exposure with no safety behaviors (NSB), (b) exposure with continuous use of restorative safety behaviors (RSB), or (c) exposure with fading of restorative safety behaviors (F-RSB). Participants completed 15 trials of exposure instructed to use either restorative or no safety behaviors. Before and after exposure condition completion, participants completed a behavioral approach task, and again completed this task at two-week follow up. Participants additionally completed a behavioral approach task on an independent set of contaminants, for which they had not yet been "exposed," in order to examine whether treatment gains made during exposure would generalize to novel materials.

Method

Participants

Participants were 51 students at a large, mid-western university with subclinical washing and contamination fear concerns. The mean age of participants was 20.84 years (*SD* = 5.29) and participants were predominately female (84.3%). They reported a variety of ethnic and racial characteristics: 54% self-identified as 'White,' 22% as 'Black,' 2% as 'Asian', and 22% as multiracial. Fourteen percent of participants identified as Hispanic.

Screening

For inclusion in the current study, participants must have met at least one of the following criteria: (a) OCI-R Washing subscale ≥ 1 or (b) Overall mean fear on pretreatment BAT ≥ 20. Additional criteria included: (a) complete the first hierarchical step on the pretreatment BAT, (b) peak fear on Trial 1 of exposure ≥ 10, and (c) target exposure stimulus must evoke a minimal level of fear as evidenced by fear ≥ 20.

Measures

Participants in the current study were administered the following battery of questionnaires.

General distress. The *Depression Anxiety Stress Scale-21* (DASS-21; Lovibond & Lovibond, 1995) is a shortened version of the 42-item DASS scale that was designed to assess depression, anxiety, and stress in adults. The 21-item version possesses excellent psychometric properties with appropriate factor structure, internal consistencies, and concurrent validity in clinical (Antony, Bieling, Cox, Enns, & Swinson, 1998) and non-clinical samples (Henry & Crawford, 2005). The Depression and Anxiety subscales of the

DASS-21 were retained in order to provide an index of general distress. In the current sample, Cronbach's α was .92 for the Depression subscale and .86 for the Anxiety subscale.

OCD and disgust measures. The *Obsessive-Compulsive Inventory-Revised* (OCI-R; Foa et al., 2002) is an 18-item measure of OCD symptoms. Participants rated the degree to which they have been bothered by OCD symptoms in the past month on a 5-point scale from 0 ("*Not at all*") to 4 ("*Extremely*"). The measure assesses for six types of symptoms: (1) Washing, (2) Checking, (3) Obsessing, (4) Mental Neutralizing, (5) Ordering, and (6) Hoarding. Internal consistencies are reported as the following: Washing (α= .80), Checking (α = .85), Obsessing (α = .90), Mental Neutralizing (α = .64), Ordering (α = .89), Hoarding (α= .78), and Total Score (α = .90).

The *Vancouver Obsessional Compulsive Inventory* (VOCI; Thordarson et al., 2004) is a 55-item self-report measure utilized to assess obsessive-compulsive symptoms. The measure contains several subscales: Obsessions, Checking, Contamination, Just Right, Indecisiveness, and Hoarding. The following Cronbach's α's are reported: Obsessions (α = .90), Checking (α = .96), Contamination (α = .90), Just Right (α = .88), Indecisiveness (α = .88), Hoarding (α = .89), and Total Score (α = .96).

The *Dimensional Obsessive Compulsive Scale* (DOCS; Abramowitz et al., 2010) is a 20-item self-report measure that assesses the severity of several OCD symptom dimensions including (a) Contamination, (b) Responsibility for harm and mistakes, (c) Symmetry and ordering, and (d) Unacceptable thoughts. Each dimension begins with a description of typical symptoms as well as representative examples. Within each symptom dimension, five items assess several parameters, including: (a) time occupied by obsessions and rituals, (b) avoidance behavior, (c) associated distress, (d) functional interference, and (e) difficulty

disregarding the obsessions and refraining from compulsions. The DOCS possesses excellent reliability in clinical samples (Abramowitz et al., 2010). In the current sample, the subscales demonstrated the following internal consistencies: Contamination (α = .60), Responsibility for harm and mistakes (α = .88), Symmetry and Ordering (α = .85), Unacceptable thoughts (α = .92), and Total Score (α = .87).

The *Obsessional Beliefs Questionnaire* (OBQ; OCCWG, 2005) is a 44-item self-report instrument which measures dysfunctional beliefs and appraisals associated with OCD symptoms. The measure contains three subscales: (a) Responsibility and overestimation of threat (OBQ-RT), (b) Importance and need for control of thoughts (OBQ-ICT), and (c) Perfectionism and need for certainty (OBQ-PC). The instrument possesses good validity, internal consistency, and test-retest reliability (OCCWG, 2005). Cronbach's α were reported as follows in the current sample: Total Score (α = .95), OBQ-RT (α = .88), OBQ-ICT (α = .84), and OBQ-PC (α =.92).

The reduced item *Disgust Propensity and Sensitivity Scale-Revised* (Fergus & Valentiner, 2009) is a 12-item measure designed to assess the frequency of disgust experiences (i.e., disgust propensity) and the emotional impact of those experiences (i.e., disgust sensitivity). The measure contains two subscales: Disgust Propensity (e.g., "I avoid disgusting things") and Disgust Sensitivity (e.g., "It scares me when I feel nauseous"). The DPSS-R possesses good convergent validity with other measures of anxiety symptoms (Olatunji et al., 2007). Internal consistency coefficients in the present sample for the Disgust Propensity and Disgust Sensitivity subscales were 0.86, and 0.84, respectively.

Safety behavior checklist. The Safety Behavior Checklist (author-constructed; see Appendix A) is a 30-item author-constructed measure that was used to assess participants' use

of a broad range of safety behaviors during repeated exposure trials. Respondents were asked to indicate whether or not they utilized other safety behaviors throughout exposure trials after having completed exposure. Examples included use of breathing exercises before or during exposure stimulus confrontation and avoidance of eye contact with the exposure stimulus. The measure was used to ensure group equivalence with respect to non-experimenter imposed safety behaviors. This measure contains subscales for both preventive and restorative safety behaviors, as well as a total score. In the current study sample, Cronbach's α was .85, .80, and .69 for the Total Score, Preventive, and Restorative subscales, respectively.

Metacognition and washing threat questionnaire. The Metacognition and Washing Threat Questionnaire (see Appendix B) is a two-part measure constructed from items contained in investigations by Rowe and Craske (1998) and Cougle and colleagues (2007). The first set of items were used to assess participant's perceptions: (a) that their fear has decreased, (b) permanency of fear reduction, (c) fearfulness if confronted with potentially contaminated materials outside of the experiment, and (d) fearfulness if asked to repeat the assessment task in a few weeks. These metacognition items have been utilized by Rowe and Craske (1998) to examine variability in spider phobia exposure. The second set of items (Washing Threat Questionnaire) assessed how strongly the participant believed several illness and non-illness related threats were to occur on a 0 "*not at all*" to 100 "*extremely*" scale. Example items included "I fear I will become ill," "I fear I will be overwhelmed by sickness" and "I fear I will catch a contagious disease." These items have been used elsewhere and contain both illness-related and non-illness related threats (Cougle et al., 2007).

The Metacognition and Washing Threat Questionnaire was administered directly following the pretreatment, post-treatment, and follow-up BATs. In the current study sample,

Cronbach's α for the four metacognition items was .67, .80, and .62 for pretreatment, post-treatment, and follow-up assessment, respectively. For the twenty-three illness and non-illness related threats, the following internal consistencies are reported for the total score (pretreatment α = .97, post-treatment α = .97, follow-up assessment α = .99).

At the first administration of the Metacognition and Washing Threat Questionnaire, participants indicated which illness or non-illness threat (e.g., "I fear I will become ill") provoked the most distress. During exposure trials, participants rated the likelihood that this feared threat would occur on a scale from 0 or "*not at all*" to 100 "*very likely*."

Credibility and expectancy questionnaire. The *Credibility and Expectancy Questionnaire* (CEQ; Devilly & Borkovec, 2000) is a measure of treatment credibility and expectancy, and assessed how much improvement participants thought would occur during the intended procedure. The measure contains good test-retest reliability and internal consistency (Devilly & Borkovec, 2000), and contains two subscales: credibility and expectancy. It was administered immediately following administration of the group rationale and description of the treatment. In the current sample, Cronbach's α for the Credibility subscale was .87, and .97 for Expectancy.

Treatment evaluation inventories. The *Treatment Evaluation Inventory-Short Form* (TEI-SF; Kelley, Heffer, Gresham, & Elliott, 1989) is a self-report measure that was administered to participants to examine overall satisfaction and palatability related to exposure. The TEI-SF contains two items that pertain only to family-based interventions, and thus were removed from the current study protocol. The TEI-SF contains a high level of internal consistency. In the current study sample, Cronbach's α for the TEI-SF was .92.

The *Endorsement and Discomfort Scale* (EDS; Tarrier, Liversidge, & Gregg, 2006) is a 10-item questionnaire developed for research on treatment acceptability. It assesses preference for treatment as well as acceptability of a treatment. Participants were asked to rate the degree to which they agreed with statements regarding treatment acceptability and suitability on a scale from 1 or "*Disagree Strongly*" to 9 "*Strongly Agree*." In the current study sample, Cronbach's α for the EDS was .91.

Psychophysiology Assessment

Heart rate was measured using a portable psychophysiology monitor (Zephyr 3 Bioharness garment and device, Biopac Systems, Inc.). Physiological data were obtained during each of the 15 repeated exposure trials. All actions required throughout the exposure trials involved a minimal range of movement at a slow-pace; thus, movement and motion effects were not expected to increase heart rate in any meaningful way.

Exposure Tasks

Ideographic exposure stimulus selection. Participants were presented with three potentially contaminated exposure stimuli: (a) dirty toilet, (b) soiled laundry, and (c) mixture of dirt, dead insects, and dog hair. These stimuli have been used in previous work and demonstrate good convergent and divergent validity (Cougle, Wolitzky-Taylor, Lee, & Taylor, 2007; Najmi, Tobin, & Amir, 2012). Participants rated their anticipated fear ("Estimate the highest level of fear you expect to experience while touching the dirty toilet/soiled laundry/mixture of dirt, dead insects, and dog hair;" Appendix C) in response to each of the three items on a scale from 0-100, with 0 being "*no fear at all*" and 100 "*extreme fear*." The stimulus with the highest fear ratings was chosen for the assessment and exposure tasks. Henceforth, this will be referred to as the *target exposure stimulus*. If all stimuli were

rated highly and similarly, the experimenter asked the participant to identify the stimulus that provoked more discomfort than the others. Once the target exposure stimulus was identified, the pretreatment BAT was initiated.

Pretreatment, post-treatment, and follow-up behavioral approach task (BAT) assessments. Before and after exposure, participants completed the BAT. The BAT was composed of 16-steps that increased in contact intensity with the target exposure stimulus (see Appendix D). The BAT steps ranged from "touch with one finger" to "touch with both hands, and then lick one hand." Each step consisted of the participant being asked to touch the target exposure stimulus and then rate their current level of fear and disgust on 0-100 scales, with higher ratings indicative of greater amounts of each emotion. Participants were also asked to rate the extent to which they feared the likelihood of contracting an illness ("How likely is it that you would become ill as a result of touching this mixture?" from 0 or "*Not at all likely*" to 100 "*Very likely-illness certain*") as well as the perceived severity of a potential illness ("If you became ill as a result of touching this, how severe would your illness be?") from 0 "*Not ill at all*" to 100 "*Extremely ill*." Similar procedures have been used in previous work examining contamination concerns (Cougle et al., 2007; Goetz & Lee, 2015; Najmi et al., 2012). The final hierarchical step that the participant was physically able to perform served as the *target exposure step* and was the behavior used for the repeated exposure trials. The BAT was terminated once the participant could no longer complete a hierarchy step. Post-treatment assessment directly followed condition completion, and the follow-up assessment was conducted approximately two weeks following the initial study visit. The Metacognition and Washing Threat Questionnaire was administered directly following the pretreatment, post-treatment, and follow-up BATs. The pretreatment, post-treatment, and follow-up BAT

assessments provided the primary outcome indices (i.e., mean fear, disgust, illness likelihood, illness severity) and number of steps completed (i.e., index of behavioral approach).

Exposure condition. Participants were randomly assigned to one of three groups: (a) Exposure with no safety behaviors (NSB), (b) Exposure with continuous use of restorative safety behaviors (RSB), or (c) Exposure with fading of restorative safety behaviors (F-RSB). Participants were instructed to touch the target exposure stimulus with the target exposure step across 15 exposure trials.

Exposure with no safety behaviors (NSB). Participants in NSB were not permitted to engage in safety behaviors during repeated exposure trials, although the safety aids were in participant's view. This was done in order to reduce the likelihood that the mere presence of safety behaviors could potentiate the threat value of the exposure procedure. For example, Goetz and Lee (2015) found that those in NSB evidenced significantly lower peak fear ratings at Trial 1 of exposure, relative to participants assigned to RSB. The authors surmised that the presence of hand sanitizer (the restorative safety aid used by RSB in Goetz & Lee, 2015) potentiated the threat value and implied the presence of harmful bacteria in the target exposure stimulus. In that study, those assigned to NSB were not exposed to the safety aids. Therefore, in the current study, participants in NSB were "passively exposed" to the presence of the safety aids but were not permitted to use them. The exposure rationale detailed to participants that they should not use safety aids during exposure. The experimenter told participants:

> *"We need to explore how you can tolerate your discomfort about dirty objects. In order to do this, try to go into the situation and confront the fear you are afraid of. When you go into the situation try to avoid using behaviors that make it more*

comfortable for you to approach contaminating objects. To do this, avoid using coping strategies which you might normally use like using hand sanitizer or hand wipes after touching something potentially contaminating. [Experimenter places restorative safety behaviors down in room] *I need to put these here, but you have been assigned to a condition where you cannot use them. For example, when you are in the situation, do not rely on other coping strategies. Do not use behaviors like washing or cleansing yourself after touching something that is potentially contaminating. By confronting your fear without using these strategies, you will realize that this task is not as difficult or threatening"*

Once participants in NSB reached at least 50% of their initial peak fear (from the exposure Trial 1 value), the experimenter gave additional instructions to the participant. For example, if at Trial 1, the participant's peak fear was 80, and dropped to a 40 on Trial 6, the experimenter (upon initiating Trial 7) stated the following instructions to the participant. If the participant did not evidence 50% peak fear reduction, the following instructions were provided at the initiation of exposure Trial 8.

"It seems that you feel more comfortable with this task. Please continue to confront your fear without using any coping strategies. You will continue to complete the remaining trials with no coping strategies."

Exposure with continuous use of restorative safety behaviors (RSB). Participants in RSB were told to use restorative safety behaviors following immediate contact with the target exposure stimulus. They were instructed to use hand sanitizer, hand wipes, and/or paper towels after each stimulus contact, and were permitted to choose as many safety behaviors as they wished. The experimenter stated to the participant:

"We need to explore how you can tolerate your discomfort about dirty objects. In order to do this, try to go into the situation and confront the fear you are afraid of. When you go into the situation try to use behaviors that make it more comfortable for you to approach contaminating objects and gain a greater sense of control. To do this you should try to use coping strategies like use hand sanitizer, hand wipes, or paper towels after coming into contact with contaminating objects. For example, when you are in a situation with a potentially contaminating object, please use hand sanitizer directly after. You are free to use any or all of these coping aids during the exposure trials. By confronting your fear with the help of these strategies, you will realize that this task is not as difficult or threatening."

Once those in RSB achieved 50% peak fear reduction (from the Trial 1 value), the experimenter stated the following instructions to the participant. If the participant did not reach 50% peak fear reduction, the instructions were given at the initiation of Trial 8.

"It seems that you feel more comfortable with this task. Please continue to confront your fear while using your coping strategies. You will complete the remaining trials with your coping strategies."

Exposure with fading of restorative safety behaviors (F-RSB). Participants in F-RSB were given the same rationale as those in RSB and allowed to select as many restorative safety behaviors as they wished. They were *not* told that their safety behaviors would be removed during the 15 exposure trials, as this could potentially confound the experimental design and lead to varying degrees of expectancy and credibility. All restorative safety behaviors were removed from participant use once peak fear reached at least 50% of its original Trial 1 value. For example, if peak fear at Trial 1 of exposure was 80, and the

participant reached a peak fear level of 40 on Trial 5 of exposure, safety behaviors would be removed upon the initiation of Trial 6. If 50% of the initial Trial 1 value was not reached by Trial 7, then safety behaviors were removed at Trial 8, so that participants could experience a potent dose of exposure both with and without safety behaviors. Participants at that time were told:

> *"It seems that you feel more comfortable with this task. You will now be asked to no longer use any of the coping strategies that you've been using. You will complete the remaining trials with no coping strategies."*

Exposure trials. Participants proceeded through 15 trials of exposure commensurate with the randomly assigned condition (see Trials 1-15 of Exposure in Appendix E). At each trial, participants rated a number of indices *before/anticipatory, during/peak, and following* stimulus contact. Prior to touching the target exposure stimulus with the target exposure step, participants completed several anticipatory items. They estimated their level of fear and disgust for touching the stimulus, and rated their confidence in being able to complete the exposure step. They additionally rated the perceived threat level of the target exposure stimulus. During the exposure trial, participants touched the target exposure stimulus for approximately 20-sec with the target exposure step. While touching the exposure stimulus, participants rated their level of peak fear and disgust. Following completion of the target exposure step, participants were permitted to use their restorative safety behaviors if assigned to RSB or F-RSB. After confronting the stimulus or after safety behavior use, participants rated several measures including likelihood that their feared negative threat were to occur (as obtained from the Metacognition and Washing Threat Questionnaire), urge to wash, and likelihood and severity of contracting an illness. At 50% peak fear reduction or at the

initiation of Trial 8 (whichever occurred first), all participants – no matter condition – were given additional instruction by the experimenter.

Generalizability assessment. Following condition completion, participants were taken to a separate room and presented with a second set of potentially contaminated stimuli, similar to the first set. This included: (a) dirty toilet, (b) soiled laundry, and (c) mixture of dirt, dead insects, and dog hair. Participants proceeded through the 16-step hierarchy that increased in level of contact intensity for the stimulus consistently used for exposure and BATs. This allowed for testing of whether the three conditions differed in the degree to which exposure therapy generalized to other contaminants in a context that differed from the original treatment environment. For example, if the dirty toilet was used during exposure, the participant proceeded through the 16-step hierarchy on the novel dirty toilet. This second administration was conducted to examine between-group differences in the degree to which decreases across conditions generalized to novel contaminated materials.

Procedure

Following informed consent, the participant was instructed by the experimenter to place the psychophysiology monitor around their chest. To ensure proper placement and adequate habituation to the device, the participant wore the monitor throughout the duration of the study. At this time, the participant was also given a hand wipe with which to cleanse their hands. This initial hand wipe was given to participants in order to ensure that all participants began the study with a similar level of baseline perceived cleanliness given that participants may have reported to the study with differing levels. Following completion of several self-report measures, participants rated their level of anticipated fear towards the three exposure stimuli, and the target exposure stimulus was derived. Following selection of the target

exposure stimulus, participants complete the pretreatment BAT wherein they proceeded through a series of 16 hierarchical steps on the target exposure stimulus. The final step physically completed in the hierarchy served as the target exposure step for which exposure was conducted. At the conclusion of the pretreatment BAT, participants completed the Metacognition and Washing Threat Questionnaire and were then randomly assigned to one of three groups: (a) NSB, (b) RSB, or (c) F-RSB. After administration of the condition rationale, the Credibility and Expectancy Questionnaire was given to participants. They then completed 15 trials of exposure based upon their assigned condition, either using restorative safety behaviors or not. Psychophysiological arousal was assessed during the 15 trials of exposure. Following exposure condition completion, the Treatment Evaluation Inventory-Short Form and Endorsement and Discomfort Scale were administered. Participants also completed the Safety Behavior Checklist in order to examine whether other safety behaviors may have been utilized during the exposure procedure. Following the completion of the treatment evaluation measures and Safety Behavior Checklist, participants were given a second hand wipe. Similar to the hand wipe given at the onset of the study, this second hand wipe was provided to ensure that perceived levels of "contamination" from exposure, did not "contaminate" the post-treatment BAT; thus, all participants could have a return to pretreatment levels regarding perceptions of their own contamination. Participants then completed the post-treatment BAT on the target exposure stimulus and again completed the Metacognition and Washing Threat Questionnaire. Participants were given a third hand wipe and short break before initiating the generalizability assessment BAT on the second set of novel and potentially contaminated stimuli.

Approximately two weeks following exposure, participants returned to the laboratory

to complete the follow-up assessment wherein they completed the BAT using the target exposure stimulus. They again completed the Metacognition and Washing Threat Questionnaire. Participants were then thanked for their time and given course credit in exchange for participation in the current study.

Aims and Hypotheses

The following hypotheses were based on our conceptualization and guiding exposure therapy framework of inhibitory learning theory. It was predicted that F-RSB would produce greater improvement pre to post-treatment and pretreatment to follow-up, as compared to NSB and RSB. Presumably, the F-RSB procedure would allow for optimized expectation violation, greater variability, and multiple contextual environments (Craske et al., 2014), resulting in better overall outcomes. Regarding process measures, it was predicted that RSB would produce significantly greater improvements on ratings obtained during repeated exposure trials, relative to F-RSB and NSB. It was predicted that RSB would outperform F-RSB and NSB; however, for F-RSB, it was expected that the threatening context would become potentiated by the withdrawal of safety behaviors, and potentially result in relative and temporary increases in symptoms following safety behavior removal.

Primary Hypotheses- Pretreatment vs Post-treatment and Pretreatment vs Follow-up outcomes

Aim 1. Investigate the effects of group (NSB, RSB, F-RSB) on pretreatment, post-treatment, and follow-up outcomes.

Hypothesis 1. It was predicted that F-RSB will evidence greater pre to post-treatment reductions in fear, disgust, illness likelihood, illness severity, and behavioral avoidance during BAT, compared to NSB and RSB. It was not defined whether NSB and RSB would be

expressively equivalent, as it may be that RSB outperforms NSB.

Hypothesis 2. It was predicted that F-RSB will evidence greater pretreatment to follow-up reductions in fear, disgust, illness likelihood, illness severity, and behavioral avoidance during BAT, compared to NSB and RSB. It was not defined whether NSB and RSB would be expressively equivalent, as it may be that RSB outperforms NSB.

Hypothesis 3. It was predicted that F-RSB would demonstrate lower subjective fear/disgust, cognitive ratings, and behavioral avoidance towards a second set of potentially contaminated materials, in comparison to NSB and RSB. RSB would be either comparable to, or result in significantly better outcomes compared to NSB. Furthermore, gains made by F-RSB during exposure treatment will generalize to a novel set of stimuli, relative to NSB and RSB.

Hypothesis 4. It was predicted that F-RSB would produce significantly greater pre to post-treatment improvements in fear toleration (as assessed by the Metacognition and Washing Threat Questionnaire), compared to NSB and RSB. RSB and NSB will either show comparable outcomes or RSB will show significantly greater improvements. A similar pattern was also predicted for F-RSB on a measure of illness and non-illness related threats such that F-RSB would endorse lower threat-related beliefs, in comparison to NSB and RSB.

Hypothesis 5. It was predicted that F-RSB would produce significantly greater pretreatment to follow-up improvements in fear toleration (as assessed by the Metacognition and Washing Threat Questionnaire), compared to NSB and RSB. RSB and NSB will either show comparable outcomes or RSB will show significantly greater improvements. It was also predicted that F-RSB will endorse fewer threat-related beliefs from pretreatment to follow-up on a measure of illness and non-illness related beliefs, compared to NSB and RSB.

Secondary Hypotheses- Process Measures

Aim 2. Investigate the effects of exposure condition (NSB, RSB, F-RSB) throughout the 15 repeated trials of exposure.

Hypotheses 6 (Subjective) and 7 (Psychophysiology). It was predicted that RSB will produce significantly greater improvements on indices of (a) greater (linear effect) and faster decreases (quadratic effect) in subjective ratings obtained across exposure, and (b) greater and faster decreases in heart rate across the 15-trials of exposure, as compared to F-RSB and NSB. It was predicted that RSB will produce greater improvements compared to NSB, given this finding will replicate Goetz and Lee (2015).

It was anticipated that RSB will outperform F-RSB given that those assigned to F-RSB may experience a potentiated threat context following safety behavior withdrawal. This may result in a slight and temporary re-emergence of symptoms, at least immediately following removal. Due to the potential for the threatening context to become more salient since safety behaviors will no longer be available, it was hypothesized that RSB will outperform F-RSB in terms of linear and quadratic patterns. Regarding differences between NSB and F-RSB, it was predicted that they will either be comparable or F-RSB will demonstrate greater and more rapid decreases on indices. Despite the prospect that participants may have a slight re-emergence of symptoms while undergoing F-RSB, they were predicted to have superior pre to post-treatment and pretreatment to follow-up outcomes.

Secondary Hypotheses –Treatment Acceptance

Aim 3. Examine tolerability, acceptability and overall treatment endorsement of the three exposure-based conditions (NSB, RSB, F-RSB).

Hypothesis 8. It was hypothesized that exposure with safety behaviors (F-RSB and RSB) would be experienced as more tolerable, acceptable, and palatable, compared to NSB. It is furthermore predicted that F-RSB and RSB will not significantly differ in degree of treatment acceptability, although they will both outperform NSB on treatment endorsement and acceptability ratings.

Results

Demographic and Baseline Characteristics

A total of fifty-one participants completed the current study (See Figure 1 for Participant Flow). Baseline characteristics were compared between groups with ANOVA tests conducted for continuous variables and χ^2 tests for categorical variables. Participants in NSB, RSB, and F-RSB did not significantly differ with respect to age [$F(2, 48) = 1.41$, $p = .25$], race [χ^2 (6) = 6.41, $p = .38$], ethnicity [χ^2 (2) = 1.33, $p = .52$], or gender [χ^2 (2) = 0.30, $p = .86$].

The potential for between-group differences on relevant clinical scales and subscales was also examined. Specifically, these included OCD and disgust measures (i.e., OCI-R, VOCI, DOCS, OBQ, DPSS-R) and general emotional distress (DASS-21). Pretreatment ratings on the BAT (behavioral approach, fear, disgust, illness likelihood, and illness severity) were also examined. None of the tests were significant, all *p's* > .05, suggesting that randomization was purportedly successful. See Tables 1 and 2 for group differences on clinical scales and pretreatment BAT, respectively.

In addition, exposure indices were examined in order to obtain an understanding of the most frequently utilized exposure stimulus and target exposure step. The three conditions did not differ with respect to target exposure stimulus selection, χ^2 (4) = 6.80, $p = .15$. Furthermore, 31% of participants (n=16) were exposed to the mixture of dirt, dead insects and dog hair, 55% to the dirty toilet (n=28), and 14% to the soiled laundry (n=7). The mean target exposure step that was used for exposure trials was approximately step 11.43 (*SD* = 5.08), the median was 14, and the mode were steps 15 and 16.

Exclusion

Nineteen participants were excluded from the current analyses for the following reasons: (a) demonstrated peak fear < 10 on Trial 1 of exposure (n=9), (b) overall mean fear on pretreatment BAT < 20 (n=6), (c) inability to complete the first hierarchical step on pretreatment BAT (n= 2), and (d) all three exposure stimuli evoked little-to-no fear or distress as evidenced by anticipated fear < 20 (n = 2).

Follow-up Assessment

Twenty-nine participants (=57%) completed the follow-up assessment and returned to the laboratory approximately two weeks following the initial exposure intervention: NSB (n = 11), RSB (n = 10), and F-RSB (n =8). The mean length of time between the two study visits was 13.5 days (*SD* = 6.28). The three groups did not differ with respect to length of time between the study visits [χ^2 (24) = 19.50, p = .73] or the rate at which they returned for the second study visit [χ^2 (58) = 60.00, p = .40]. The mean age of participants who completed the follow-up assessment was 19.97 years (*SD* = 1.78). 83.3% of the participants who completed the second visit were female. Out of the completers, groups did not differ with respect to age [F(2, 26) = 1.13, p = .34], race [χ^2 (6) = 6.30, p = .39], ethnicity [χ^2 (2) = 1.47, p = .48], or gender [χ^2 (2) = 0.85, p = .65].

Treatment Credibility and Expectancy

Treatment credibility and expectancy effects were measured immediately following administration of the group rationale using the Credibility and Expectancy Questionnaire (Devilly & Borkovec, 2000). Mean credibility ratings for participants in NSB (*M* = 16.41, *SD* = 6.43), RSB (*M* = 18.88, *SD* = 4.64), and F-RSB (*M* = 18.82, *SD* = 5.38) did not significantly differ, F(2, 48) = 1.11, p = .34. Furthermore, expectancy ratings did not significantly differ

between the three groups, $F(2, 48) = 1.00$, $p = .37$ [NSB ($M = 13.18$, $SD = 8.74$), RSB ($M = 16.71$, $SD = 6.55$), and F-RSB ($M = 16.24$, $SD = 8.20$)]. From this, it may be inferred that procedural expectations did not differ by condition or presumably as a function of the group rationale.

Fading of Restorative Safety Behaviors

The mean trial for which safety behavior withdrawal was initiated (i.e., the first trial experienced without restorative safety behaviors for F-RSB) was Trial 7.12 ($SD = 2.23$). The median and mode for fading in F-RSB was Trial 8.

Safety Behavior Utilization

The number of safety behaviors used per trial for RSB and F-RSB was first examined. Participants were permitted to use as many safety behaviors as they wished of the three available options. Participants in F-RSB and RSB both used on average one safety behavior per exposure trial (F-RSB: $M = 1.08$; $SD = 0.24$; RSB: $M = 1.13$, $SD = 0.41$). Because safety behaviors were, on average, faded by exposure Trial 7 for F-RSB, this seemed an appropriate cut point with which to examine use of safety behaviors by RSB. Examination of all 15 trials of exposure indicated that RSB used a similar number of safety behaviors per trial (RSB: $M = 1.09$; $SD = 0.20$).

Furthermore, hand-sanitizer was the most frequently utilized restorative safety behavior by the two safety behavior-aided conditions. Independent samples t-tests were conducted to compare percentage of safety behavior use between RSB and F-RSB. For example, if Participant A, over 4 trials of exposure in F-RSB, used hand sanitizer across three of the trials and a hand wipe for one trial, then Participant A used hand sanitizer across 75% of their exposure trials in which safety behaviors were permitted. Furthermore, Participant A

would have used the hand wipe on 25% of the completed exposure-aided trials. Results revealed no significant between-group differences on percentage of hand sanitizer [$t(32) = 1.63$, $p > .05$], hand wipe [$t(32) = -1.09$, $p > .05$], or paper towel use [$t(32) = -0.35$, $p > .05$]. Therefore, groups were no different regarding the types of safety behaviors that were selected as well as the frequency of use.

Safety Behavior Checklist

Participants were administered the Safety Behavior Checklist immediately following exposure condition completion in order to ensure that participants were similar in use of other safety behaviors that may have been utilized during exposure. Total use of safety behaviors, as well as subscales for preventive and restorative were examined. The three conditions did not differ to the extent in which they used other safety behaviors during exposure (*p's* range =.18 - .73).

Peak Fear and Disgust at Trial 1 of Exposure

Analyses first sought to examine whether the three groups significantly differed with respect to peak fear and disgust at Trial 1 of exposure, an index that is indicative of initial arousal (Foa & Kozak, 1986). Two one-way ANOVAs were conducted to determine whether the three groups differed in their level of initial fear and disgust activation. No group differences were found for either peak fear [$F(2, 48) = 0.12$, $p = .88$] or disgust [$F(2,48) = 0.07$, $p = .94$], suggesting that all three groups initiated exposure at approximately the same peak fear [NSB: $M = 61.18$, $SD = 26.43$; RSB: $M = 61.12$, $SD = 27.40$; F-RSB: $M = 65.59$, $SD = 25.00$] and disgust [NSB: $M = 77.65$, $SD = 24.63$; RSB: $M = 75.29$, $SD = 20.95$; F-RSB: $M = 75.00$,

SD = 23.32] levels.[3] Regarding "ending" fear and disgust levels on Trial 15, it was anticipated that all three groups would terminate exposure at approximately the same levels. In other words, all three groups would not differ on peak fear [NSB: *M* = 33.24, *SD* = 32.93; RSB: *M* = 28.82, *SD* = 37.90; F-RSB: *M* = 22.65, *SD* =23.59] or disgust [NSB: *M* = 45.00, *SD* = 34.37; RSB: *M* = 37.65, *SD* = 39.45; F-RSB: *M* = 30.59, *SD* =31.67] at Trial 15 of exposure. This hypothesis was supported as no differences were found at the final exposure trial for fear [$F(2, 48) = 0.47$, $p = .63$] or disgust [$F(2, 48) = 0.71$, $p = .50$].

Primary Hypotheses- Pretreatment vs Post-treatment and Pretreatment vs Follow-up Outcomes

Hypothesis 1

The means and standard deviations of all pretreatment, post-treatment, and follow-up BAT outcome measures are located in Table 3. A multivariate analysis of covariance (MANCOVA) was used to examine between-group differences on Time 2 assessment outcomes (Behavioral Approach, Fear, Disgust, Illness Likelihood, Illness Severity), controlling for their severity at Time 1. The analysis failed to yield a statistically significant effect of group, $F(10, 78) = 1.11$, $p = .36$, Wilks' $\Lambda = 0.77$.

[3] It was previously predicted that RSB and F-RSB would significantly differ in fear from NSB as the sight of the safety aids may have implied the presence of harmful bacteria, potentiated the threat value of the stimuli, and inferred the need to use safety aids. In order to negate this potential effect, participants in NSB were "passively exposed" to the presence of restorative safety aids during repeated exposure trials. Restorative safety aids were described to those in NSB as methods that they should avoid using during exposure. The safety aids were then left in the room with the participant as they completed exposure trials. Therefore, any potential group differences cannot be attributed to the *mere presence* (or lack thereof) of the safety aids inside the exposure therapy room.

Hypothesis 2

A second MANCOVA examined between-group differences on the follow-up BAT, while controlling for their severity at pretreatment. Completer analyses (n=29) indicated that the omnibus test was not significant, $F(10, 36) = 1.04$, $p = .43$, Wilks' $\Lambda = 0.59$.

Additional Analyses for Hypotheses 1 and 2

To examine *changes* in pre-, post-, and follow-up BAT, a series of 3 (group: NSB, RSB, F-RSB) x 2 (time: pre vs post or pre vs follow-up) Repeated Measures ANOVAs were conducted on BAT assessment variables (see Figure 2 for graph of pre-, post-, and follow-up BAT outcomes).

Regarding pre to post-treatment outcomes, significant main effects of time were found on all measures, including Behavioral Approach [$F(1, 48) = 15.30$, $p < .001$, $h_p^2 = .24$], Fear [$F(1, 48) = 61.67$, $p < .001$, $h_p^2 = .56$], Disgust [$F(1, 48) = 63.98$, $p < .001$, $h_p^2 = .57$], Illness Likelihood [$F(1, 48) = 25.08$, $p < .001$, $h_p^2 = .34$], and Illness Severity [$F(1, 48) = 19.76$, $p < .001$, $h_p^2 = .29$]. Main effects were suggestive of increased rates of Behavioral Approach and decreases in Fear, Disgust, Illness Likelihood, and Illness Severity across the two assessments. Main effects were not qualified by significant Group X Time interactions, $p > .05$.

Pretreatment to follow-up BAT outcomes were also examined. Although a Group X Time effect was not found when probing pre-post changes, a group effect may exist when investigating long-term outcomes. Significant main effects of time were found for Behavioral Approach [$F(1, 27) = 8.57$, $p < .01$, $h_p^2 = .24$], Fear [$F(1, 27) = 61.96$, $p < .001$, $h_p^2 = .70$], Disgust [$F(1, 27) = 62.30$, $p < .001$, $h_p^2 = .70$], Illness Likelihood [$F(1, 27) = 24.82$, $p < .001$, $h_p^2 = .48$], and Illness Severity [$F(1, 27) = 17.16$, $p < .001$, $h_p^2 = .39$]. Examination of means

indicated overall increases in Behavioral Approach as well as reductions in Fear, Disgust, Illness Likelihood, and Illness Severity from pretreatment to follow-up. No Group X Time effects were found on any of the indices.

Hypothesis 3

The means and standard deviations of the generalizability assessment outcome measures are located in Table 4. A one-way MANOVA was conducted to examine group differences with respect to Behavioral Approach, Fear, Disgust, Illness Likelihood, and Illness Severity. The omnibus MANOVA was not significant, $F(10, 88) = 0.69$, $p = .73$, Wilks' $\Lambda = 0.86$.

Given that the generalizability assessment was conducted to examine whether gains made during exposure generalized to other sources of contamination, Repeated Measures ANOVA was used to examine changes from post-treatment to generalizability BAT performance. Generalization may be characterized as further decreases in symptoms from post-treatment to generalizability test, although it may also be the simple maintenance of therapeutic gains (i.e., ratings are unchanged from post-treatment to generalizability BAT). A main effect of time may be indicative of *decreases* or *increases* in symptoms ratings. An increase in a symptom of interest (e.g., increases in fear from post-treatment to generalizability) would seem to indicate a failure of generalization, whereas a decrease in symptoms or the maintenance of symptoms (i.e., lack of time effect) would likely indicate generalization success.

A series of five 3 x 2 Repeated Measures ANOVAs were conducted to compare between-group changes from post-treatment to generalizability BAT. Results showed significant main effects of time for Fear [$F(1,48) = 5.36$, $p < .05$, $h_p^2 = .10$] and Illness

Likelihood [$F(1,48) = 4.51$, $p < .05$, $h_p^2 = .09$]. No main effect of time was found for Illness Severity, $p > .05$. Specifically, all three groups demonstrated slight yet significant increases in Fear and Illness Likelihood. No Group X Time interactions were found on Fear, Illness Likelihood, or Illness Severity. A main effect of Time [$F(1,48) = 12.05$, $p < .001$, $h_p^2 = .20$] and significant Group X Time interaction were shown for Disgust, $F(2,48) = 3.99$, $p < .05$, $h_p^2 = .14$. Interaction contrast tests showed that F-RSB significantly differed from both NSB [$F(1, 48) = 4.26$, $p = .04$, $h_p^2 = .08$] and RSB [$F(1, 48) = 7.29$, $p = .01$, $h_p^2 = .13$]. Although all groups evidenced significant increases in Disgust from post-treatment to generalizability BAT, participants in F-RSB demonstrated relatively greater increases, compared to the other two groups. No time or Group X Time effects were found for Behavioral Approach, p's $> .05$. See Figure 3 for bar graph demonstrating changes in Fear, Disgust, and Illness-related beliefs from post-treatment to generalizability BAT.

Overall, given the increases in subjective ratings from post-treatment BAT to generalizability assessment, one could state that generalization failed to occur. However, results did show that behavioral approach was maintained across the two assessments points. Furthermore, when examining differences at the single assessment point using a multivariate approach, no significant group effect was shown. Behavioral approach is likely a more objective indicator of behavior than expressed fear, disgust, and illness beliefs; therefore, it appears that generalization did occur for behavioral approach given the absence of avoidance behavior.

Hypothesis 4

To examine *changes* in pre-, post-, and follow-up ratings on the Metacognition and Washing Threat Questionnaires, a series of 3 (group: NSB, RSB, F-RSB) x 2 (time: pre vs

post or pre vs follow-up) Repeated Measures ANOVAs were conducted. The four metacognition questions were examined individually, as per Rowe and Craske (1998). Significant main effects of time were found on perceived degree of fear reduction [$F(1, 47) = 34.46$, $p < .001$, $h_p^2 = .42$] and permanence of fear reduction $F(1, 46) = 23.07$, $p < .001$, $h_p^2 = .33$]. Respectively, these measures indicated that groups showed greater willingness to believe that their fear had reduced and that these reductions had greater permanence. No Group X Time interactions were found.

Responses on the Washing Threat Questionnaire were also examined by averaging fear towards illness-related threats, non-illness threats, and combining each to compute a total score. Significant main effects of time for Total Score [$F(1, 47) = 26.54$, $p < .001$, $h_p^2 = .36$], Illness Threat [$F(1, 43) = 26.41$, $p < .001$, $h_p^2 = .38$], and Non-illness Threats [$F(1, 45) = 15.46$, $p < .001$, $h_p^2 = .26$] were found, indicating reductions in fears of illness and non-illness threats. No Group X Time interactions were detected.

Hypothesis 5

The above analyses were conducted examining pretreatment to follow-up ratings. Significant main effects of time were found on perceived degree of fear reduction [$F(1, 26) = 23.99$, $p < .001$, $h_p^2 = .48$], permanence of fear reduction $F(1, 25) = 4.79$, $p < .05$, $h_p^2 = .16$], degree to which the exposure procedure generalized to potential contaminants outside of the experiment [$F(1, 27) = 7.71$, $p < .01$, $h_p^2 = .22$], and prediction of fear on future tasks [$F(1, 27) = 13.99$, $p < .001$, $h_p^2 = .34$]. Main effects of time were in the identical direction as those from pre to post-treatment. No Group X Time interactions were found.

Responses on the Washing Threat Questionnaire were examined. Significant main effects of time for Total Score [$F(1, 27) = 10.72$, $p < .01$, $h_p^2 = .28$] and Illness Threat [$F(1,$

24) = 8.16, $p < .01$, $h_p^2 = .25$] were detected. No Group X Time interactions were found for Total Score, Illness-related, or Non-Illness Threats.

Secondary Hypotheses- Process Measures

Hypothesis 6

To examine changes across repeated exposure trials, Multilevel Modeling (MLM) was utilized. The models used here and throughout the manuscript were conducted using SPSS for Windows (IBM version 23.0). MLM holds advantages over traditional repeated measures ANOVA as there is no requirement for complete data for repeated assessments, nor is there a requirement for equal intervals of measurement per case. Sphericity (uncorrelated errors over time) is also not a concern in MLM. The following multilevel models were comprised of two levels: At level 1, repeated measures (i.e., the 15 exposure trials) were nested within individuals (Level 1) and were entered to examine the individual growth curve in process measures as a function of Time (i.e., a linear function; overall amount of increase or decrease) and $Time^2$ (i.e., a quadratic function; change in rate of change, whether symptoms rapidly accelerate or decelerate). At level 2, the variance in random intercept (i.e., initial status) and random slope (i.e., growth rate) were examined with the inclusion of individual-level covariates (i.e., dummy-coded condition variables).

There are several possible trajectories that may be established when examining linear and quadratic patterns. First, linear patterns over time will be considered: (a) ratings increase across trials (e.g., fear worsens across trials of exposure), (b) ratings decrease across trials (e.g., fear reduction across trials of exposure), or (c) no change across trials (e.g., fear is held constant across repeated exposure trials, non-significant slope). Second, the quadratic effect examines the "speediness' with which increases or decreases in a particular rating occurred

across the exposure trials. A significant quadratic effect may show one of several patterns: (a) rapid and early increases in rating followed by "leveling off" (e.g., fear rapidly increases early on, and then levels off during later exposure trials), (b) rapid and early decreases in rating followed by "leveling off," (e.g., fear rapidly decreases early on, and then levels off during later exposure trials), (c) maintained symptom level followed by rapid increases in rating at later exposure trials (e.g., fear is maintained at a constant level and then rapidly increases at later exposure trials), (d) maintained symptom level followed by rapid decreases in rating at later exposure trials (e.g., fear is maintained at a constant level and then rapidly decreases at later exposure trials), or (e) the absence of a quadratic component, such that a rating is held constant (i.e., there is no change in the rate of change). See Figure 4 for graphs depicting examples of significant quadratic components.

Condition was modeled using dummy-coded variables so that condition status could be added as a predictor to examine Group X Time interactions. The covariance structure was defined as Diagonal for repeated measures, and Variance Component for random effects of the model. Covariance parameters showed significant variance in random intercept and slope, which supports the relevance and utility of multilevel modeling for these data. Results solely focus on describing the significance of fixed effects in the model. Ratings were obtained prior to exposure confrontation (i.e., anticipatory ratings), during exposure confrontation (i.e., peak ratings), and then following safety behavior use/ offset of confrontation with the target exposure stimulus. Please see Table 5 for ratings obtained throughout the 15 trials of exposure.

Anticipatory ratings across exposure trials. Anticipatory ratings included those items assessed prior to direct confrontation with the target exposure stimulus. Ratings were obtained at the onset of each of the 15 exposure trials.

Anticipatory fear. Significant linear Time (β = -8.26, $t(348.55) = -5.70$, $p < .001$) and quadratic Time^2 effects (β = 0.34, $t(308.79) = 4.11$, $p < .001$) indicated overall reductions and rapid initial reduction. Furthermore, significant Group X Time and Group X Time^2 interactions were detected for RSB and NSB [Group X Time: (β = 3.22, $t(348.75) = 2.71$, $p < .007$); Group X Time^2: (β = -0.17, $t(309.07) = -2.58$, $p < .01$)] as well as F-RSB and NSB [Group X Time: (β = 2.77, $t(348.75) = 2.33$, $p < .05$); Group X Time^2: (β = -0.13, $t(309.08) = -1.88$, $p = .06$)]. Overall, participants assigned to RSB and F-RSB demonstrated greater overall and more rapid initial decreases in anticipated fear, compared to NSB. Those assigned to NSB appeared to exhibit little change in the rate of anticipatory fear decline as decreases were maintained (see Figure 5).

Anticipatory disgust. Significant linear Time (β = -7.09, $t(300.09) = -5.04$, $p < .001$) and quadratic Time^2 effects (β = 0.24, $t(309.60) = 2.91$, $p < .01$) were shown indicating overall symptom reduction, as well as rapid rates of reduction in early exposure trials. Significant Group X Time and Group X Time^2 effects were found for RSB and NSB [Group X Time: (β = 2.84, $t(300.09) = 2.46$, $p < .01$); Group X Time^2: (β = -0.15, $t(309.60) = -2.18$, $p < .05$)] as well as RSB and F-RSB [Group X Time: (β = 2.11, $t(295.32) = 1.86$, $p = .06$); Group X Time^2: (β = -0.15, $t(307.18) = -2.29$, $p < .05$)]. Overall, participants assigned to RSB demonstrated greater overall reductions in anticipatory disgust, as well as a faster rate of initial anticipatory disgust decline, relative to NSB and F-RSB. It is noteworthy that all groups appeared to exhibit early and rapid deceleration in anticipatory disgust, although those in RSB exhibited the most rapid decline followed by leveling off at later trials. Participants in F-RSB showed no leveling off effect; only continued decreases in anticipatory disgust (see Figure 6).

Estimated confidence. Significant linear Time (β = 5.10, $t(293.54) = 3.50$, $p < .001$) and quadratic Time^2 (β = -0.29, $t(359.60) = -2.96$, $p < .01$) effects were found, suggesting overall and rapid initial *increases* in confidence across individuals over time. Significant Group X Time and Group X Time^2 effects were found for RSB and F-RSB [Group X Time: (β = -2.67, $t(291.08) = -2.28$, $p = .02$); Group X Time^2: (β = 0.20, $t(357.97) = 2.56$, $p = .01$)]. Overall, participants in F-RSB evidenced significantly greater increases in confidence across trials compared to RSB, whereas those assigned to RSB demonstrated more rapid initial confidence acceleration at early exposure trials followed by leveling off at later trials. Individuals in F-RSB exhibited continued increases in confidence per examination of the quadratic function. (see Figure 7).

Anticipated threat. Significant linear Time (β = -4.78, $t(356.77) = -3.80$, $p < .001$) and quadratic Time^2 effects (β = 0.22, $t(290.53) = 2.90$, $p < .01$), indicated overall and rapid initial decreases (followed by leveling off) in ratings of anticipated threat. Significant Group X Time and Group X Time^2 effects were found for NSB and RSB [Group X Time: (β = 2.92, $t(356.77) = 2.84$, $p < .01$); Group X Time^2: (β = -0.17, $t(290.53) = -2.77$, $p < .01$)]. Participants in RSB had greater overall decreases in anticipated threat, compared to NSB. In regards to the quadratic pattern of findings, participants assigned to RSB exhibited rapid and early decreases in anticipated threat followed by leveling off at later trials, relative to NSB. Those in NSB experienced little change in rate of anticipated threat growth (see Figure 8).

Summary of anticipatory ratings obtained across exposure trials. Several significant group differences were noted throughout administration of anticipatory indices during exposure trials. In regards to NSB, participants in RSB and F-RSB outperformed NSB on ratings of anticipatory fear. The two safety behavior groups did not differ from one another

on these measures as both groups exhibited overall greater and more rapid initial decreases on ratings, relative to NSB. RSB and F-RSB did, however, significantly differ on the measure of estimated confidence: those assigned to F-RSB exhibited overall greater increases in confidence, although participants who continuously used restorative safety behaviors (RSB) showed more rapid initial increases in confidence. The pattern of initial symptom acceleration for those assigned to RSB was often followed by leveling off, indicating no further continued growth in confidence. Those in F-RSB *did not appear* to experience rapid rates of acceleration; only sustained growth in confidence across exposure trials.

Peak ratings across exposure trials. Peak ratings were obtained throughout the repeated exposure trials. Ratings were administered while participants confronted the target exposure stimulus with the target exposure step.

Peak fear. Significant linear Time effect ($\beta = -4.11$, $t(313.71) = -3.11$, $p < .01$) and quadratic Time^2 effects ($\beta = 0.17$, $t(334.09) = 2.32$, $p < .05$) indicated overall reductions, and rapid, initial reductions in peak fear. Significant Group X Time and Group X Time^2 effects were shown for RSB and NSB [Group X Time: ($\beta = 2.18$, $t(315.71) = 2.02$, $p < .05$); Group X Time^2: ($\beta = -0.13$, $t(336.02) = -2.16$, $p < .05$)]. Participants in RSB demonstrated a greater overall decline in peak fear as well as a faster rate of initial fear decline than NSB. Those participants in RSB and NSB appeared to exhibit a leveling off effect at later trials of exposure (see Figure 9).

Peak disgust. Significant linear Time ($\beta = -5.75$, $t(282.19) = -4.24$, $p < .001$) and quadratic Time^2 ($\beta = 0.27$, $t(289.77) = 3.50$, $p < .001$) effects were shown indicating overall reductions in peak disgust, and faster initial decline in peak disgust across trials of exposure. A significant Group X Time^2 effect was shown for RSB and F-RSB ($\beta = -0.14$, $t(288.63) = -$

2.24, $p < .05$) indicating that participants in RSB had a more rapid rate of initial disgust reduction. Those randomly assigned to RSB leveled off at later exposure trials whereas participants in F-RSB showed significant and sustained decreases across the trials (no rapid acceleration; see Figure 10).

Summary of peak ratings obtained across exposure trials. In terms of differential patterns of linear and quadratic change, some group differences were noted throughout the obtained peak fear and disgust ratings. These differences were specific to RSB, in which participants evidenced overall greater and more rapid reductions in peak fear, compared to participants in NSB. Both groups tended to exhibit a leveling off of peak fear at later exposure trials as no further growth was evident. Participants in RSB had a faster rate of disgust reduction at early exposure trials, although this was followed by gradual leveling off, compared to F-RSB. Those in F-RSB evidenced sustained decreases in peak disgust across the 15 trials.

Post exposure confrontation or post safety behavior use ratings across exposure trials. These ratings were obtained directly following confrontation with the exposure stimulus or following use of the restorative safety behaviors.

***Likelihood of negative prediction*.** This rating was obtained from the pretreatment administration of the Metacognition and Washing Threat Questionnaire. The three groups did not differ with respect to their most feared negative prediction, $F(2,47) = 0.30$, $p = .74$. The most frequently chosen feared negative predictions were illness-related and included "I fear I will become ill" and "I fear I will be overwhelmed by disgust." Participants rated their feared negative prediction on a scale from 0 "*Not at all likely to occur*" to 100 "*Extremely likely to occur*."

Significant linear Time (β = -3.50, $t(445.45) = -2.55$, $p < .01$) and marginally significant quadratic Time^2 effects (β = 0.15, $t(437.08) = 1.89$, $p = .06$) were indicative of overall decreases in likelihood that the participant's negative prediction would come true. Rapid reductions were shown at early trials of exposure followed by leveling off. Significant Group X Time (β = 2.42, $t(444.02) = 2.17$, $p < .05$) and Group X Time^2 (β = -0.14, $t(436.08) = -2.22$, $p < .05$) effects for RSB and F-RSB were also shown. Participants in RSB demonstrated greater overall reductions, compared to F-RSB. Furthermore, those in RSB had more rapid initial reductions in likelihood for negative prediction to occur although gains leveled off at later trials, compared to those assigned to F-RSB (see Figure 11).

Urge to wash. Significant linear Time (β = -2.86, $t(336.06) = -2.12$, $p < .05$) and quadratic Time^2 effects (β = 0.19, $t(342.09) = 2.39$, $p < .05$) indicated overall decreases and more rapid initial decreases in urge to wash. Significant and marginally significant Group X Time and Group X Time^2 effects were found for RSB and F-RSB [Group X Time: (β = 2.03, $t(332.87) = 1.86$, $p = .06$); Group X Time^2: (β = -0.16, $t(340.32) = -2.52$, $p < .01$) as well as RSB and NSB [Group X Time (β = 2.33, $t(351.35) = 2.07$, $p < .05$); Group X Time^2 (β = -0.11, $t(350.86) = -1.78$, $p = .08$)]. Participants in F-RSB showed overall greater declines in urge to wash; however, those in RSB evidenced more rapid initial decline, followed by leveling off at later exposure trials. Participants in F-RSB evidenced sustained decreases across exposure trials, with little change in the rate of urge to wash change. Moreover, those participants in RSB evidenced greater overall and more rapid decreases in urgency to wash, compared to NSB. Individuals in NSB had decreases across exposure trials but rate of reduction appeared relatively constant over time (see Figure 12).

Illness Likelihood. Significant linear Time (β = -4.09, $t(348.40) = -3.68$, $p < .001$) and quadratic Time^2 effects (β = 0.22, $t(325.02) = 3.03$, $p < .001$) were indicative of overall as well as rapid, early decreases in likelihood for illness. Significant and marginally significant Group X Time and Group X Time^2 effects were shown for RSB and F-RSB [Group X Time: (β = 2.79, $t(346.08) = 3.12$, $p < .01$); Group X Time^2: (β = -0.17, $t(324.28) = -2.90$, $p < .01$)] as well as RSB and NSB [Group X Time: (β = 1.80, $t(357.29) = 1.97$, $p = .05$); Group X Time^2: (β = -0.10, $t(332.24) = -1.71$, $p = .09$)]. Participants in RSB demonstrated greater overall decreases in illness likelihood, compared to those in F-RSB and NSB. In regards to the quadratic pattern, participants in RSB evidenced more rapid decreases early in exposure trials, compared to F-RSB and NSB; however, rapid decreases by those in RSB were often followed by leveling off at later trials. Participants in F-RSB appeared to exhibit no rapid acceleration, only sustained decreases over time. Those in NSB demonstrated rapid decreases in early trials - although not as rapid as the pattern shown by participants in RSB - followed by a leveling off at later exposure trials. (see Figure 13).

Illness Severity. Significant linear Time (β = -2.39, $t(408.65) = -2.63$, $p < .001$) and quadratic Time^2 effects (β = 0.11, $t(376.71) = 2.03$, $p < .05$) were indicative of overall decreases, and rapid and early deceleration, for illness severity. No significant Group X Time or Group X Time^2 effects were observed.

Summary of post-confrontation or post-safety behavior use ratings across exposure trials. Participants in RSB demonstrated overall greater decreases in likelihood for negative prediction and illness severity, compared to F-RSB. Furthermore, those in RSB evidenced more rapid rates of initial decline in these ratings as well as on ratings of urge to wash. Although participants in this group demonstrated rapid decreases, this was typically

followed by leveling off of symptoms, suggesting no further gains made by those in RSB. Participants in F-RSB experienced only sustained decreases over time on most measures with little change in the rate of symptom change. Participants in F-RSB did however outperform RSB on overall decreases in urge to wash. Relative to NSB, participants in RSB showed greater and more rapid decreases in urge to wash and illness likelihood, but with later leveling off. No differences were shown between NSB and F-RSB on post-confrontation or post-safety behavior ratings.

Piecewise Multilevel Modeling to Study Continuity (and Discontinuity) across Exposure Trials

Given that the aforementioned analyses were conducted using traditional MLM across all 15 exposure trials, it was appropriate to explore process measure slopes prior to safety behavior removal and directly following removal for F-RSB, relative to NSB and RSB. Piecewise MLM (also referred to as piecewise linear growth, broken stick, two-phase, or segmented modeling; Hernandez-Lloreda, Colmenares, & Martinez-Arias, 2004) has advantages over traditional MLM, as it allows one to (a) examine the variation in growth parameter changes across two time periods, and (b) determine whether the correlates of variation (e.g., dummy-coded group) change across the two periods of time. Given that the current study contains an objective procedure with which fading occurred (i.e., after 50% peak fear reduction from Trial 1 value or following seven trials of safety behavior-aided exposure), piecewise MLM (i.e., examining changes in slope across two segments of exposure trial data) may theoretically differ as a function of participant. For example, fading may have occurred at Trial 3 of exposure for Participant A while fading occurred at Trial 6 for Participant B. For Participant A, Trials 1-3 would belong to Period or Piece 1 and Trials 4-15 as Period 2. For

Participant B, the two segments would include Trials 1-6 and 7-15. Therefore, the two segments of trial data are different but examined aggregately.

For NSB and RSB, the segmented difference was "forced" to occur at Trial 7; thus, Period 1 of data for these individuals included Trials 1-7 and Period 2 included Trials 8-15. This additionally maps onto when participants in these conditions were given additional instructions (i.e., continue to confront target exposure stimulus with safety behaviors or without safety behaviors) if 50% peak fear reduction was not achieved earlier. If 50% peak reduction was achieved prior to Trial 7, then additional instructions would have been supplied at an earlier point. Piecewise MLM can pave the way for a deeper, more fine-grained analysis of the factors (e.g., group allocation) that may be involved in behavioral changes across time. Similar to the traditional MLM approach, the parameters of the model stayed the same.

Ratings across exposure trials using piecewise MLM. Fixed effects of the model are reported. Estimated confidence, peak fear, and peak disgust were examined across exposure trials. Only linear patterns of change were examined.

Estimated confidence. A significant linear Period1 ($\beta = 3.53$, $t(271.86) = 3.71$, $p < .001$) effect was indicative of overall increases in confidence across individuals at the first segment. There was a marginally significant Group X Period1 effect for F-RSB and RSB ($\beta = -1.47$, $t(287.51) = -1.89$, $p = .06$), such that participants in RSB demonstrated greater increases in confidence across the first segment of exposure trials. A significant Group X Period2 effect was also found for RSB and F-RSB ($\beta = 1.15$, $t(346.96) = 2.44$, $p < .05$). Those participants assigned to F-RSB evidenced greater overall increases in confidence, compared to RSB whom experienced an overall decline in slope (see Figure 14).

Peak fear. Significant linear Period1 (β = -3.75, $t(266.29) = -3.31$, $p < .001$) and Period2 (β = -1.45, $t(354.23) = -3.64$, $p < .001$) effects were suggestive of overall decreases in peak fear across individuals at Period1 and Period2 segments. There was a significant Group X Period1 effect for NSB and RSB (β = 1.94, $t(245.52) = 2.09$, $p < .05$): Participants in RSB evidenced greater reductions in peak fear throughout Period1 trials. Significant Group X Period2 effects were found for RSB and F-RSB (β = -1.12, $t(372.43) = -3.48$, $p = .001$). F-RSB resulted in greater reductions, compared to RSB during the second time segment (see Figure 15).

Peak disgust. Significant linear Period1 (β = -4.24, $t(228.41) = -3.80$, $p < .001$) and Period2 (β = -2.34, $t(275.04) = -5.18$, $p < .001$) effects were indicative of overall decreases in peak disgust across individuals at both time segments. Significant Group X Period2 effects were found for NSB and F-RSB (β = -1.17, $t(287.82) = -3.22$, $p < .001$) and RSB and F-RSB (β = -1.32, $t(287.94) = -3.63$, $p < .001$). Participants in F-RSB demonstrated overall greater reductions in peak disgust at Period2, compared to participants in NSB and RSB (see Figure 16).

Hypothesis 7

Traditional MLM was again utilized to examine the overall decline in heart rate across exposure trials. Level 1 predictors were 15 repeated exposure trials which were nested within individuals. The repeated measures were utilized to examine individual growth curve in average and peak heart rate as a function of Time (i.e., rate of linear growth) and $Time^2$ (i.e., change in the rate of growth; occurrence of acceleration of deceleration). At Level 2, the variance in random intercept and random slope were examined with the inclusion of individual level covariates (i.e., dummy-coded group variables). The parameters were

identical to the aforementioned parameters. Average and peak heart rate were examined. These data underwent cleaning in an attempt to remove gross technological errors. Trial data that differed more than 2 SDs from the mean were removed. This entailed removing 10% of average heart rate and 11% of peak heart rate data points. Due to technological difficulties in use of the psychophysiological device, only a subset of the sample (n = 31) completed this protocol. The three groups did not differ with respect to completion of psychophysiological monitoring [χ^2 (60) = 62.00, p = .41].

Heart Rate. A significant linear Time effect (β = -4.78, t(76.10) = -2.89, p < .01) indicated overall decreases in average heart rate across individuals. A significant Time^2 (β = 0.31, t(70.05) = 2.93, p < .01) effect was suggestive of rapid, early decreases (followed by leveling off) in average heart rate. Significant Group X Time (β = 2.96, t(74.29) = 2.22, p < .05) and Group X Time^2 (β = -0.19, t(67.17) = -2.21, p < .05) effects were shown for NSB and RSB. Those in NSB evidenced greater overall reductions in average heart rate, whereas participants in RSB evidenced an overall increase in heart rate slope. In terms of the quadratic pattern, participants in NSB maintained heart rate at early trials followed by rapid decreases at later exposure trials. RSB, however, demonstrated a "U" pattern characterized by initial decreases in early exposure trials followed by rapid increases at later exposure trials. The identical pattern emerged for peak heart rate between NSB and RSB across exposure trials in regards to linear and quadratic patterns of change: Linear Time (β = -6.10, t(103.89) = -3.24, p < .01), quadratic Time^2 (β = 0.36, t(115.89) = 2.86, p < .01), Group X Time for NSB and RSB (β = 3.95, t(100.61) = 2.64, p < .01), and Group X Time^2 for NSB and RSB (β = -0.26, t(113.35) = -2.60, p < .01). See Figure 17 for linear and quadratic changes in peak heart rate.

Secondary Hypotheses –Treatment Acceptance

Hypothesis 8

One-way ANOVAs were conducted on the TEI-SF, EDS, and the EDS subscales (see Figure 18). No differences were found on EDS Total Score [$F(2,41)=0.13$, $p=.88$], EDS – Discomfort [$F(2,41)=0.81$, $p=.45$], or EDS – Endorsement [$F(2,41)=0.90$, $p=.91$]. On the TEI-SF, no group differences were detected [$F(2,47)=1.21$, $p=.31$].

Discussion

The judicious use of safety behaviors in exposure has received much research attention in recent years. Researchers have proposed that the careful implementation of specific types of safety behaviors may enhance the acceptability and tolerability of exposure-based therapies (Rachman et al., 2008) and potentially result in reduced attrition, increased comfort with exposure, and greater treatment utilization by providers. Recent findings have expanded our understanding of what safety behaviors may be harmful vs helpful (Goetz & Lee, 2015; Goetz et al., 2016). It is argued that preventive safety behaviors, which attenuate confrontation with an exposure stimulus likely result in poorer outcomes compared to restorative safety behaviors which allow for potent and non-attenuated confrontation throughout exposure. The current study attempted to expand upon existing knowledge by examining the overall impact of restorative safety behaviors on a single session of exposure for contamination fear when used continuously vs faded. In general, findings suggest that restorative safety behaviors, whether used continuously or judiciously, do not pose reliable drawbacks compared to an exposure only control condition. Indeed, use of restorative safety behaviors even conferred therapeutic benefit during repeated trials of exposure. Overall, these data add to a growing body of work indicating the relatively benign and occasionally facilitative impact of restorative safety behavior use on treatment outcomes (Abramowitz & Moore, 2007; de Silva & Rachman, 1984; Goetz & Lee, 2015; Goetz et al., 2016; Lickel et al., 2013; Rachman et al., 1986, 2011; van den Hout et al., 2001, 2002, 2011, 2012).

Interpretation of Primary Outcomes

Although primary hypotheses regarding pretreatment vs post-treatment and pretreatment vs follow-up predicted that F-RSB would outperform RSB and NSB, there was a

failure to find significant group differences. Indeed, all groups exhibited significant decreases on subjective ratings of fear, disgust, illness likelihood, and illness severity, in addition to increased rates of behavioral approach from pre to post-treatment and pretreatment to follow-up assessment. Furthermore, when examining whether exposure gains generalized to a novel set of contaminated stimuli, all groups exhibited modest yet significant increases on ratings of fear and illness-related beliefs from post-treatment to generalizability BAT. These increases did not differ by group. All three groups additionally evidenced increases in disgust ratings from post-treatment to generalizability BAT, with participants in F-RSB demonstrating significantly greater increases, relative to the other two groups. No increases or decreases in behavioral approach were found across the two BATs, suggesting that gains made during exposure were maintained - at least on this single outcome measure. From this, it may be inferred that the use of safety behaviors did not interfere with continued therapeutic progress given that increased rates of behavioral avoidance were not found (i.e., fewer steps completed on generalizability BAT, relative to post-treatment BAT) when participants were assessed on a second set of contaminated materials.

The finding that behavioral approach was maintained from post-treatment to generalizability assessment, while subjective ratings worsened, deserves some attention. Indeed, behavioral approach provides an objective measure of behavior, whereas ratings of fear, disgust, and illness-related beliefs leave room for subjectivity (Baumeister, Vohs, & Funder, 2007). The findings provide mixed support given groups maintained their level of behavioral approach although subjective ratings worsened. From an inhibitory learning perspective, these outcomes do not appear to be counter-therapeutic or represent a treatment generalization failure. Inhibitory learning theory emphasizes the importance of fear tolerance,

suggesting that habituation and fear reduction are not necessary to treatment success. Researchers have emphasized the importance of maintaining behavioral approach while also tolerating varying and changing levels of fear during exposure (Craske et al., 2008; Culver, Stoyanova, & Craske, 2012). The ability to engage in goal-directed behavior (i.e., behavioral approach), despite the experience of discomfort, may also ensure extinction learning (Asnaani, McLean, & Foa, 2016). For the current investigation's generalization task, it is unsurprising to see increased fear, disgust, and illness-related beliefs as reported on the second set of threatening stimuli given the novelty of these materials. Nevertheless, participants continued to demonstrate their previously established level of behavioral approach towards the new potent stimuli despite increases in negative emotions. Therefore, it would seem that the index of behavioral approach, as assessed at generalization test, is reflective of substantial therapeutic gain from the exposure intervention as well as the possibility for inhibitory learning to have occurred. An additional analysis revealed a marginally significant time effect from pretreatment to generalizability BAT, such that participants evidenced increases in behavioral approach, $F(1,48) = 2.77$, $p = .10$, $h_p^2 = .06$. On average, participants completed one additional step at generalizability assessment, as compared to pretreatment levels (pretreatment average behavioral approach: $M = 11.43$, $SD = 5.08$; generalizability assessment average behavioral approach: $M = 12.59$, $SD = 4.27$). Although participants may have experienced relatively greater overall discomfort from post-treatment to generalization BAT, this did not affect rate of behavioral approach. Therefore, this suggests that increases in distress were *tolerable enough* to not warrant avoidance behavior across the three conditions.

Moreover, when examining cognitive change on the Metacognition and Washing Threat Questionnaire, group differences were not found from pre to post-treatment. All groups

evidenced decreases on measures assessing perceived degree of fear reduction, permanence of fear reduction, and fears of illness and non-illness threats. These results were replicated from pretreatment to follow-up as decreases across measures were found on these indices as well as others including the degree to which participants believed exposure would generalize to potential contaminants founds outside the experiment, and reductions in their prediction of fear on similar tasks. Results from items assessing metacognition (i.e., fear reduction, fear permanence) are consistent with findings by Rowe and Craske (1998) who examined parameters of spider phobia exposure. As in their study, they surmised that participants may not have been "accurate judges of their own training experience" (p. 716). Nevertheless, results from this questionnaire indicate that safety behaviors do not appear to preclude immediate or long term changes in beliefs about fear tolerance, beliefs about future behavior in exposure-relevant situations, and fear towards illness and non-illness threats.

Do Changes in Ratings During Exposure Trials Differ Between Groups?

The current investigation additionally examined process measures across the 15 exposure trials using MLM. Peak fear and disgust on Trial 1 of exposure were first examined as these are putative indicators of initial arousal (Foa & Kozak, 1986). Initial fear and disgust activation did not differ between the three groups, suggesting that any potential group differences across process ratings obtained during the 15 exposure trials are unlikely to be accounted for by initial peak fear or disgust status. For example, if peak fear and disgust were found to be at very low levels at Trial 1 of exposure, one might expect a narrowed range of fear/disgust expression, such that substantial symptom gains would be unattainable.

In general, it was predicted that RSB would outperform both F-RSB and NSB across process measures. Compared to NSB, participants in RSB demonstrated greater reductions

and faster initial reduction across measures examined before, during, and after exposure stimulus confrontation during repeated exposure trials (e.g., Anticipated Fear, Anticipated Disgust, Anticipated Threat, Peak Fear, Urge to Wash, and Illness Likelihood). These findings corroborate previous research by Goetz and Lee (2015) who found that participants in RSB showed overall greater and more rapid, early decreases in Peak Fear and Disgust compared to those in NSB. Moreover, the observed superiority of RSB to NSB is consistent with substantial reductions in fear and avoidance found by two independent research groups who examined restorative safety behaviors (i.e., use of hygienic wipe after touching a contaminated object) as compared to conventional exposure (Rachman et al., 2011; van den Hout et al., 2011). The current investigation replicates previous research suggesting the benign and/or facilitative role that restorative safety behavior use imparts on the exposure process relative to an exposure only control condition (Abramowitz & Moore, 2007; de Silva & Rachman, 1984; Goetz & Lee, 2015; Goetz et al., 2016; Lickel et al., 2013; Rachman et al., 1986, 2011; van den Hout et al., 2001, 2002, 2011, 2012).

Following safety behavior removal for F-RSB, it was thought that the threatening context (i.e., target exposure stimulus) may increase in salience. Because the F-RSB procedure may engender a more threatening and potent exposure experience after safety behavior removal, it was argued that participants in F-RSB may demonstrate a slight re-emergence of distressing symptoms. This period of sudden and short-lived deterioration following safety behavior removal would presumably be followed by a return to reduction on the process measure. Given this, it was predicted that those in RSB would outperform F-RSB in terms of linear and quadratic patterns of change as the RSB procedure would not have had this context-dependent threat interruption. Results showed that participants in RSB

demonstrated greater overall reductions on measures of Anticipated Disgust, Likelihood of Negative Prediction, and Illness Likelihood, relative to those assigned to F-RSB. Examination of the quadratic pattern indicated that RSB also demonstrated more rapid initial decreases in Anticipatory Disgust, Estimated Confidence, Peak Disgust, Likelihood of Negative Prediction, Urge to Wash, and Illness Likelihood. Although participants in RSB exhibited more rapid initial symptom decrease (or rapid initial *increase*, as in the case of Estimated Confidence), such rapid decreases at initial exposure trials may provide little benefit in regards to later exposure trials. On indices with dramatic early symptom reduction, participants in RSB tended to exhibit "leveling off" in later exposure trials (e.g., Anticipated Disgust, Estimated Confidence, Peak Disgust, Likelihood of Negative Prediction, Urge to Wash, and Illness Likelihood). They may exhibit no further symptom improvement as exposure trials progress. Therefore, although there may be accelerated symptom improvement early on, there does not appear to be continued symptom reduction. In contrast, participants in F-RSB demonstrated little rapid falling behavior in terms of the quadratic pattern; instead, they evidenced a steady linear pattern of change on outcome indices, despite removal of restorative safety behaviors (e.g., Anticipated Disgust, Estimated Confidence, Peak Disgust, Urge to Wash, and Illness Likelihood). In lieu of rapid decreases on process measures, participants in F-RSB typically exhibited sustained linear decreases over time, suggesting little change in the rate of change for this condition. These findings nicely indicate that perhaps an important enhancement effect occurs following safety behavior withdrawal to allow F-RSB to exhibit further sustained declines across repeated exposure trials, whereas RSB exhibits leveling off following rapid and early gains in symptoms.

Regarding differences between F-RSB and NSB, few were found. F-RSB did result in overall and more rapid initial decreases on measures of Anticipated Fear. Pertaining to differences between F-RSB and NSB, it was predicted that they would be either equivalent, or that F-RSB would demonstrate greater and more rapid decreases on indices. Anticipatory Fear was the only measure in which participants in F-RSB demonstrated overall and more rapid symptom reduction. Given that RSB also outperformed NSB on this index, safety behavior use may confer some added benefit such that fear declines early and quickly as a function of safety behavior use. However, it is important to note that F-RSB and NSB did not evidence differences across other exposure process measures, suggesting that their decline patterns are relatively similar across the repeated exposure trials. This, as well as mixed results between RSB and F-RSB (particularly regarding differences on linear and quadratic patterns) begged the question whether additional facilitation occurred following safety behavior removal.

Do Changes in Ratings During Exposure Trials Differ by Group as a Function of Safety Behavior Removal?

The current study examined process measures *prior to* and *following* fading for F-RSB. After fading, F-RSB resulted in greater reductions in Peak Disgust and Fear, compared to RSB, and greater reductions in Peak Disgust relative to NSB. Why might participants in F-RSB exhibit continued reductions after safety behaviors are withdrawn, relative to the other groups? One of the purported mechanisms for the success of safety behavior use in exposure is self-efficacy (Goetz et al., 2016). Two separate research groups noted that perceptions of greater control may have resulted in exposure with restorative safety behaviors outperforming exposure only (Rachman et al., 1986; van den Hout et al., 2011). The use of restorative safety behaviors may lead to heightened perceptions of control that increase self-efficacy given

participants may quickly achieve personal mastery with the distressing experience. With restorative safety behavior use, a contingency is created between confrontation with the exposure stimulus and use of restorative safety behaviors. The expectation that remedy directly follows potent exposure trials may allow the participant to engage in the full intensity of exposure without hesitation. When safety behaviors are removed, and remedy does not immediately follow, participants proceed through exposure trials without aids. Although participants may have been somewhat reluctant to proceed with unaided-exposure, they may have learned that they did not need the safety behaviors to progress through exposure in a successful manner, thereby gaining confidence to complete the remaining exposure trials. Although there was a failure to find support for the primary outcomes, F-RSB was predicted to have superior primary outcome improvements as they may have felt a greater sense of self-confidence, accomplishment, and belief in themselves during exposure, resulting in lasting symptom benefit. When examining ratings of confidence before safety behavior removal for F-RSB, RSB exhibited relatively greater overall increases compared to F-RSB. After safety behavior removal, this pattern was found to have reversed: participants in F-RSB had continued increases at a greater rate than RSB whereas participants in RSB evidenced declines in confidence. Potentially, instructing participants in F-RSB and RSB to utilize hand-sanitizer, hand wipes, and/or paper towels may have led to increased perceptions of self-efficacy and control at different periods of time (e.g., both groups evidenced increases early on in exposure but F-RSB exhibited enhanced increases following safety behavior removal) by allowing participants to complete exposure with less reluctance. When examining all 15 repeated exposure trials without the influence of segmenting the data, RSB and F-RSB were mixed in terms of overall confidence increases and rate of increase. Although the current

study examined changes in confidence across repeated exposure trials, perceptions of control and self-efficacy were not examined before and after treatment. It may be that group differences in confidence could also be found pre to post-treatment or pretreatment to follow-up. Perhaps F-RSB conferred greater confidence following removal of safety behaviors, while also allowing participants to feel more confident at the post-treatment BAT. However, given that confidence and self-efficacy assessments were not administered during the BATs, this claim should be examined empirically in order to determine whether fading of safety behaviors bestows greater courage following exposure treatment.

Do Changes in Physiology During Exposure Trials Differ Between Groups?

This investigation examined physiological measures of heart rate during exposure trials. Participants in NSB showed greater overall reductions in heart rate, compared to those in RSB whom evidenced increases over time. NSB additionally showed rapid rates of heart rate reduction at later exposure trials, and RSB had early decreases followed by later increases. With respect to studies investigating psychophysiology and safety behavior use, these findings tend to align with previous research indicating that heart rate remained elevated amongst participants who used preventive safety behaviors relative to those with did not (Grayson et al., 1986). However, the findings are at odds with a large volume of research which failed to find differences amongst those who use safety behaviors versus traditional exposure (Craske, Street, Jayaraman, & Barlow, 1991; Grayson, Foa, & Steketee, 1982; Schmid-Leuz, Elsesser, Lohrmann, Johren, & Sartory, 2007).

From the perspective of emotional processing theory, within-session habituation capitalizes on fear and autonomic arousal which should theoretically reduce during an exposure session. From this viewpoint, the activity of NSB conforms to emotional processing,

but RSB does not given the pattern of reduction and later activation. Yet, there is weak evidence that within-session physiological reduction predicts treatment outcomes (see Craske et al., 2008 for a review). For example, the absence of within-session heart rate reduction did not result in poor exposure outcomes (e.g., Tsao & Craske, 2000; Lang & Craske, 2000; Rachman et al., 1986), and even large in-session reductions in heart rate were associated with greater return of fear (Rachman, Robinson & Lopatka, 1987). Thus, heart rate reduction may not be necessary, and at times, may actually interfere with long-term learning. It should be noted that the aforementioned studies did not examine psychophysiology in the context of exposure protocols that involved safety behaviors, but this research does provide evidence that increased arousal is not consistently associated with poor outcomes.

If results are viewed from the inhibitory learning perspective, sustained autonomic arousal may aid with relapse prevention following extinction learning (Craske et al., 2008). Contrary to emotional processing theory, terminating exposure at a point of elevated fear or physiological activity may promote better outcomes. For example, Lang and Craske (2000) randomly assigned participants to blocked or variable exposure for height phobia. The blocked exposure condition transitioned in a uniform direction through a height exposure hierarchy; for example, exposure was first conducted on the 2nd floor, and then subsequently moved to the 3rd, 4th, and other higher level floors. The variable condition transitioned through the hierarchy in a random order (e.g., randomly moved through floors). The two groups additionally differed in their style of height exposure approach. For example, the variable group conducted exposures in a random order of "looking down, leaning back on the rail, hanging their hands over the rail" (pg. 3; Lang and Craske, 2000) whereas the blocked group consistently approached the exposure in the same manner across trials and floors. Results

revealed that only the blocked group evidenced overall reductions in heart rate from the beginning to the conclusion of treatment. This is at odds with physiological habituation as a necessary component for fear to reduce (Foa & Kozak, 1986). Lang and Craske surmise that variability may create a "more difficult" therapeutic context for the individual (per Bjork & Bjork, 1992) and that task-related demands elevate heart rate (Borkovec, Stone, O'Brien, & Kaloupek, 1974). Although the current study did not seek to manipulate variability directly, one may view RSB and F-RSB as both involving a more diverse and variable procedure than NSB. Findings by Lang and Craske may allow researchers to disentangle the current study's findings given that RSB and F-RSB entail more variable procedures, and increased variability may result in less fear reduction (Lang & Craske, 2000).

Overall, it does not appear problematic that participants in RSB did not evidence reductions in heart rate across exposure. Potentially, elevated physiological activity during exposure may even increase retention and learning. These findings and conclusions notwithstanding, future inquiry should examine more fully the differences between F-RSB and RSB. Although no between-group differences existed for F-RSB, this group evidenced sustained decreases over time, and rapid decreases followed by increases at later exposure trials (a pattern similar to RSB; yet F-RSB still evidenced an overall pattern of heart rate decline). Theoretically, it is reasonable for this group to exhibit later increases in heart rate given the removal of safety behaviors; yet RSB did not undergo safety behavior removal and still demonstrated elevations at later exposure trials. More research is needed to understand why participants in RSB may evidence heart rate acceleration at later exposure trials despite the uniform procedure.

These findings, however, may be indirect evidence that the cycle of contamination exposure followed by "spoiling the ritual" and then subsequent re-contamination, and so on across exposure trials, may be a difficult, and potentially more therapeutic task. Furthermore, this difficulty may be associated with the increased physiological arousal, as was seen in the current study. Moreover, if greater task variability equates to a "more difficult" exposure procedure, such that participants may exhibit greater overall heart rate during exposure trials, it would be likely that we would have seen this pattern for F-RSB. Although participants in F-RSB exhibited rapid decline followed by rapid increases at later exposure trials, the overall linear pattern suggested decreases across the exposure trials. More research should examine the degree of heart rate variability across conditions of safety behavior use and disuse.

Treatment Acceptability as a Function of Group Allocation

As a secondary hypothesis, it was predicted that procedures that utilized safety behaviors would be rated as more acceptable and tolerable than NSB, yet the current findings did not support this hypothesis as group differences were not found across two measures of treatment acceptability, endorsement, and discomfort. Research is mixed regarding whether safety behavior use evidence reliable benefits in improving exposure likeability. For example, Deacon and colleagues (2010) found no effect of treatment condition for differences in acceptability or aversion on a single-session exposure intervention for claustrophobia wherein participants were randomly assigned to judiciously use safety behaviors or a no safety behavior control condition. Meanwhile, others have found evidence for the effects of safety behaviors as more acceptable during exposure (Levy & Radomsky, 2014; Milosevic & Radomsky, 2008, 2013; Hood et al., 2010). It may be that the measures used in the current study were not sensitive enough to adequately capture group differences, although it may also

be that the current dose of exposure is not potent enough to detect group differences in terms of acceptability. For example, if measures of treatment acceptability and satisfaction are employed in the presence of a comprehensive exposure protocol with multiple exposure sessions, group differences may be significant. This proposed study design would also allow researchers to examine rates of drop out and treatment refusal, which are central tenets to the judicious use hypothesis proposed by Rachman and colleagues (2008). Alternatively, dimensional measures of acceptability could be included at individual exposure trials to examine the likeability of treatment as a function of progress through exposure trials (e.g., Deacon et al., 2010).

Why Might Safety Behaviors be Facilitative?

Overall, the use of RSB and F-RSB did not diminish the efficacy of exposure therapy. Safety behavior use even facilitated clinical improvement across process measures, with RSB consistently outperforming NSB, and F-RSB outperforming both RSB and NSB following the removal of safety behaviors. These data suggest that safety behavior use, either used judiciously or continuously, result in improvements on relevant clinical indices of change.

Furthermore, for RSB and F-RSB, each exposure trial was akin to a new exposure task (i.e., RSB and F-RSB encompassed *separate* exposure tasks as opposed to 15 repeated trials of touching a contaminated stimulus as in NSB). Participants who were randomized to RSB and F-RSB were instructed to use restorative safety behaviors immediately following each stimulus contact, in a way creating a new exposure context per trial. After stimulus contact, participants "spoil the exposure" by cleaning themselves and then must "re-contaminate" upon initiation of the next trial. For participants assigned to either RSB and F-RSB this may have led to a more intense exposure procedure than that of NSB (Goetz & Lee,

2015). Moreover, restorative safety behaviors in F-RSB were removed once peak fear reduced by at least 50% of its original trial 1 value or once a potent dose of exposure was achieved (i.e., seven trials of exposure were completed). Therefore, participants in F-RSB were exposed to multiple contexts with which they were "contaminated and subsequently re-contaminated" across trials, and then, once safety behaviors were removed, simply "remained contaminated" across the remainder of trials. Participants in NSB were "contaminated" for the duration of the 15 trials and it may have been that "once contaminated, always contaminated" and perhaps touching the target exposure stimulus again would not be an insurmountable step. Perhaps, both RSB and F-RSB may entail tasks which are more difficult than NSB given their significant variability in protocol, although more research is needed to examine this claim. Safety behaviors may also foster approach behavior and allow participants to interact with the target exposure stimulus (Milosevic & Radomsky, 2008; Parrish et al., 2008; Rachman et al., 2008) in a more direct and intense manner. Furthermore, since restorative safety behaviors are used following potent trials of exposure, they do not attenuate or blunt exposure confrontation.

Findings from the Perspective of Cognitive Theory

To date, cognitive theory has received the most attention to explain the deleterious impact of safety behaviors. It is argued that individuals who use safety behaviors are unable to test their faulty negative beliefs regarding how threatening an object/situation truly is, and may (mis)attribute the non-occurrence of a feared outcome to use of the safety behavior (Salkovskis, 1991). Thus, restorative safety behaviors are expected to be detrimental due to failed threat disconfirmation, at least from the perspective of cognitive theory. For example, restorative safety behaviors may block disconfirmatory learning of the benign consequences of exposure given that restoration methods serve to immediately "remedy" the predicted

feared consequences. Therefore, participants' use of hand-sanitizer, hand wipes, and/or paper towels may remove the opportunity to disconfirm the anticipated catastrophic consequences (Goetz & Lee, 2015; Goetz et al., 2016).

In general, the current findings would suggest that restorative safety behaviors do not preclude cognitive change or threat disconfirmation in the immediate or long-term. Examination of follow-up data indicated no interference of safety behaviors in regards to likelihood and severity of acquiring an illness or beliefs about fear reduction and confrontation with novel contaminated materials. Perhaps, if participants had misattributed their perceived safety to the use of safety behaviors, one would expect differences at long-term follow-up. Given that differences were not found post-treatment or at follow-up, it may be inferred that disconfirmatory learning occurred across the three groups.

Still, ratings of cognitive change differed amongst participants in RSB and F-RSB during exposure trials. Trial-by-trial examination of likelihood of negative prediction indicated that those in RSB demonstrated greater and more rapid initial decline in ideographic feared prediction, compared to F-RSB. Participants in RSB evidenced symptom leveling off at later exposure trials although those in F-RSB showed no rapid pattern of change; only steady decreases. A similar pattern was shown on ratings of illness likelihood, suggesting some enhanced effect of safety behavior use. Moreover, although participants assigned to RSB evidenced more rapid decreases on these ratings, those in F-RSB exhibited sustained reductions. This again indicates the continued symptom reduction benefit from the eventual withdrawal of safety behaviors.

Findings which demonstrate the superiority of F-RSB to RSB are particularly noteworthy. Although such findings were purely exploratory (e.g., see Piecewise MLM

findings), they compellingly indicate the facilitated effects of safety behavior removal following a potent dose of exposure using safety behaviors. Perhaps individuals in F-RSB pushed themselves harder to face their fears and tolerate discomfort once safety behaviors were removed, resulting in enhanced confidence and greater reductions in fear and disgust. Deacon et al. (2010) examined the fading of preventive safety behaviors (e.g., open a window to allow a fan to blow air into claustrophobia chamber, communicate with experimenter via radio, have experimenter unlatch top of the chamber) versus conventional exposure, finding that both groups were comparable on ratings of cognitive change, self-control, peak fear, and time spent in a claustrophobia chamber challenge. Prior to completion of exposure, participants in the fading condition were told that their safety behaviors would eventually be removed. Deacon and colleagues (p. 78; 2010) presumed that knowing that access to safety is temporary may have created a "different psychological experience" than the knowledge that safety is present throughout the entire exposure intervention. They surmised that participants may have felt the need to challenge themselves and become appropriately engaged with the exposure stimulus as they were aware of the impending safety behavior withdrawal. However, in the current study, differences in psychological experience, at least prior to safety behavior removal, are unlikely as participants were unaware of the eventual removal. In fact, there were no group differences in terms of treatment credibility or expectancy. However, this potential difference in psychological experience may not have been detected by the current study's credibility measure. Perhaps only a measure that could have examined beliefs about safety would have been able to find differences. Future work should seek to examine safety attributions in regards to rationale for the use of safety behaviors during exposure.

Findings from the Perspective of Inhibitory Learning Theory

Although the current study did not intend to target or manipulate parameters of inhibitory learning directly (e.g., Deacon et al., 2013), findings may be viewed from this perspective. In general, inhibitory learning is optimized when clients learn that fear is tolerable and harmless, and the theory addresses several components with which to optimize this new form of learning (Craske et al., 2008, 2014). Strategies for optimization of inhibitory learning include (a) expectancy violation, (b) deepened extinction, (c) occasional reinforced extinction, (d) removal of safety signals, (e) variability, (f) retrieval cues, (g) multiple contexts, and (h) affective labeling. Many of the aforementioned components align nicely with current findings. These include: (a) variability across exposure, (b) multiple contexts, (c) removal of safety signals, and (d) expectation violation.

First, both F-RSB and RSB encompass highly diverse exposure procedures, compared to NSB, although F-RSB involves even greater variability in protocol than RSB. Because participants in F-RSB first proceed through exposure with safety behaviors, and then experience their subsequent withdrawal, participants are presented with several varied contexts with which to undergo new learning. Moreover, inhibitory learning capitalizes on the element of "surprise" and F-RSB advances this aim given the removal of safety behaviors without prior warning is likely somewhat abrupt. Furthermore, participants presumably came to rely and predict safety behavior use following potent confrontation with a potentially threatening stimulus. The diversity in procedure for F-RSB likely promoted some variability in fear level as well. For example, fear level may increase immediately following the removal of safety behaviors due to the potentiated threat context. Participants were then expected to continue confronting the exposure stimulus without the potential for remedy, which may have

yielded temporary increases in distress from the pre-safety behavior withdrawal exposure trial. From the model perspective, this increase in distress may be appropriate and even beneficial given the focus on variability and fear tolerability (Craske et al., 2014). Increased variability may also yield a more difficult and therapeutic context for new learning (Lang & Craske, 2000).

Second, Craske and her colleagues (2008) have suggested that exposure should be conducted in multiple contexts, and in particular, contexts that are personally-relevant to the client. The F-RSB procedure entailed multiple contexts: one in which safety behaviors were utilized and the second involving unaided-exposure. Although this may not have encompassed distinct physical contexts, it may have allowed participants to experience multiple internal contexts and psychological experiences during exposure (Mystkowski et al., 2003). For example, piecewise MLM findings showed that confidence increased following safety behavior removal for participants assigned to F-RSB. Changes in confidence from safety behavior-aided exposure to unaided exposure may have encompassed a shift in participant's personal psychological experience and internal context.

Third, as a core component of inhibitory learning, it is recommended that safety signals or behaviors are removed or prevented (Craske et al., 2008; 2014); however, Arch and Abramowitz (2014) stated that inhibitory learning may still occur in the presence of safety signals. Relative to preventive safety behaviors, restorative safety behaviors are employed following potent confrontation with the perceived threatening stimulus, and may be less likely to undermine the formation of secondary inhibitory associations (i.e., the client can still learn that feared outcomes are less likely or less severe than previous thought). It is possible that some aspects of inhibitory learning (i.e., obtaining safety inhibitory information about long-

term consequences) may still be undermined by the use of restorative safety behaviors. Because of this, it has been suggested that restorative safety behaviors should eventually be faded from exposure to maximize inhibitory learning (Goetz et al., 2016). However, the current study found that at least at follow-up, there were no differences between safety behaviors used continuously throughout exposure versus exposure conducted with safety behavior withdrawal, relative to conventional exposure. This would seem to suggest that restorative safety behaviors are not harmful to long-term outcomes, at least at two week follow-up assessment. Craske et al. stated the following:

> *The ability of safety behaviors to mitigate extinction learning likely varies depending on the ratio of inhibition and excitation in a given trial. That is, the presence of inhibitory stimuli (i.e., stimuli that decrease the likelihood that the US will be delivered) will mitigate extinction learning inasmuch as they decrease the expectation of the US, and the discrepancy between what is predicted and what actually occurs determines the degree of associative change. The impact of inhibitory stimuli on extinction learning will therefore depend on the number and strength of inhibitory stimuli versus the number and strength of excitatory stimuli (i.e., stimuli that predict the US; Craske et al., 2014;* p. 13*).*

In general, excitatory and inhibitory stimuli (i.e., safety behaviors) should be examined purposefully in exposure-based treatment such that inhibitory stimuli are not overpowering the excitatory. Craske and colleagues (2014; Hermans et al., 2006) also stated that safety behaviors should be removed over the course of exposure. Thus, it is suggested that restorative safety behaviors should eventually be removed from exposure in order to maximize continued inhibitory learning, as continued use of restorative safety behaviors (throughout a comprehensive exposure protocol) could possibly be detrimental and interfere with new learning. Although this investigation found few aggregate differences between RSB and F-RSB (other than on process measure outcomes), it is recommended across the literature that safety behaviors are eventually faded over the course of treatment (Craske et al., 2008;

2014; Rachman, Radomsky, & Shafran, 2008; Telch et al., 2013). Even so, the current study adds to the growing literature demonstrating the benign and beneficial role of restorative safety behaviors (Abramowitz & Moore, 2007; de Silva & Rachman, 1984; Goetz & Lee, 2015; Lickel et al., 2013; Rachman et al., 1986, 2011; van den Hout et al., 2001, 2002, 2011, 2012).

Lastly, expectation violations are important to the model of inhibitory learning, although they were not specifically examined in the current study. Extinction is argued to occur following a mismatch between the expectancy for an aversive event and the lack of its occurrence. One important and timely question to answer includes whether safety behaviors directly impede violation of expectancies. Follow-up investigation should determine whether level of expectation violation moderates pre to post-treatment outcomes with use of safety behaviors. Perhaps improvement is potentiated by the level to which expectancies for negative outcomes are violated.

A Note on Fear Reduction and Inhibitory Learning Theory

This investigation reported on data demonstrating that expressed fear declined from the beginning to the end of exposure as well as from pretreatment to post-treatment and pretreatment to follow-up. Fear reduction or within-session habituation is an important tenet of emotional processing theory (Foa & Kozak, 1986), although the amount by which fear declines does not seem to predict overall treatment success (Craske et al., 2008). Although the current study found substantial reductions in fear and has commented on these patterns of reduction throughout the manuscript, one may wonder whether this is somewhat inconsistent with an inhibitory learning-based characterization of results. Inhibitory learning acknowledges that fear reduction processes may not be necessary given there is little evidence to indicate

that reduction influences later improvement. However, expressed fear does generally decline during exposure, although this is not always the case. Therefore, inhibitory learning models may wish to capitalize on the components of inhibitory learning first and foremost (Craske et al., 2008; 2014), keeping in mind that fear reduction may still occur, but its occurrence is not necessary. Inhibitory learning and emotional processing are not mutually exclusive models of exposure. Overall fear reduction may likely still occur, and did occur in the current study, even when one is interpreting results from an inhibitory framework.

Examination of the Parameters Associated with Safety Behavior Fading

It is important to reflect on when is the optimal time to implement safety behavior fading. The current study employed a method by which participant distress must reach a pre-determined level prior to fading. If this reduction in distress was not achieved, fading was imposed once a specific number of exposure trials was delivered. However, there may be other ways in which safety behavior withdrawal is undertaken. For example, Deacon and colleagues (2010) stated to participants that safety behaviors could be used during the first four exposure trials, but would be unavailable during the final two trials. Another study explicitly manipulated parameters of safety behavior removal, examining both experimenter-initiated and participant-initiated safety behavior withdrawal relative to an experimenter-initiated distress condition (Levy & Radomsky, 2016). Participants either (a) eliminated safety behaviors when they chose (i.e., participant-initiated safety behavioral removal), (b) dropped safety behaviors when instructed by the experimenter (i.e., experimenter-initiated safety behavior removal; this was yoked with participant-initiated safety behavior removal), or (c) dropped safety behaviors following a 50% reduction in distress (i.e., experimenter-initiated distress condition). This final condition was analogous to the current investigation's condition

involving safety behavior fading (i.e., F-RSB). The authors predicted that participant-initiated safety behavior removal would outperform the other two conditions. Safety behaviors included a mix of both preventive and restorative items (e.g., gloves, hand sanitizer, hygienic wipes). Results showed few differences between both experimenter-initiated safety behavior removal conditions and the participant-initiated removal condition. One potential benefit for participant-initiated safety behavior removal concerned greater improvements on a measure of self-efficacy. The authors claim that exposure may be more efficacious and acceptable when participants and clients "determine the progression of the exposure session" (p. 26; Levy & Radomsky, 2016). Altogether, findings from the current investigation align with Levy and Radomsky (2016) as no reliable drawbacks were found for F-RSB. Moreover, more research will be needed to further examine parameters associated with safety behavior fading in order to determine *when* safety behaviors should be faded and *whom* (i.e., participant/client or experimenter/therapist) should initiate the fading.

Limitations

The current study is not without its limitations. First, the use of a sub-clinical sample of presumably healthy undergraduate students at a large, mid-western university does limit the clinical relevance of our findings, although research shows that non-clinical and clinical samples demonstrate comparable OCD-related cognitions (Gibbs, 1996; Olatunji et al., 2008). It remains to be examined how the findings would generalize to a treatment seeking sample with contamination fears and washing concerns.

Second, control over the pacing and timing of exposure was kept constant, although differences did exist between participant's responses per trial. For example, a participant's peak fear was required to meet a certain threshold prior to removal of restorative safety

behaviors. However, this is likely similar to a treatment context (and a habituation framework) as a clinician will typically wait for a reduction in distress prior to removing safety behaviors from the participant's use. More research will be needed to examine fading; including, when and how fading should be initiated, and whom should decide when fading occurs, among other parameters.

Third, exposure was conducted with only one step in the hierarchy, and participants were unable to proceed to the next step if they felt as though they "mastered" the step they were using during the 15 exposure trials. Thus, the current study attempted to balance individualizing exposure versus studying key elements of restorative safety behavior use and fading. For example, an ideographic target exposure stimulus and target exposure step were derived, but the current investigation was limited to the extent of individualizing exposure in other areas (e.g., all participants completed 15 exposure trials commensurate with group assignment, completed ratings throughout all trials of exposure, were prompted to use restorative safety behaviors).

Fourth, the structure and duration of exposure may seem somewhat artificial given that traditional exposure for OCD involves multiple 60-90 min sessions wherein ideographic exposure hierarchies are developed. In the current study, each of the 15 exposure trials involved participants interacting with the stimuli using the target exposure step for approximately 20-sec in duration. This level of standardization allowed us to exert rigorous experimental control over the pacing and delivery of exposure as well as observe trial-by-trial changes in variables of interest, such as fear and disgust. Moreover, repetition of brief exposure trials within a single session is widely used and is well-established across the OCD field specifically and exposure therapy field more broadly. This paradigm has also been used

in previous research on safety behaviors (e.g., Rachman et al., 2011; van den Hout et al., 2011). Still, future research should evaluate the function of safety behaviors in a more ecologically-valid clinical setting, involving comprehensive sessions of exposure therapy. Therefore, although the current study sought to balance individualization of exposure (e.g., use of ideographic target exposure stimulus and target exposure step), common standards of behavioral approach task studies were followed to investigate safety behaviors in a well-controlled setting.

Fifth, the risk of Type I error is inflated due to the large number of outcomes that were examined. However, it is noted that despite conducting a large number of outcome comparisons, very few between-group comparisons approached significance and even fewer resulted in marginally significant outcomes.

Summary

The current findings add to a growing body of literature indicating the benign and/or beneficial role of safety behaviors in exposure therapy. Currently, exposure therapy is typically conducted with instructions for clients to eliminate the use of safety behaviors at the onset of treatment (Clark, 1999; Clark & Wells, 1995; Salkovskis, 1991). The current study examined the continuous and judicious use of restorative safety behaviors during a single session of exposure, relative to an exposure only control condition. No consistent and reliable drawbacks for restorative safety behavior use were found, even when groups were assessed at follow-up. Indeed, restorative safety behavior use was associated with greater symptom change during repeated exposure trials, and following safety behavior removal, participants evidenced facilitated symptom reduction. In general, it is apparent that restorative safety behaviors, whether used continuously or faded, do not pose a substantial threat to the integrity

of exposure. The present study contributes to a growing body of research suggesting that allowing individuals to use safety behaviors during exposure is not deleterious.

Table 1. Means and standard deviations of symptom measures at pretreatment.

Measure	NSB (n=17)	RSB (n=17)	F-RSB (n=17)
OCI-R Checking	5.88 (2.00)	6.76 (3.72)	5.47 (2.94)
OCI-R Hoarding	6.53 (2.67)	6.18 (3.09)	6.76 (2.68)
OCI-R Neutralize	5.71 (2.54)	4.47 (1.87)	5.59 (2.24)
OCI-R Obsessions	5.35 (2.83)	5.88 (3.43)	6.00 (2.67)
OCI-R Ordering	8.71 (2.82)	8.65 (4.06)	6.71 (2.49)
OCI-R Washing	6.12 (2.83)	6.24 (2.97)	6.65 (2.55)
OCI-R Total	38.29 (10.70)	38.18 (15.31)	37.18 (10.67)
VOCI Contamination	11.06 (10.04)	13.35 (11.90)	10.29 (7.79)
VOCI Obsessions	4.24 (8.08)	5.82 (7.98)	5.18 (6.26)
VOCI Checking	2.12 (3.18)	5.24 (8.01)	3.59 (6.06)
VOCI Hoarding	3.00 (4.18)	3.65 (4.90)	4.24 (4.67)
VOCI Just Right	11.53 (8.49)	11.88 (10.70)	10.18 (6.52)
VOCI Indecision	5.71 (5.24)	7.06 (6.47)	7.12 (5.59)
DOCS Contamination	9.12 (7.73)	11.00 (7.12)	10.06 (6.43)
DOCS Harm	3.24 (3.36)	4.59 (4.46)	2.59 (2.37)
DOCS Obsessions	3.82 (3.64)	4.65 (5.49)	4.18 (3.76)
DOCS Just Right	4.71 (4.12)	3.00 (3.41)	2.24 (1.75)
DOCS Total	20.88 (14.55)	23.24 (17.71)	19.06 (11.55)
OBQ RT	60.25 (18.61)	63.63 (14.48)	59.44 (15.82)
OBQ PC	66.12 (21.36)	69.18 (20.57)	65.12 (15.84)
OBQ ICT	32.00 (11.92)	35.24 (11.26)	33.75 (11.36)
OBQ Total	156.88 (49.97)	165.38 (40.46)	157.25 (37.24)
DPSS-R Sensitivity	6.00 (5.51)	6.53 (4.82)	7.41 (5.79)
DPSS-R Propensity	9.12 (5.24)	10.12 (4.24)	10.50 (4.93)
DASS Depression	3.00 (3.59)	6.34 (5.41)	5.44 (5.43)
DASS Anxiety	3.88 (3.96)	4.41 (5.27)	4.00 (3.91)

Note: VOCI = Vancouver Obsessive Compulsive Inventory; OCI-R = Obsessive Compulsive Inventory Revised; DOCS = Dimensional Obsessive Compulsive Inventory; DASS = Depression Anxiety Stress Scale; DPSS-R = Disgust Propensity and Sensitivity Scale Revised; OBQ = Obsessional Beliefs Questionnaire; NSB = Exposure with No Safety Behaviors; RSB = Exposure with Continuous Use of Restorative Safety Behaviors; F-RSB = Exposure with Fading of Restorative Safety Behaviors.

Table 2. Means and standard deviations for pretreatment behavioral approach task.

	NSB (n=17)	RSB (n=17)	F-RSB (n=17)
Pretreatment Fear	53.70 (25.56)	63.62 (23.66)	62.30 (29.43)
Pretreatment Behavioral Approach	12.53 (5.17)	10.71 (4.98)	11.06 (5.19)
Pretreatment Disgust	66.93 (25.28)	79.04 (18.52)	66.15 (30.69)
Pretreatment Illness Likelihood	41.10 (28.26)	41.31 (27.59)	33.09 (28.50)
Pretreatment Illness Severity	36.05 (27.13)	35.46 (27.61)	28.61 (27.53)

Note: NSB = Exposure with No Safety Behaviors; RSB = Exposure with Continuous Use of Restorative Safety Behaviors; F-RSB = Exposure with Fading of Restorative Safety Behaviors.

Table 3. Means and standard deviations for pretreatment, post-treatment, and follow-up behavioral approach task.

	NSB (n=17)			RSB (n=17)			F-RSB (n=17)		
	Pre	Post	Follow up	Pre	Post	Follow up	Pre	Post	Follow up
Behavioral Approach	12.53 (5.17)	14.18 (3.28)	14.00 (3.61)	10.71 (4.98)	12.59 (3.55)	13.10 (3.76)	11.06 (5.19)	12.77 (4.27)	12.22 (4.71)
Fear	53.70 (25.56)	30.64 (27.19)	20.68 (18.04)	63.63 (23.66)	30.33 (35.05)	20.36 (28.97)	62.30 (29.43)	22.86 (26.46)	22.35 (32.93)
Disgust	66.93 (25.28)	41.86 (31.22)	34.25 (19.43)	79.04 (18.52)	39.63 (36.02)	29.05 (28.66)	66.15 (30.70)	29.36 (27.81)	23.89 (34.19)
Illness Likelihood	41.10 (28.26)	25.04 (21.25)	16.63 (16.02)	41.31 (27.59)	20.15 (32.77)	16.61 (28.38)	33.09 (28.50)	16.22 (21.53)	12.90 (16.88)
Illness Severity	36.05 (27.13)	20.82 (19.06)	16.79 (16.13)	35.46 (27.61)	19.27 (31.57)	14.24 (25.04)	28.61 (27.53)	14.37 (20.97)	11.24 (13.25)

Note: NSB = Exposure with No Safety Behaviors; RSB = Exposure with Continuous Use of Restorative Safety Behaviors; F-RSB = Exposure with Fading of Restorative Safety Behaviors.

Table 4. Means and standard deviations for generalizability behavioral approach task.

	NSB	RSB	F-RSB
Fear	33.90 (25.72)	30.54 (35.97)	30.15 (31.55)
Behavioral Approach	13.24 (4.70)	11.77 (4.48)	12.59 (4.27)
Disgust	46.65 (27.73)	41.18 (36.13)	44.65 (39.55)
Illness Likelihood	26.96 (22.24)	20.36 (33.32)	20.34 (25.11)
Illness Severity	21.05 (19.45)	20.10 (30.99)	16.85 (22.69)

Note: NSB = Exposure with No Safety Behaviors; RSB = Exposure with Continuous Use of Restorative Safety Behaviors; F-RSB = Exposure with Fading of Restorative Safety Behaviors.

Table 5. Process ratings obtained during 15 trials of exposure.

Anticipatory ratings
1. Anticipatory Fear - Estimate the highest level of fear you expect to experience while touching the object.
2. Anticipatory Disgust - Estimate the highest level of disgust you expect to experience while touching the object.
3. Anticipated Confidence - Estimate your confidence in being able to reduce your fear to a manageable level while touching the object.
4. Anticipated Threat – How threatening is this object to you?
Peak ratings
5. Peak Fear - What is your highest level of fear during this trial?
6. Peak Disgust - What is your highest level of disgust during this trial?
Ratings following exposure or use of restorative safety behavior
7. Likelihood of Negative Prediction - What is the likelihood that your feared negative prediction will occur?
8. Urge to Wash - How great is your urge to wash right now?
9. Illness Likelihood - How likely is it that you would become ill as a result of touching this?
10. Illness Severity - If you became ill as a result of touching this, how severe would your illness be?

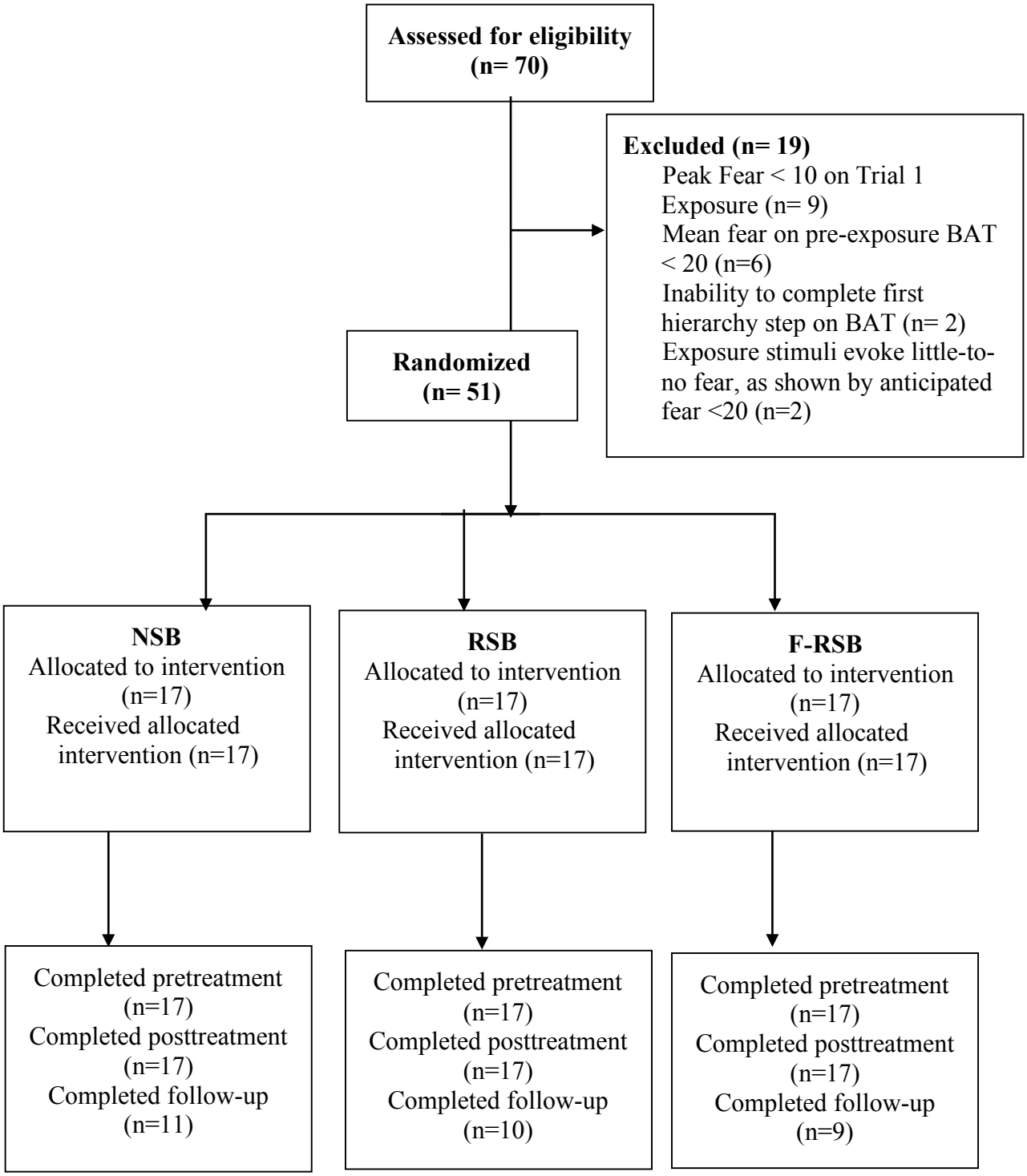

Figure 1: Participant Flow.

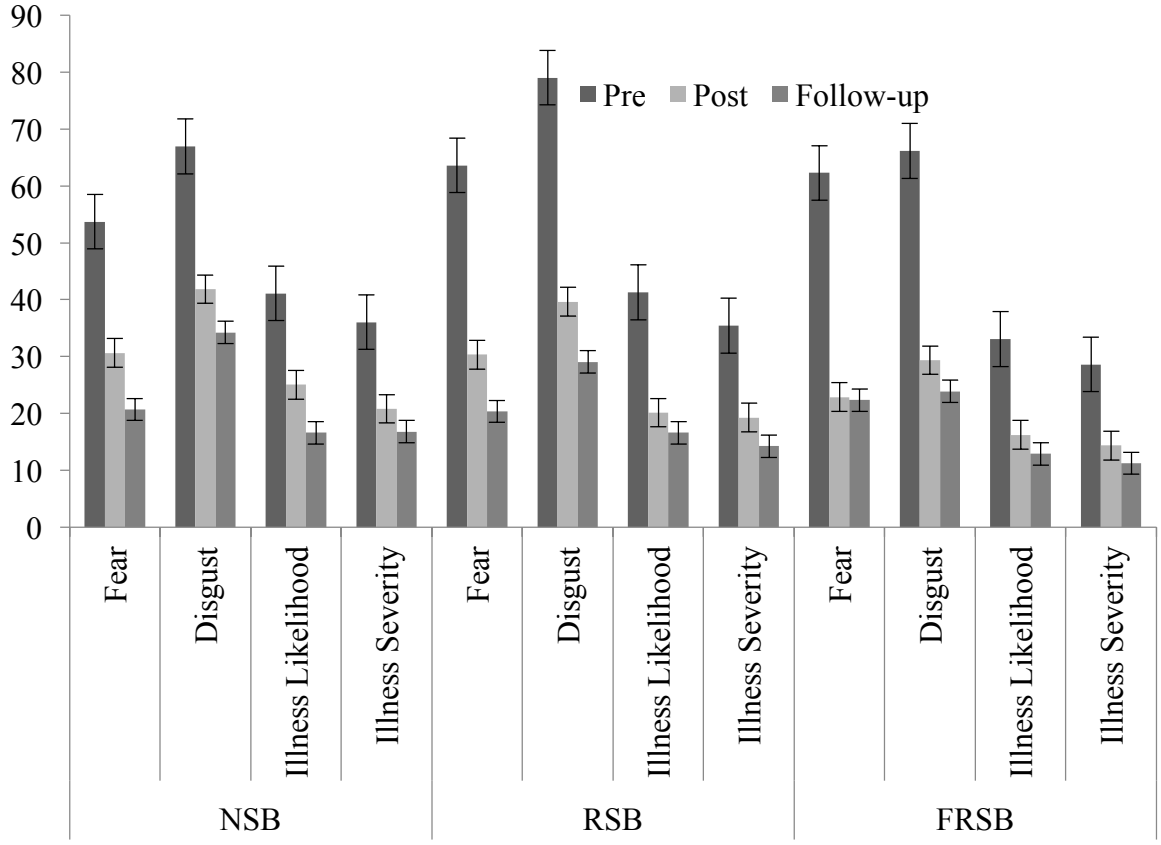

Figure 2: BAT outcomes at pretreatment, post-treatment and follow-up.

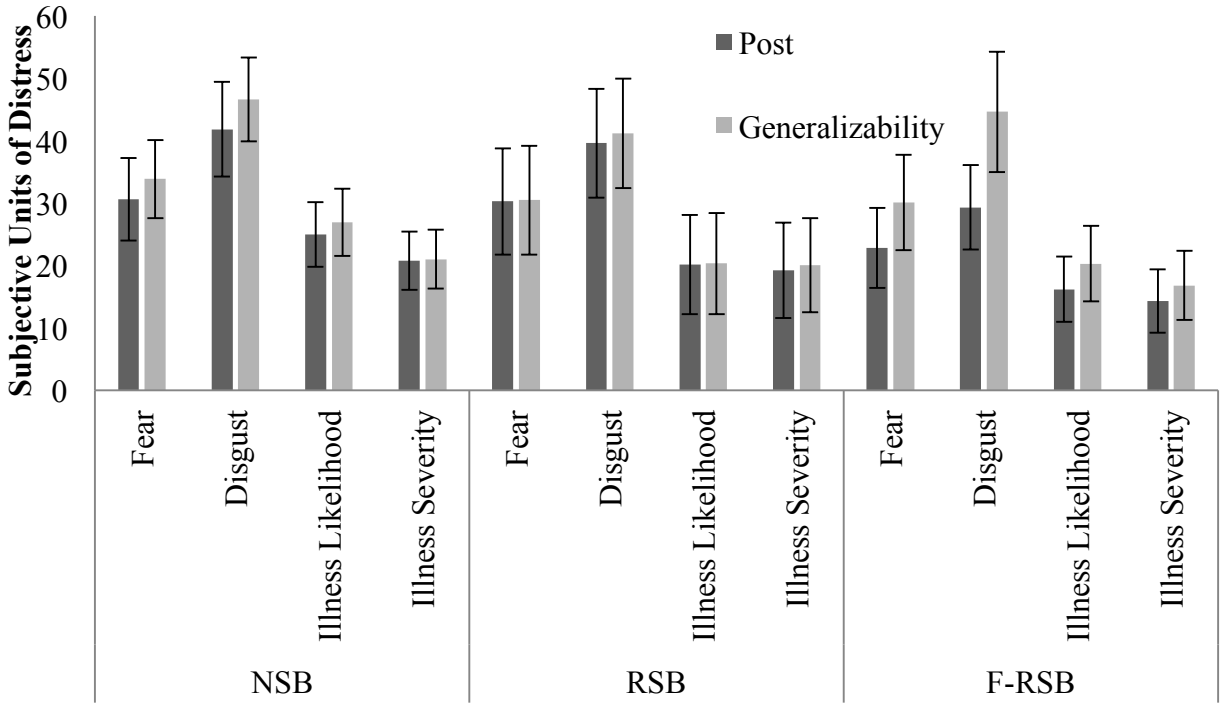

Figure 3: Bar graphic indicating changes in fear, disgust, illness likelihood, and illness severity from post-treatment to generalizability BAT.

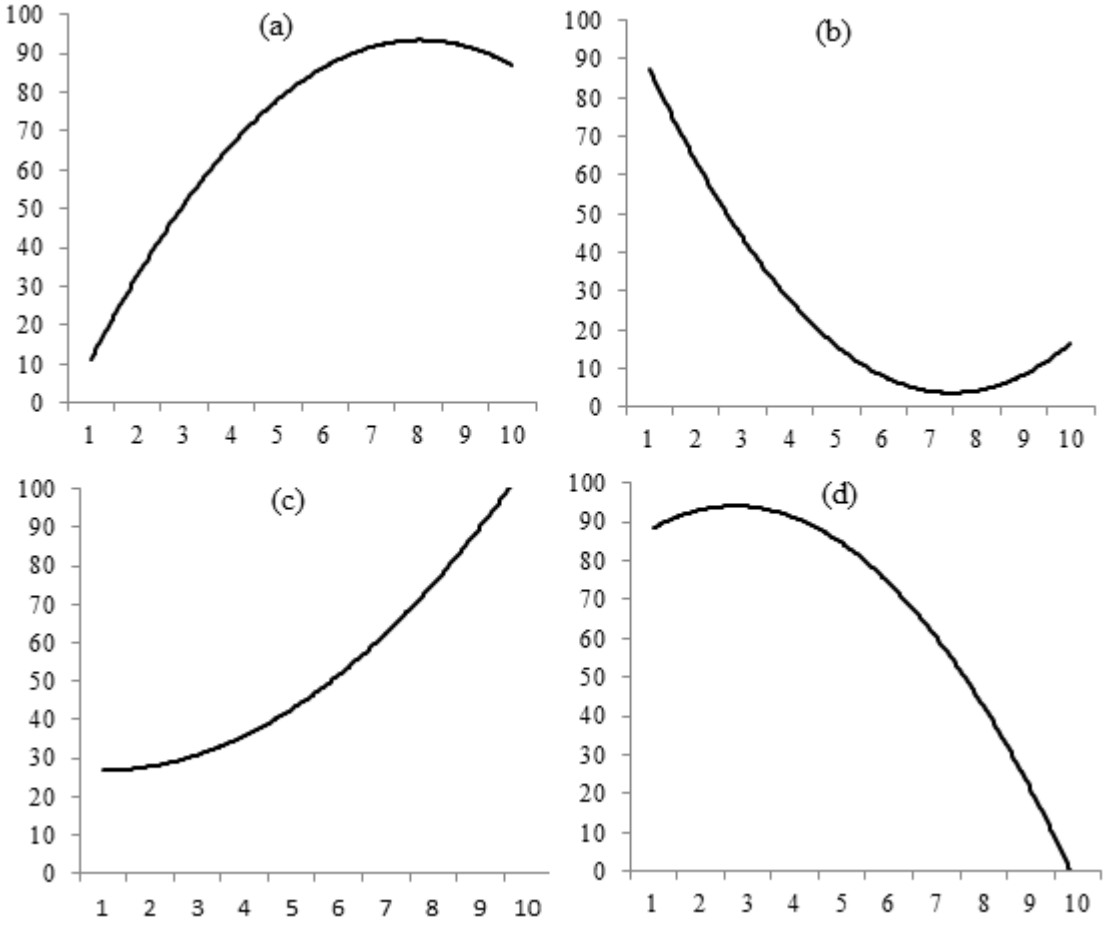

Figure 4: Examples of quadratic components used in MLM.

Note: (a) rapid and early increases in rating followed by "leveling off" (e.g., fear rapidly increases early on, and then levels off), (b) rapid and early decreases in rating followed by "leveling off," (e.g., fear rapidly decreases early on, and then "levels off"), (c) "leveling off" followed by rapid increases in rating, (d) "leveling off" followed by rapid decreases in rating.

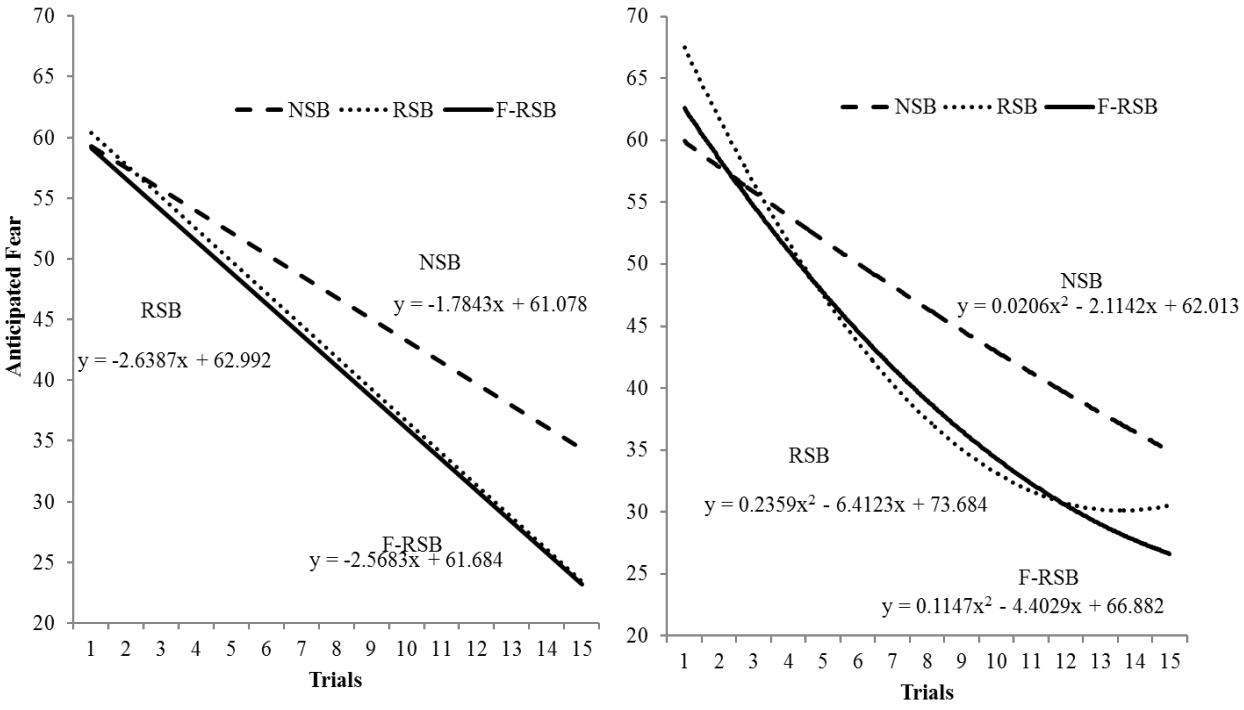

Figure 5: Linear and quadratic decreases in anticipated fear across 15 trials of exposure as a function of group membership.

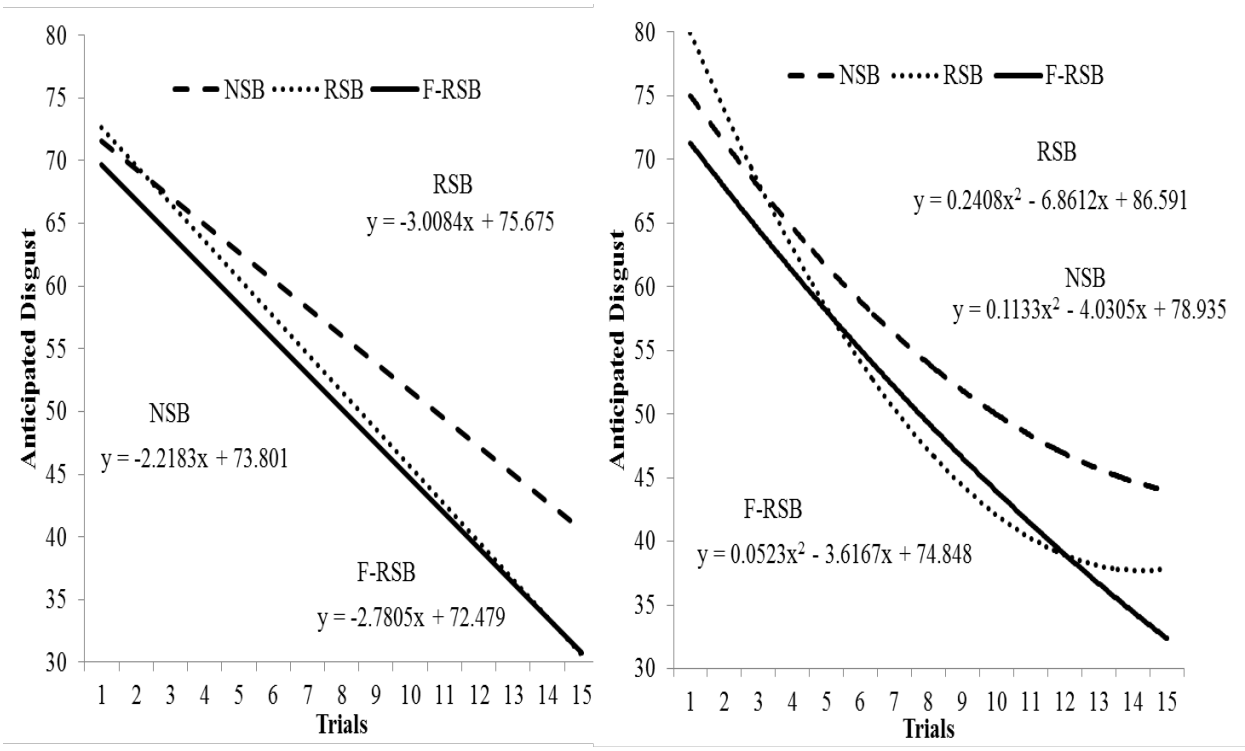

Figure 6: Linear and quadratic decreases in anticipated disgust across 15 trials of exposure as a function of group membership.

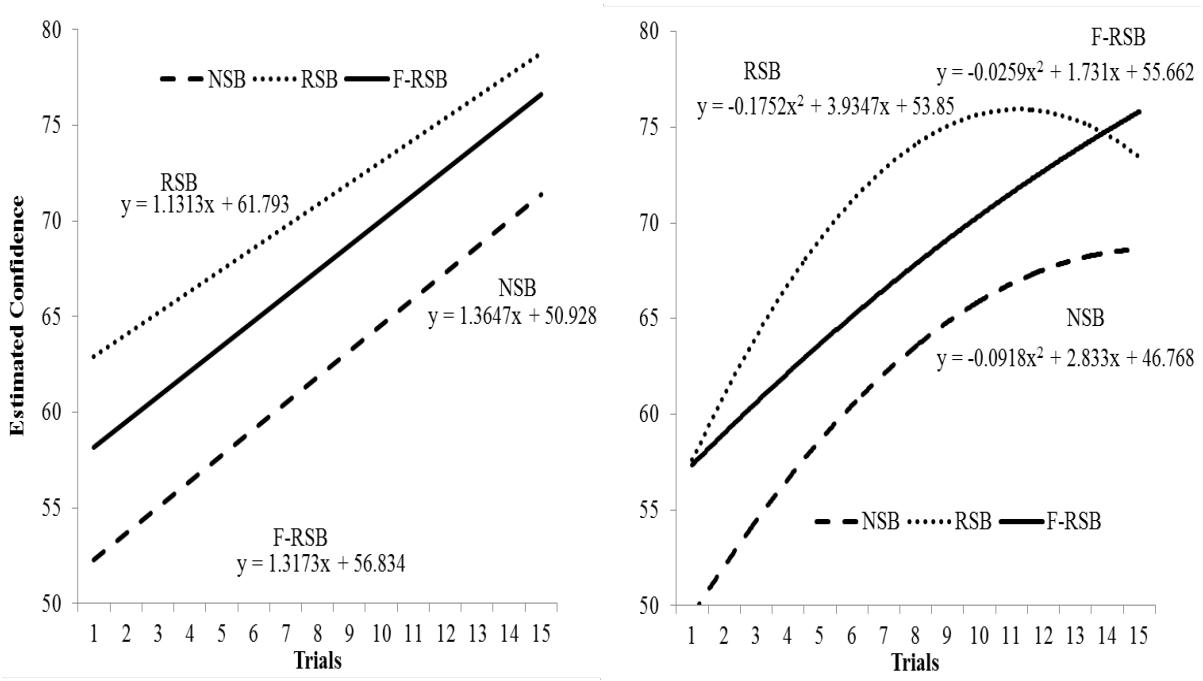

Figure 7: Linear and quadratic increases in estimated confidence across 15 trials of exposure as a function of group membership.

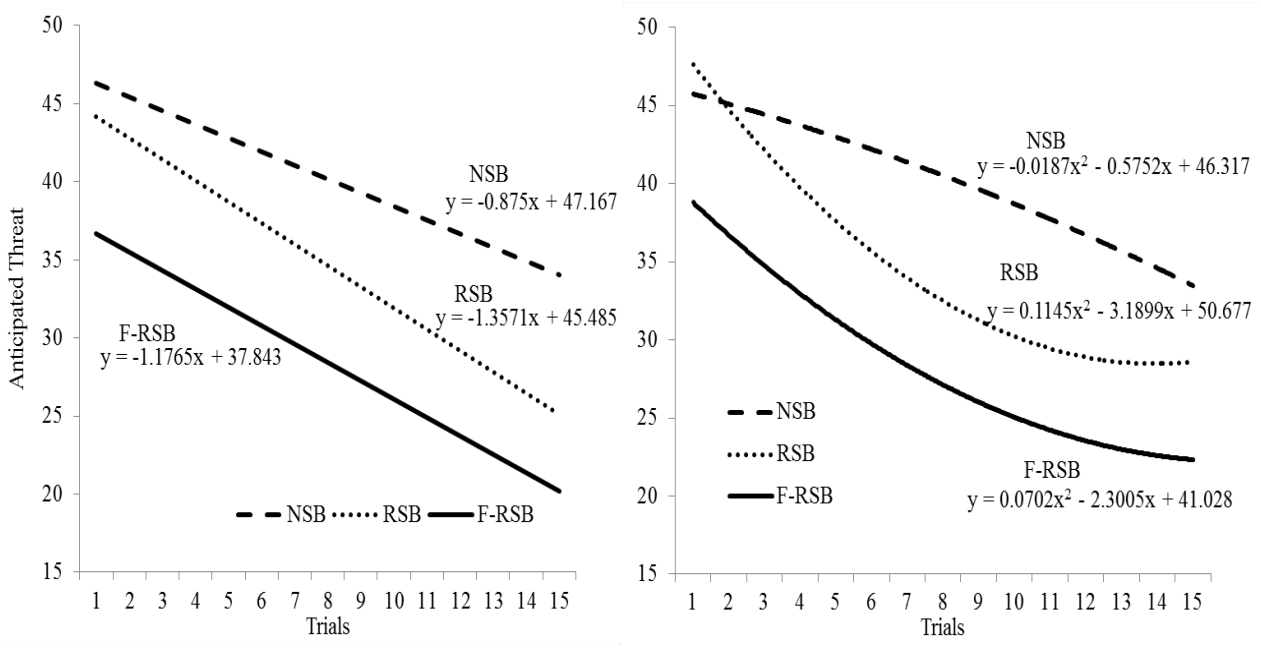

Figure 8: Linear and quadratic decreases in anticipated threat across 15 trials of exposure as a function of group membership.

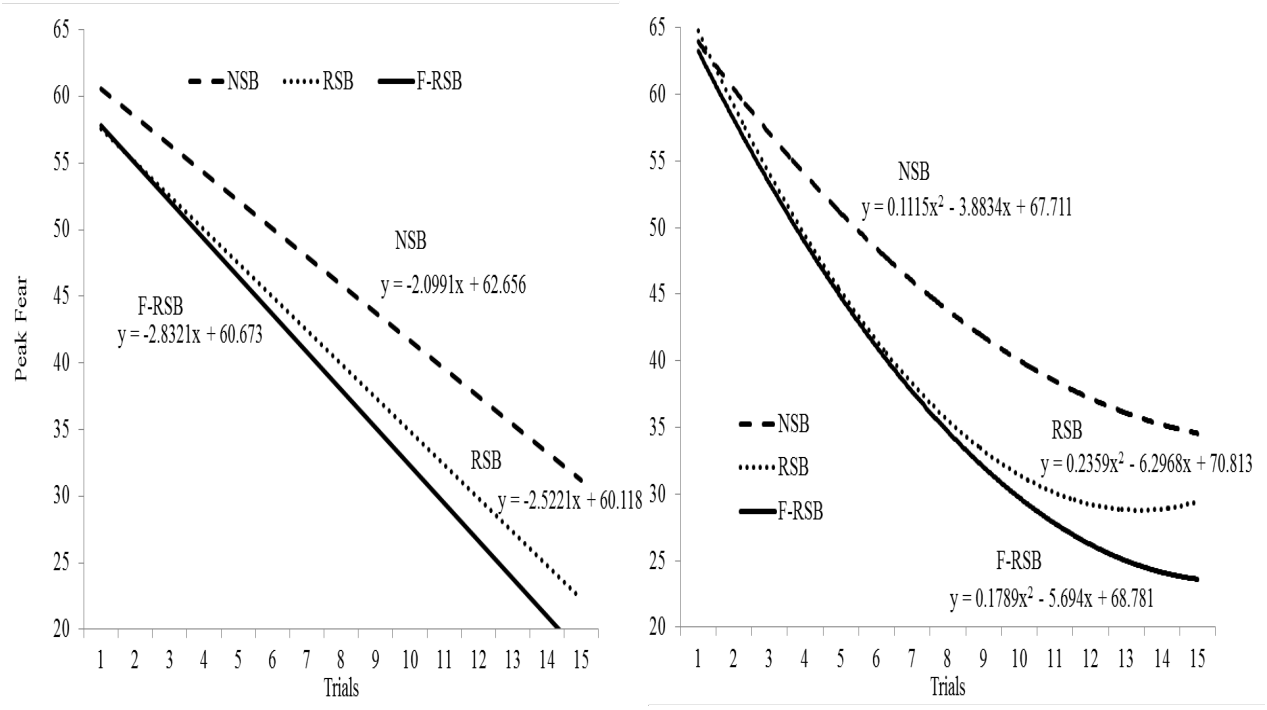

Figure 9: Linear and quadratic decreases in peak fear across 15 trials of exposure as a function of group membership.

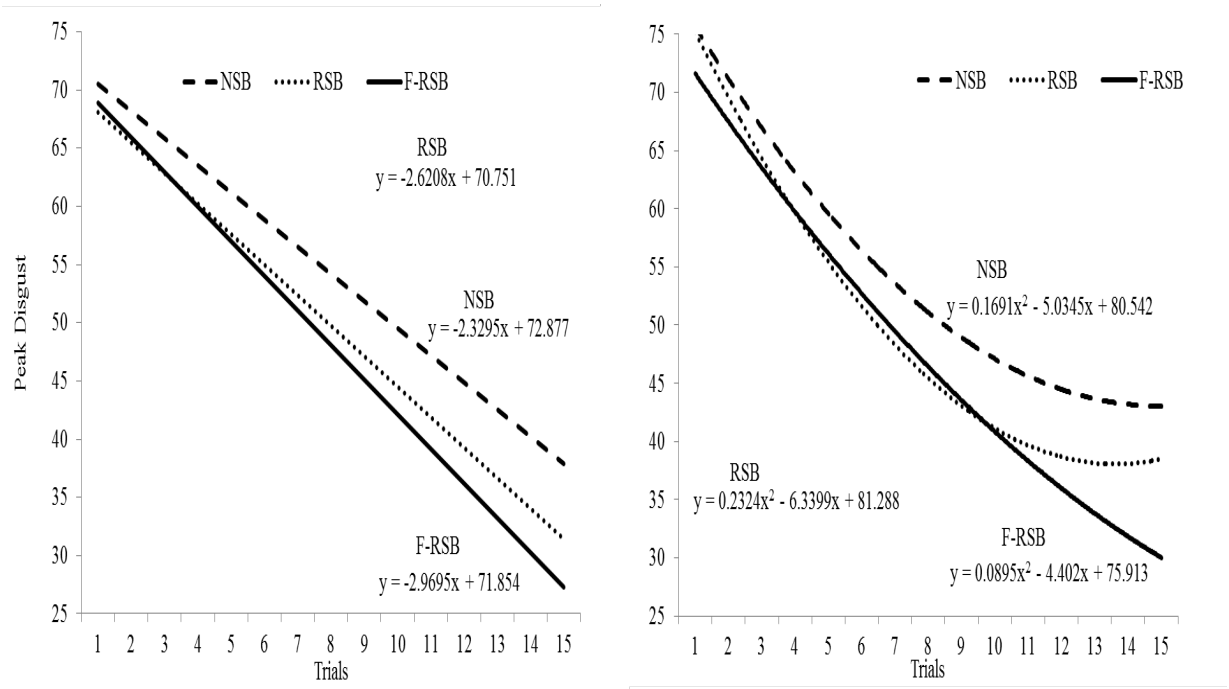

Figure 10: Linear and quadratic decreases in peak disgust across 15 trials of exposure as a function of group membership.

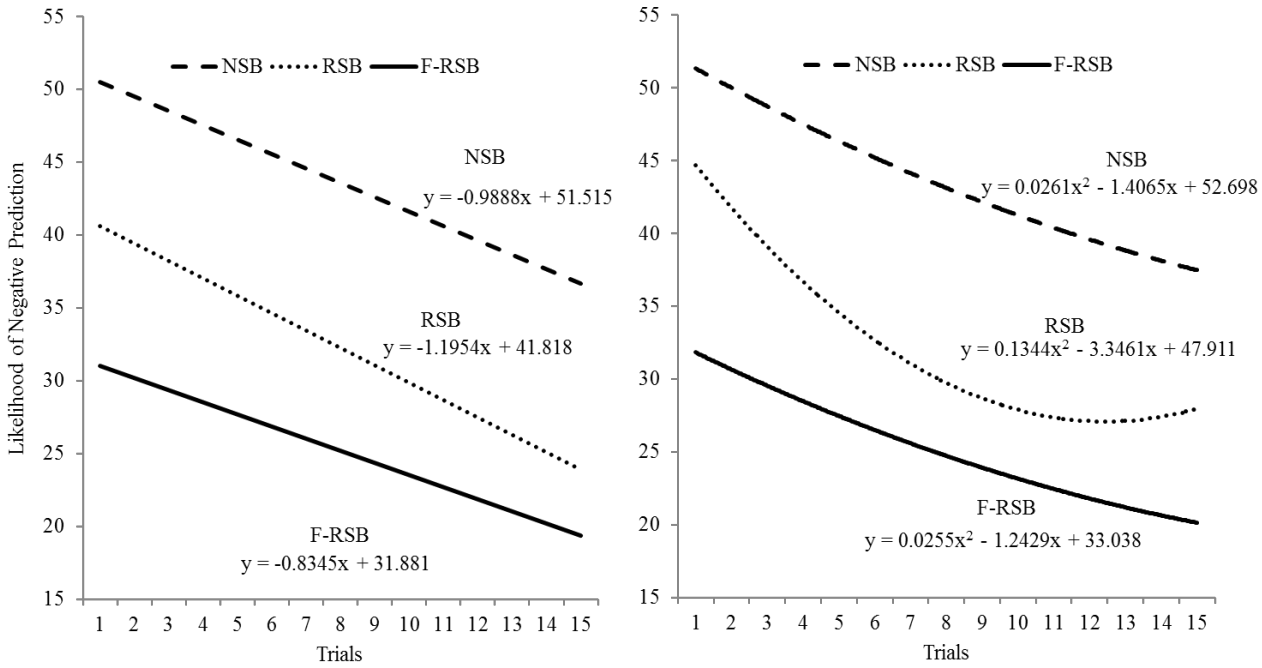

Figure 11: Linear and quadratic decreases in likelihood of negative prediction across 15 trials of exposure as a function of group membership.

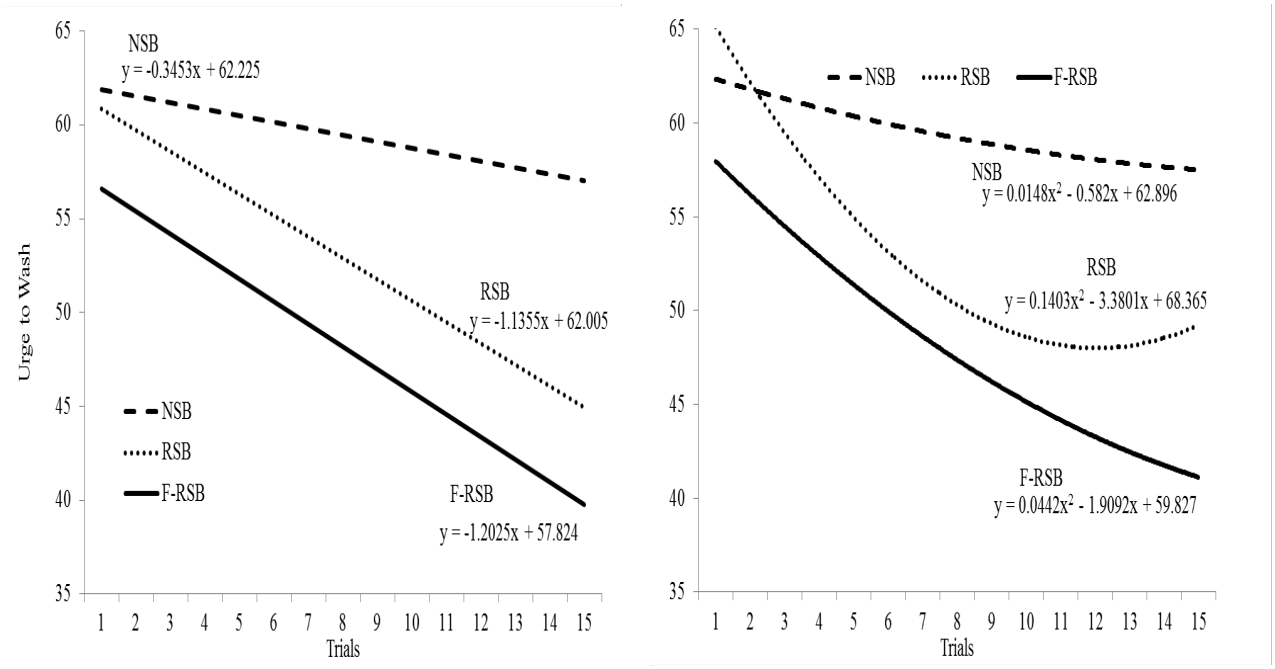

Figure 12: Linear and quadratic decreases in urge to wash across 15 trials of exposure as a function of group membership.

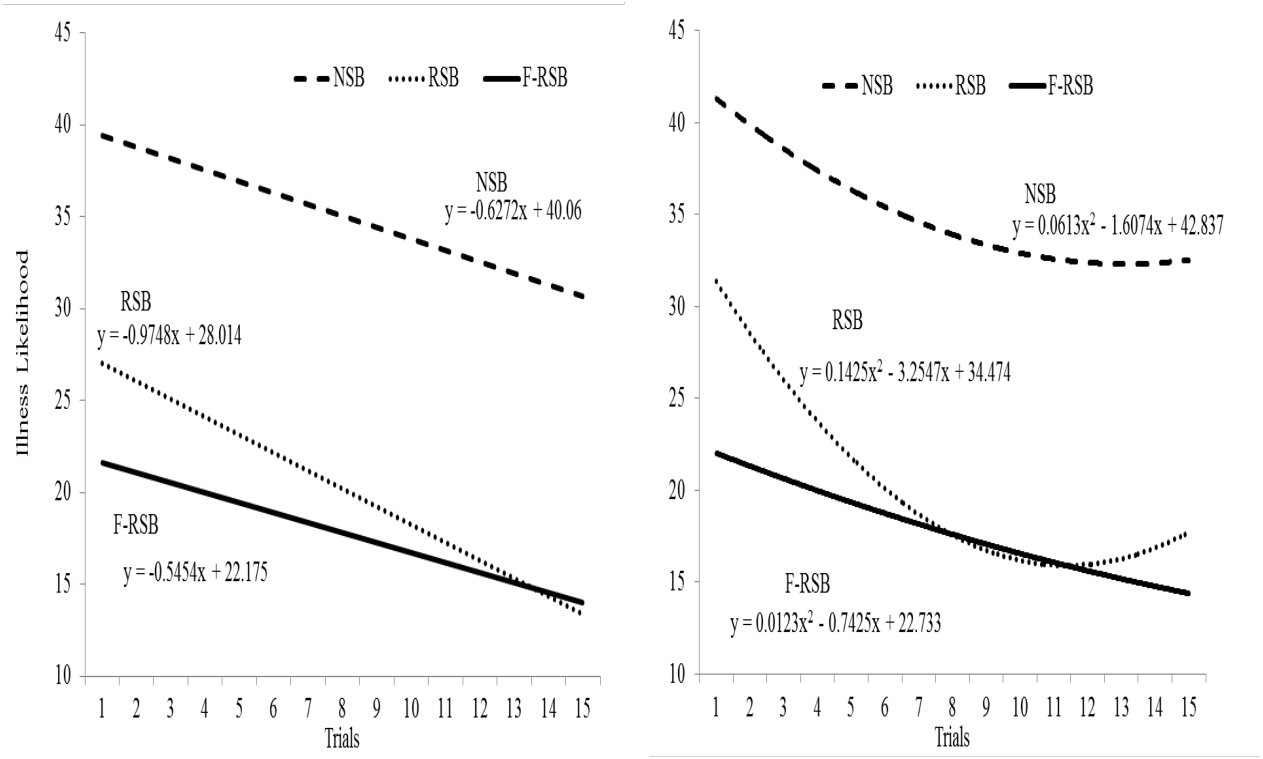

Figure 13: Linear and quadratic decreases in illness likelihood across 15 trials of exposure as a function of group membership.

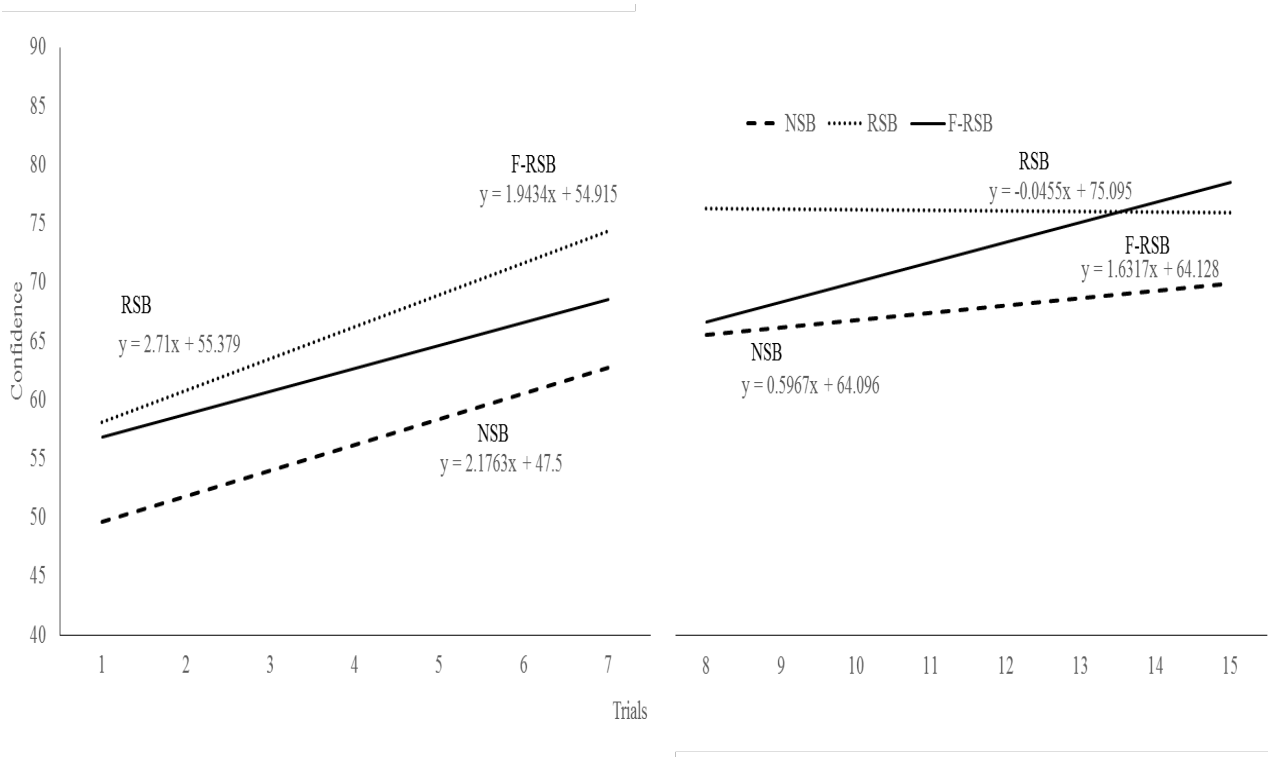

Figure 14. Linear increases in confidence by group membership across time segments during 15 trials of exposure.

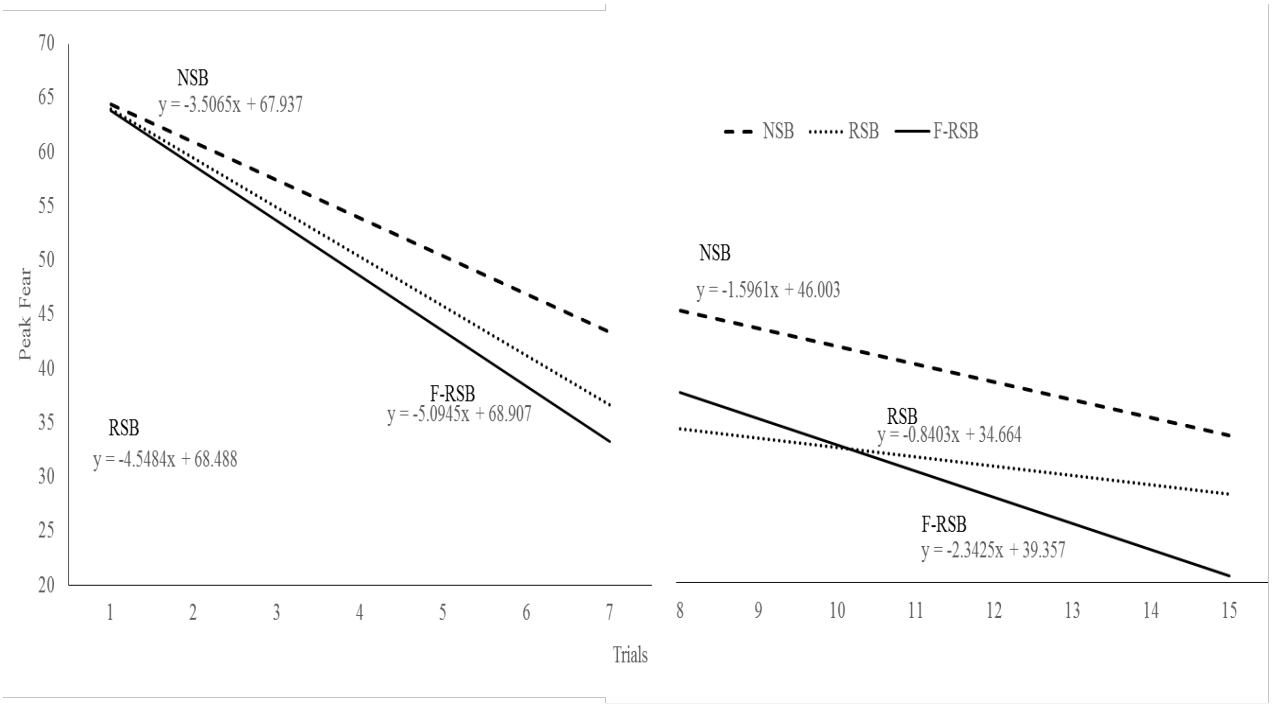

Figure 15. Linear decreases in peak fear by group membership across time segments during 15 trials of exposure.

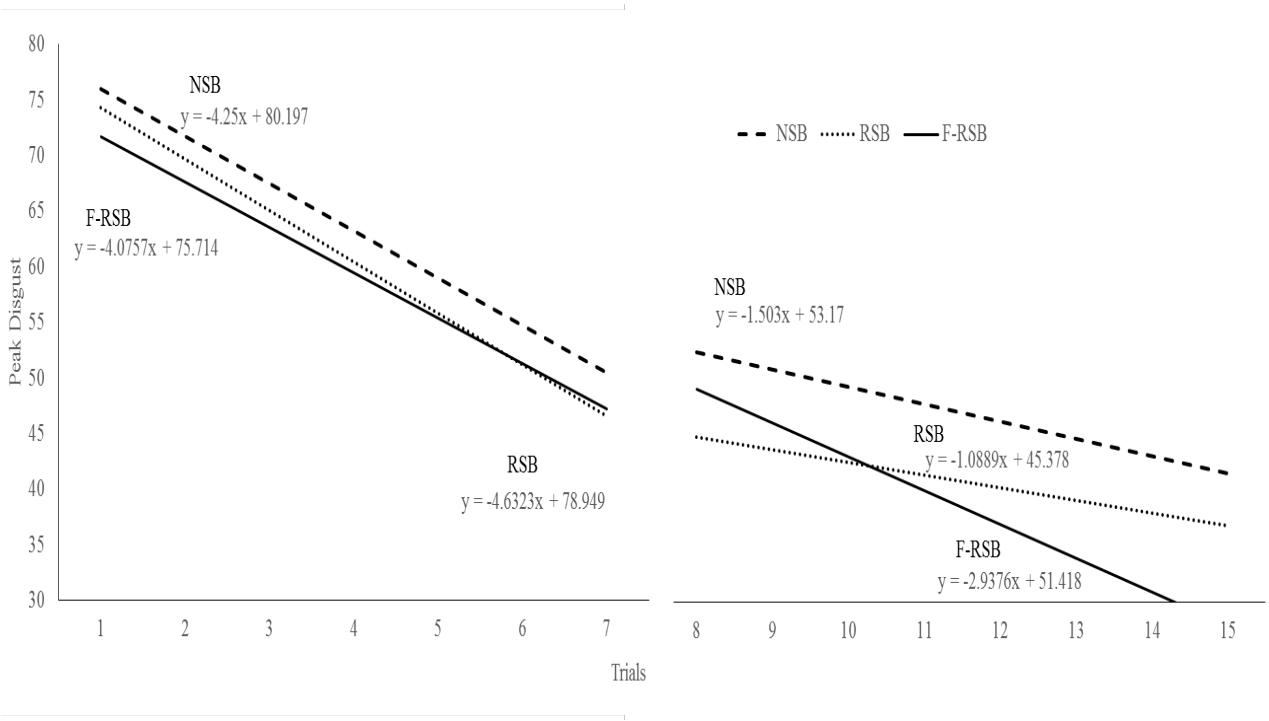

Figure 16. Linear decreases in peak disgust by group membership across time segments during 15 trials of exposure.

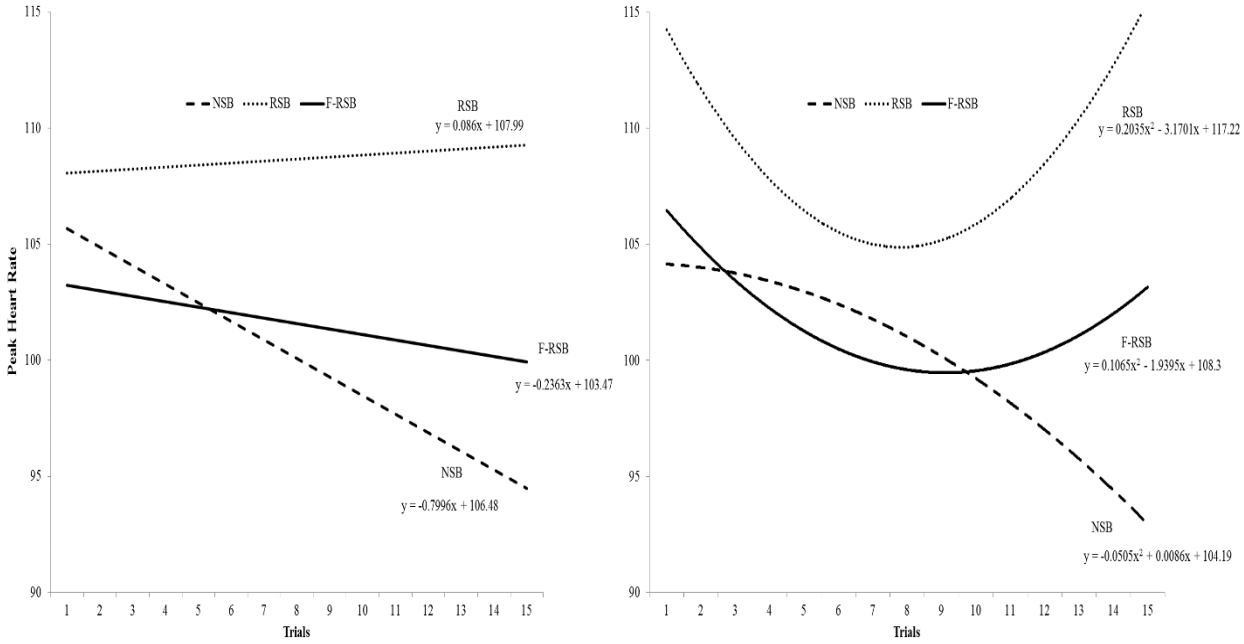

Figure 17. Linear and quadratic changes in peak heart rate by group membership across time segments during 15 trials of exposure.

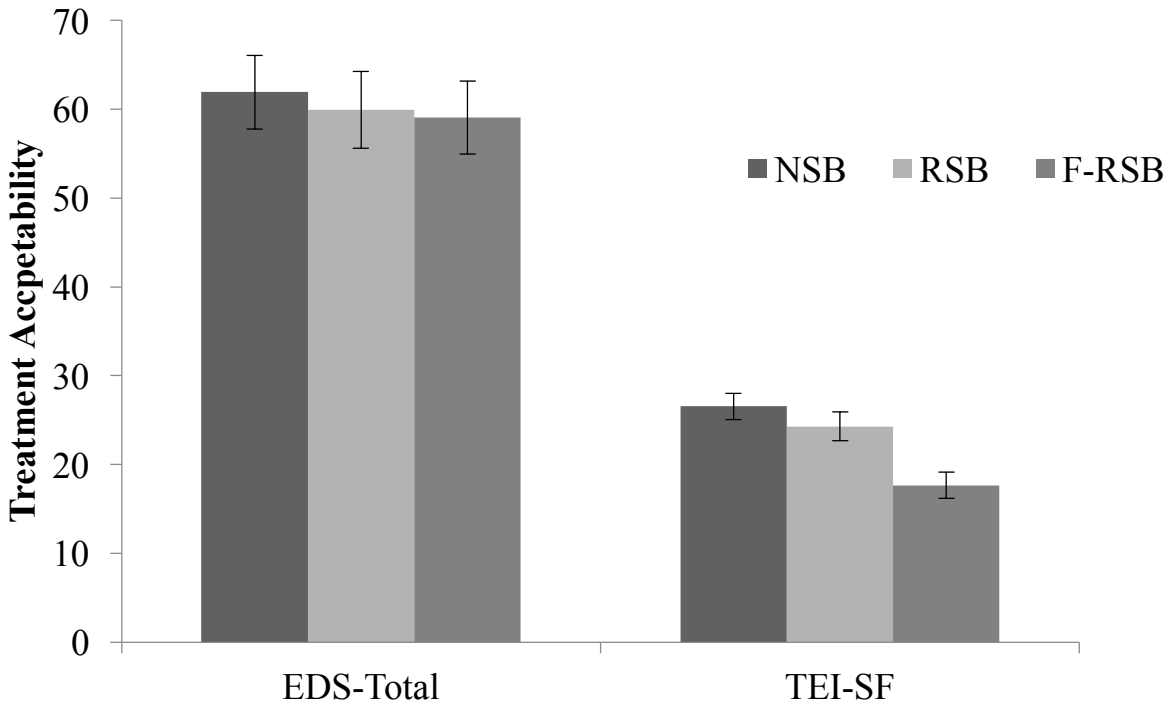

Figure 18: Bar graph indicating scores by group on treatment acceptability measures.

References

Abramowitz, J. S., Deacon, B. J., Olatunji, B. O., Wheaton, M. G., Berman, N. C., Losardo, D., ... & Björgvinsson, T. (2010). Assessment of obsessive-compulsive symptom dimensions: Development and evaluation of the Dimensional Obsessive-Compulsive Scale. *Psychological Assessment*, *22*(1), 180.

Abramowitz, J.S. & Moore, E.K. (2007) An experimental analysis of hypochondriasis. *Behaviour Research and Therapy, 45,* 413-424.

Antony, M. M., Bieling, P. J., Cox, B. J., Enns, M. W., & Swinson, R. P. (1998). Psychometric properties of the 42-item and 21-item versions of the Depression anxiety stress scales in clinical groups and a community sample. *Psychological Assessment, 10*, 176–181.

Arch, J.J. & Abramowitz, J.S. (2015) Exposure therapy for obsessive-compulsive disorder: An optimizing inhibitory learning approach. *Journal of Obsessive-Compulsive and Related Disorders, 6*, 174-182.

Asnaani, A., McLean, C.P., & Foa, E.B. (in press) Updating Watson and Marks (1971): How has our understanding of the mechanisms of extinction learning evolved and where is our field going next? *Behavior Therapy.*

Baumeister, R. F., Vohs, K. D., & Funder, D. C. (2007). Psychology as the science of self-reports and finger movements: Whatever happened to actual behavior? *Perspectives on Psychological Science*, *2*(4), 396-403.

Borkovec, T.D., Stone, N.M., O'Brien, G.T., & Kaloupek, D.G. (1974). Evaluation of a clinically relevant target behavior for analog outcome research. *Behavior Therapy, 5*(4), 503-513.

Bjork, R.A. & Bjork, E.L. (1992). A new theory of disuse and an old theory of stimulus fluctuation. In: A Healy, S. Kosslyn, & R. Shiffrin, *From learning processes to cognitive processes: essays in honor of William K. Estes* (Vol. 2, pp. 35-67). Hillsdale, NJ: Erlbaums.

Bouton, M. E. (1993). Context, time, and memory retrieval in the interference paradigms of Pavlovian learning. *Psychological Bulletin*, *114*(1), 80.

Bouton, M. E., & King, D. A. (1983). Contextual control of the extinction of conditioned fear: tests for the associative value of the context. *Journal of Experimental Psychology: Animal Behavior Processes*, *9*(3), 248-265.

Clark, D. M. (1999). Anxiety disorders: Why they persist and how to treat them. *Behaviour Research and Therapy*, *37*(Suppl 1), S5-S27.

Clark, D.M., & Wells, A. (1995). A cognitive model of social phobia. In R.G. Heimberg, M.R. Liebowitz, D.A. Hope, & F.R. Schneier (Eds.), *Social phobia: Diagnosis, assessment, and treatment* (p. 69-93). New York: Guilford Press.

Cougle, J.R., Wolitzky-Taylor, K.B., Lee, H.J., Telch, M.J. (2007). Mechanisms of change in ERP treatment of compulsive hand washing: Does primary threat make a difference? *Behaviour Research and Therapy, 45*(7), 1449–1459.

Craske, M.G., Kircanski, K., Zelikowsky, M., Mystkowski, J., Chowdhury, N., & Baker, A. (2008). Optimizing inhibitory learning during exposure therapy. *Behaviour Research and Therapy, 46,* 5-27.

Craske, M.G., Street, L.L., Jayaraman, J., & Barlow, D.H. (1991). Attention versus distraction during in vivo exposure: Snake and spider phobias. *Journal of Anxiety Disorders, 5*(3), 199-211.

Craske, M. G., Treanor, M., Conway, C. C., Zbozinek, T., & Vervliet, B. (2014). Maximizing exposure therapy: an inhibitory learning approach. *Behaviour Research and Therapy*, *58*, 10-23.

Culver, N.C., Stoyanova, M., Craske, M.G. (2012). Emotional variability and sustained arousal during exposure. *Journal of Behavior Therapy and Experimental Psychiatry, 43,* 787-793.

Deacon, B.J. & Abramowitz, J.S. (2004). Cognitive and behavioral treatments for anxiety disorders: A review of meta-analytic findings. *Journal of Clinical Psychology, 60*(4), 429-441.

Deacon, B. J., Farrell, N. R., Kemp, J. J., Dixon, L. J., Sy, J. T., Zhang, A. R., & McGrath, P. B. (2013). Assessing therapist reservations about exposure therapy for anxiety disorders: The Therapist Beliefs about Exposure Scale. *Journal of Anxiety Disorders*, *27*(8), 772-780.

Deacon, B.J., Sy, J.T., Lickel, J.J., & Nelson, E.A. (2010). Does the judicious use of safety behaviors improve the efficacy and acceptability of exposure therapy for claustrophobic fear? *Journal of Behavior Therapy and Experimental Psychiatry, 41,* 71-80.

de Silva, P. & Rachman, S. (1984). Does escape behaviour strengthen agoraphobic avoidance: A preliminary study. *Behaviour Research and Therapy, 22*(1), 87-91.

Devilly, G. J., & Borkovec, T. D. (2000). Psychometric properties of the credibility/expectancy questionnaire. *Journal of Behavior Therapy and Experimental Psychiatry*, *31*(2), 73-86.

Fergus, T. A., & Valentiner, D. P. (2009). The Disgust Propensity and Sensitivity Scale-Revised:

An examination of a reduced-item version. *Journal of Anxiety Disorders*, *23*(5), 703-710.

Foa, E.B., Huppert, J., Leiberg, S., Langner, R., Kichic, R., Hajcak, G., Salkovskis, P. (2002). The obsessive-compulsive inventory: Development and validation of a short version. *Psychological Assessment*, *14*(4), 485-496.

Foa, E. B., & Kozak, M. J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin, 99,* 20-35.

Foa, E.B., Liebowitz, M.R., Kozak, M.J., Davies, S., Campeas, R., Franklin, M.E., Huppert, J.D., Kjernisted, K., Rowan, V., Schmidt, A.B., Simpson, H.B., & Tu, X. (2005). Randomized, placebo-controlled trial of exposure and ritual prevention, clomipramine, and their combination in the treatment of obsessive-compulsive disorder. *American Journal of Psychiatry, 162,* 151-161.

Foa, E. B., & McNally, R. J. (1996). Mechanisms of change in exposure therapy. Current controversies in the anxiety disorders (pp. 329-343). The Guilford Press: New York.

Gibbs, N.A. (1996). Nonclinical populations in research on obsessive-compulsive disorder: A critical review. *Clinical Psychology Review, 17,* 729-773.

Goetz, A.R., Davine, T.P., Siwiec, S.G., & Lee, H.-J. (2016). The functional value of preventive and restorative safety behaviors: A systematic review of the literature. *Clinical Psychology Review, 44,* 112-124.

Goetz, A.R. & Lee, H.-J. (2015). The effects of preventive and restorative safety behaviors on contamination fear. *Journal of Behavior Therapy and Experimental Psychiatry, 46,* 151-157.

Grayson, J.B., Foa, E.B., & Steketee, G.S. (1986). Exposure in vivo of obsessive-compulsives under distracting and attention-focusing conditions: Replication and extension. *Behaviour Research and Therapy, 24*(4), 475-479.

Grayson, J.B., Foa, E.B., & Steketee, G. (1982). Habituation during exposure treatment: Distraction vs attention-focusing. *Behaviour Research and Therapy, 20*(4), 323-328.

Helbig-Lang, S., & Petermann, F. (2010). Tolerate or eliminate? A systematic review on the effects of safety behavior across anxiety disorders. *Clinical Psychology Science and Practice,17*(3), 218-233.

Henry, J. D. & Crawford, J. R. (2005). The short form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large nonclinical sample. *British Journal of Clinical Psychology, 44*, 227–239.

Hermans, D., Craske, M. G., Mineka, S., & Lovibond, P. F. (2006). Extinction in human fear conditioning. *Biological Psychiatry*, *60*(4), 361-368.

Hernández-Lloreda, M. V., Colmenares, F., & Martínez-Arias, R. (2004). Application of piecewise hierarchical linear growth modeling to the study of continuity in behavioral development of baboons (Papio hamadryas). *Journal of Comparative Psychology*, *118*(3), 316.

Hipol, L.J., & Deacon, B.J. (2012). Dissemination of evidence-based practices for anxiety disorders in Wyoming: A survey of practicing psychotherapists. *Behavior Modification, 37,* 170-188.

Hood, H.K., Antony, M.M., Koerner, N., & Monson, C.M. (2010). Effects of safety behaviors on fear reduction during exposure. *Behaviour Research and Therapy*, *48*(12), 1161-1169.

Kelley, M.L., Heffer, R.W., Gresham, F.M., & Elliott, S.N. (1989). Development of a modified treatment evaluation inventory. *Journal of Psychopathology and Behavioral Assessment, 11*, 235–247.

Kim, E.-J. (2005). The effect of decreased safety behaviors on anxiety and negative thoughts in social phobics. *Journal of Anxiety Disorders, 19*(1), 69-86.

Lang, A. J., & Craske, M. G. (2000). Manipulations of exposure-based therapy to reduce return of fear: A replication. *Behaviour Research and Therapy*, *38*(1), 1-12.

Levy, H.C. & Radomsky, A.S. (2014). Safety behaviour enhances the acceptability of exposure. *Cognitive Behaviour Therapy*, *43*(1), 83-92.

Levy, H.C. & Radomsky, A.S. (2016). It's the who not the when: An investigation of safety behavior fading in exposure to contamination. *Journal of Anxiety Disorders, 39,* 21-29.

Lickel, J.J., Carruthers, B.R., Dixon, L.J., & Deacon, B.J. (2013). Breathing retraining for individuals who fear respiratory sensations: Examination of safety behavior and coping aid hypotheses. *Journal of Cognitive Psychotherapy: An International Quarterly, 27*(2).

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33,* 335-342.

Milosevic, I., & Radomsky, A.S. (2008). Safety behavior does not necessarily interfere with exposure therapy. *Behaviour Research and Therapy, 46*(10), 1111-1118.

Milosevic, I., & Radomsky, A.S. (2013a). Keep your eye on the target: Safety behavior reduces targeted threat beliefs following a behavioral experiment. *Cognitive Therapy and Research, 37,* 557-571.

Milosevic, I., & Radomsky, A. S. (2013b). Incorporating the judicious use of safety behavior

into exposure-based treatments for anxiety disorders: A study of treatment acceptability. *Journal of Cognitive Psychotherapy*, *27*(2), 155-174.

Mystkowski, J.L., Mineka, S., Vernon, L.L., & Zinbarg, R.E. (2003). Changes in caffeine states enhance return of fear in spider phobia. *Journal of Consulting and Clinical Psychology*, *71*(2), 243.

Najmi, S., Tobin, A.C., & Amir, N. (2012). Psychometric properties of a behavioral test of contamination-related obsessive-compulsive symptoms. *Cognitive Therapy and Research*, *36*, 228–233.

Obsessive Compulsive Cognitions Working Group. (2001). Development and initial validation of the obsessive beliefs questionnaire and the interpretation of intrusions inventory. *Behaviour Research and Therapy*, *39*(8), 987-1006.

Olatunji, B. O., Cisler, J. M., Deacon, B. J., Connolly, K., & Lohr, J. M. (2007). The Disgust Propensity and Sensitivity Scale-Revised: Psychometric properties and specificity in relation to anxiety disorder symptoms. *Journal of Anxiety Disorders*, *21*(7), 918-930.

Olatunji, B.O., Deacon, B.J., & Abramowitz, J.S. (2009). The cruelest cure? Ethical issues in the implementation of exposure-based treatments. *Cognitive and Behavioral Practice, 16,* 172-180.

Olatunji, B.O., Williams, B.J., Haslam, N., Abramowitz, J.S., & Tolin, D.F. (2008). The latent structure of obsessive–compulsive symptoms: a taxometric study. *Depression and Anxiety, 25,* 956–968.

Parrish, C.L., Radomsky, A.S., & Dugas, M.J. (2008). Anxiety-control strategies: Is there room for neutralization in exposure treatment? *Clinical Psychology Review,* 1400-1412.

Rachman, S. (1976). The modification of obsessions: A new formulation. *Behaviour*

Research and Therapy, *14*(6), 437-443.

Rachman, S., Craske, M., Tallman, K., & Solyom, C. (1986). Does escape behavior strengthen agoraphobic avoidance? A replication. *Behavior Therapy, 17,* 366-384.

Rachman, S., de Silva, P., & Röper, G. (1976). The spontaneous decay of compulsive urges. *Behaviour Research and Therapy*, *14*(6), 445-453.

Rachman, S.S., Radomsky, A.S., & Shafran, R. (2008). Safety behaviour: A reconsideration. *Behaviour Research and Therapy*, *46*(2), 163-173.

Rachman, S., Robinson, S., & Lopatka, C. (1987). Is incomplete fear-reduction followed by a return of fear? *Behaviour Research and Therapy, 25*(1), 67-69.

Rachman, S., Shafran, R., Radomsky, A.S., & Zysk, E. (2011). Reducing contamination by exposure plus safety behaviour. *Journal of Behavior Therapy and Experimental Psychiatry, 42,* 397-404.

Rapee, R.M., & Heimberg, R.G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy*, *35*(8), 741-756.

Rodriguez, B.I., Craske, M.G., Mineka, S., & Hladek, D. (1999). Context-specificity of relapse: effects of therapist and environmental context on return of fear. *Behaviour Research and Therapy*, *37*(9), 845-862.

Rowe, M.K. & Craske, M.G. (1998). Effects of varied-stimulus exposure training on fear reduction and return of fear. *Behaviour Research and Therapy, 36,* 719-734.

Salkovskis, P.M. (1991). The importance of behaviour in the maintenance of anxiety and panic: A cognitive account. *Behavioural Psychotherapy, 19,* 6–19.

Salkovskis, P.M., Clark, D.M., Hackmann, A., Wells, A., & Gelder, M.G. (1999). An experimental investigation of the role of safety-seeking behaviors in the maintenance of

panic disorder with agoraphobia. *Behavior Research and Therapy*, *37*, 559-574.

Schmid-Leuz, B., Elsesser, K., Lohrmann, T., Johren, P., & Sartory, G. (2007). Attention focusing versus distraction during exposure in dental phobia. *Behaviour Research and Therapy, 45,* 2691-2703.

Tarrier, N., Liversidge, T., & Gregg, L. (2006). The acceptability and preference for the psychological treatment of PTSD. *Behaviour Research and Therapy*, *44*(11), 1643-1656.

Taylor, C.T., & Alden, L.E. (2011). To see ourselves as others see us: an experimental integration of the intra and interpersonal consequences of self-protection in social anxiety disorder. *Journal of Abnormal Psychology*, *120*(1), 129.

Telch, M.J., & Lancaster, C.L. (2012). Is There Room for Safety Behaviors in Exposure Therapy for Anxiety Disorders? In *Exposure Therapy* (pp. 313-334). Springer New York.

Thordarson, D. S., Radomsky, A. S., Rachman, S., Shafran, R., Sawchuk, C. N., & Hakstian, A. R. (2004). The Vancouver obsessional compulsive inventory (VOCI). *Behaviour Research and Therapy*, *42*(11), 1289-1314.

Tsao, J.C. & Craske, M.G. (2000). Timing of treatment and return of fear: Effects of massed, uniform-, and expanding-spaced exposure schedules. *Behavior Therapy, 31*(3), 479-497.

van den Hout, M.A., Engelhard, I.M., Toffolo, M.B.J., & van Uijen, S.L. (2011). Exposure plus response prevention versus exposure plus safety behaviours in reducing feelings of contamination, fear, danger and disgust. An extended replication of Rachman, Shafran, Radomsky & Zysk (2011). *Journal of Behavior Therapy and Experimental Psychiatry, 42*(3), 364-370.

van den Hout, M., van Pol, M., & Peters, M. (2001). On becoming neutral: Effects of

experimental neutralization reconsidered. *Behaviour Research and Therapy, 39,* 1439-1448.

van den Hout, M., Kindt, M., Weiland, T., Peters, M. (2002). Instructed neutralization, spontaneous neutralization and preventive neutralization after an obsession-like thought. *Journal of Behavior Therapy and Experimental Psychiatry, 33,* 177-189.

van den Hout, M.A., Reininghaus, J.K., van der Stap, D., Engelhard, I.M. (2012). Why safety behaviour may not be that bad in the treatment of anxiety disorders: The commitment to future exposures. *Psicoterapia Cognitiva e Comportamentale – Monograph Supplement*, 111-126.

Vervliet, B., Craske, M. G., & Hermans, D. (2013). Fear extinction and relapse: state of the art. *Annual Review of Clinical Psychology*, *9*, 215-248.

Appendix A: Safety Behavior Checklist

Did you use any of the following behaviors during the previous trials?

Use tissue to touch?	**YES NO**
Avoid touching?	**YES NO**
Avoid eye contact with stimulus?	**YES NO**
Take medication before exposure has started?	**YES NO**
Check for exits?	**YES NO**
Relaxation exercises before touching?	**YES NO**
Relaxation exercises while touching?	**YES NO**
Breathing exercises while touching?	**YES NO**
Breathing exercises before touching?	**YES NO**
Distract self while touching?	**YES NO**
Suppress thoughts of contamination while touching?	**YES NO**
Try to think of something else before touching?	**YES NO**
Praying before touching?	**YES NO**
Praying while touching?	**YES NO**
Counting before touching?	**YES NO**
Counting while touching?	**YES NO**
Use anti-bacterial hand sanitizer after touching?	**YES NO**
Wash hands after touching?	**YES NO**
Escape or try to leave session early?	**YES NO**
Take medication after exposure is over?	**YES NO**
Relaxation exercises after touching?	**YES NO**
Breathing exercises after touching?	**YES NO**
Sit down to avoid fainting after exposure?	**YES NO**
Reassurance seeking from therapist?	**YES NO**
Distract self after touching?	**YES NO**
Focus on something else after touching?	**YES NO**
Talk to therapist to distract self while touching?	**YES NO**
Neutralize act of touching by thinking of something else?	**YES NO**
Praying after touching?	**YES NO**
Counting after touching?	**YES NO**

Appendix B: Metacognition and Washing Threat Questionnaire

1. What is your perception that your fear decreased?

I don't think it decreased at all									It definitely decreased by a lot	
0	10	20	30	40	50	60	70	80	90	100

2. How permanent do you think this reduction is?

Not at all permanent									My reduction in fear is definitely permanent	
0	10	20	30	40	50	60	70	80	90	100

3. How fearful do you think you would be if confronted with contaminated materials outside of this experiment?

No fear at all									Extremely fearful	
0	10	20	30	40	50	60	70	80	90	100

4. How fearful do you think you'd be if you were asked to repeat the most recent task accomplished in a few weeks?

No fear at all									Extremely fearful	
0	10	20	30	40	50	60	70	80	90	100

Imagine that you would not be able to wash your hands right now and rate your level of agreement with the statements below using the following scale.

Not at all		*A little bit*			*Somewhat*			*Very much*		*Extremely*
0	10	20	30	40	50	60	70	80	90	100

If I don't wash my hands…

1.	I fear I will become ill	0	10	20	30	40	50	60	70	80	90	100
2.	I fear I will be incapacitated (unable to function) by my disgust	0	10	20	30	40	50	60	70	80	90	100
3.	I fear I will be overwhelmed by sickness	0	10	20	30	40	50	60	70	80	90	100
4.	I fear others will notice my dirt or smell	0	10	20	30	40	50	60	70	80	90	100
5.	I fear someone else will become ill or physically harmed in some way	0	10	20	30	40	50	60	70	80	90	100
6.	I fear my anxiety will last forever	0	10	20	30	40	50	60	70	80	90	100
7.	I fear I will be overwhelmed by disgust	0	10	20	30	40	50	60	70	80	90	100
8.	I fear I will lose control	0	10	20	30	40	50	60	70	80	90	100
9.	I fear I will go crazy	0	10	20	30	40	50	60	70	80	90	100
10.	I fear I won't be able to manage my anxiety	0	10	20	30	40	50	60	70	80	90	100
11.	I fear I will be incapacitated (unable to function) by my anxiety	0	10	20	30	40	50	60	70	80	90	100
12.	I fear my feelings of disgust will be too much for me to bear	0	10	20	30	40	50	60	70	80	90	100
13.	I fear my health will worsen	0	10	20	30	40	50	60	70	80	90	100
14.	I fear my disgust will last forever	0	10	20	30	40	50	60	70	80	90	100
15.	I fear others will view me negatively	0	10	20	30	40	50	60	70	80	90	100
16.	I fear my feelings of anxiety will be too much for me to bear	0	10	20	30	40	50	60	70	80	90	100
17.	I fear I will have a nervous breakdown	0	10	20	30	40	50	60	70	80	90	100
18.	I fear I will throw up	0	10	20	30	40	50	60	70	80	90	100
19.	I fear I will catch a contagious disease	0	10	20	30	40	50	60	70	80	90	100
20.	I fear germs will overtake me	0	10	20	30	40	50	60	70	80	90	100
21.	I fear I won't be able to manage my disgust	0	10	20	30	40	50	60	70	80	90	100
22.	I fear I will be physically harmed in some way	0	10	20	30	40	50	60	70	80	90	100
23.	I fear I will be repulsive to others	0	10	20	30	40	50	60	70	80	90	100

Which fear from the list above is the **worst?** Please list the item #:_____

Appendix C: Ideographic Exposure Stimulus Selection (example shown is for Dirt, Dead, Insects, and Dog Hair)

Dirt, Dead Insects, and Dog Hair

1. Estimate the highest level of fear you expect to experience while touching the mixture.

No fear at all									Extremely fearful	
0	10	20	30	40	50	60	70	80	90	100

2. Estimate the highest level of disgust you expect to experience while touching the mixture.

Not disgusting at all									Extremely disgusting	
0	10	20	30	40	50	60	70	80	90	100

3. How likely is it that you would become ill as a result of touching this mixture?

Not at all likely									Very likely – Illness certain	
0	10	20	30	40	50	60	70	80	90	100

4. If you became ill as a result of touching the dirt mixture, how severe would your illness be?

Not ill at all			Mildly ill	Moderately ill			Very ill		Extremely ill	
0	10	20	30	40	50	60	70	80	90	100

Appendix D: Behavioral Approach Task Assessment (example shown is for pre-treatment BAT)

Stimulus used (circle): DDH Toilet Soiled Laundry

While touching:
CF- What is your current level of fear?
CD- What is your current level of disgust?
IL - How likely is it that you would become ill as a result of touching this mixture?
IS – If you became ill as a result of touching this, how severe would your illness be? 0-no noticeable symptoms, minor illness – 100-terminal illness, death certain

Behavior	**Touch? Y/N**	**CF**	**CD**	**IL**	**IS**
1. Touch with one finger	_____Yes _____No				
2. Touch with one hand	_____Yes _____No				
3. Touch with both hands	_____Yes _____No				
4. Touch with both hands, and then touch pants (on thighs)	_____Yes _____No				
5. Touch with both hands, and then touch chest	_____Yes _____No				
6. Touch with both hands, and then rub hands together	_____Yes _____No				
7. Touch with both hands, and then rub wrists with opposite hands.	_____Yes _____No				
8. Touch with both hands, and then touch upper arms (skin to skin contact)	_____Yes _____No				
9. Touch with both hands, and then touch hair	_____Yes _____No				
10. Touch with both hands, and then push hair back with hands	_____Yes _____No				
11. Touch with both hands, and then smell both hands	_____Yes _____No				
12. Touch with both hands, and then touch neck	_____Yes _____No				
13 Touch with both hands, and then touch face	_____Yes _____No				
14. Touch with both hands, and then use hands to cover eyes	_____Yes _____No				
15. Touch with both hands, and then touch lips.	_____Yes _____No				
16. Touch with both hands, and then lick one hand	_____Yes _____No				

Last behavior performed:_____

Appendix E: Trials 1-15 of Exposure

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ANTICIPATORY															
1. Estimate the highest level of FEAR you expect to experience while touching the object.															
2. Estimate the highest level of DISGUST you expect to experience while touching the object.															
3. Estimate your confidence in being able to reduce your fear to a manageable level while touching the object.															
4. How threatening is this object to you?															
WHILE TOUCHING															
5. What is your highest level of FEAR during this trial?															
6. What is your highest level of DISGUST during this trial?															
STOP TOUCHING															
7. What is your current level of FEAR?															
8. What is your current level of DISGUST?															
9. What is the likelihood that your feared negative prediction will occur? 0 – not at all likely, 100= extremely likely (FROM METACOG Q)															
10. How great is your urge to wash right now?															
11. How likely is it that you would become ill as a result of touching this?															
12. If you became ill as a result of touching this, how severe would your illness be?															

Peak Fear at Trial 1 = _____ 50% of Peak Fear at Trial 1 = _____

Amy Rachel Goetz, M.S.

CURRICULUM VITAE

EDUCATION

Doctorate of Philosophy 2017 (anticipated)	University of Wisconsin-Milwaukee Milwaukee, Wisconsin
Masters of Science 2013	University of Wisconsin-Milwaukee Milwaukee, Wisconsin
Bachelors of Science 2011	Florida State University, magna cum laude with Honors Tallahassee, Florida

AWARDS & HONORS

2015-2016	UWM Distinguished Dissertation Fellowship
2014	Department of Psychology Summer Research Fellowship
2013-2014	UWM Distinguished Graduate Student Fellowship
2012	UWM Graduate Student Travel Award
2011	UWM Graduate Student Travel Award
2011-2013	UWM Chancellor's Graduate Student Award
2011	Elected Phi Beta Kappa, FSU Chapter
2010	FSU Honors Conference Travel Award
2009	Bess H. Ward Honors Thesis Award
2007-2011	FSU Honors Program
2007-2011	Dean's List, FSU

PUBLICATIONS: JOURNAL ARTICLES

1. **Goetz, A.R.,** Davine, T.P., Siwiec, S.G., & Lee, H.-J. (2016). The functional value of preventive and restorative safety behaviors: A systematic review of the literature. *Clinical Psychology Review, 44,* 112-124.

2. Ricketts, E.J., **Goetz, A.R.,** Capriotti, M.R., Bauer, C.C., Brei, N.G., Himle, M.B., Espil, F.M., Snorrason, I., Ran, D., & Woods, D.W. (2016). A randomized wait-list controlled trial of voice over internet protocol-delivered behavior therapy for youth with chronic tic disorders. *Journal of Telemedicine and Telecare, 22*(3), 153-162.

3. Lee, H.-J., **Goetz, A.R**., Turkel, J.E., & Siwiec, S.G. (2015). Computerized attention retraining for individuals with elevated health anxiety. *Anxiety, Stress & Coping, 28,* 226-237.

4. **Goetz, A.R.** & Lee, H.-J. (2015) The effects of preventive and restorative safety behaviors on a single-session of exposure therapy for contamination fear. *Journal of Behavior Therapy and Experimental Psychiatry, 46,* 151-157.

5. **Goetz, A.R.,** Lee, H.-J., Cougle, J.R., & Turkel, J.E. (2013). Disgust propensity and sensitivity: Differential relationships to obsessive-compulsive symptoms and behavioral approach task performance. *Journal of Obsessive-Compulsive and Related Disorders, 2*(4), 412-419.

6. **Goetz, A.R.,** Cougle, J.R., & Lee, H.-J. (2013). Revisiting the factor structure of the 12-item Disgust Propensity and Sensitivity Scale-Revised: Evidence for a third component. *Personality and Individual Differences, 55,* 579-584.

7. **Goetz, A.R.,** Lee, H.-J., & Cougle, J.R. (2013). The association between health anxiety and disgust reactions in a contamination-based behavioral approach task. *Anxiety, Stress, & Coping, 26*(4), 431-446.

8. Lee, H.-J., Turkel, J.E., Cotter, S.P., Milliken, J.M., Cougle, J.R., **Goetz, A.R**., & Lesnick, A.M. (2013). Attentional bias to health threat words. *Anxiety, Stress & Coping, 26*(5), 493-507.

9. Lee, H.J., Turkel, J.E., Woods, D.W. Coffey, S.F., & **Goetz, A.R.** (2012). Elevated affective lability and poor response inhibition: An investigation based on emotional and non-emotional go/no-go tasks. *Journal of Experimental Psychopathology, 3*(5), 750-767.

10. Cougle, J.R., **Goetz, A.R.,** Hawkins, K.A., & Fitch, K.E. (2012). Guilt and compulsive washing: Experimental tests of interrelationships. *Cognitive Therapy and Research*, *36,* 358-366.

11. Lee, H.-J., Franklin, S.A., Turkel, J.E., **Goetz, A.R.,** & Woods, D.W. (2012). Facilitated Attentional Disengagement from Hair-Related Cues among Individuals Diagnosed with Trichotillomania: An Investigation based on the Exogenous Cueing Paradigm. *Journal of Obsessive-Compulsive and Related Disorders, 1*, 8-15.

12. Cougle, J.R., Timpano, K.R., & **Goetz, A.R.** (2012). Exploring the unique and interactive roles of distress tolerance and negative urgency in obsessions. *Personality and Individual Differences, 52,* 515-520.

13. Cougle, J.R., **Goetz, A.R.,** Fitch, K.E., & Hawkins, K.A. (2011). Termination of washing compulsions: A problem of internal reference criteria or 'not just right' experience? *Journal of Anxiety Disorders, 25*, 801-805.

PUBLICATIONS: BOOK CHAPTERS

1. Snorrason, I., **Goetz, A.R.,** & Lee, H.-J. (in press). Psychological treatment of excoriation disorder. In J. Abramowitz, D. McKay, & E.A. Storch (Eds.), *Handbook of Obsessive-Compulsive Related Disorders*. Wiley Publishing.

MANUSCRIPTS UNDER REVIEW

1. **Goetz, A.R.,** Summers, B.J., Cougle, J.R., & Lee, H.-J. Differences in disgust reactions and contamination-related behavior between African Americans and European Americans: In vivo tests of specificity.

CONFERENCE PRESENTATIONS

1. **Goetz, A.R.** & Lee, H.-J. (2014, November). The effects of preventive and restorative safety behaviors on a single-session of exposure therapy for contamination fear. In **Goetz, A.R**. and Lee, H.-J. (Chairs), Do safety behaviors facilitate or hinder fear reduction? Evidence from the lab to the clinic. Symposium presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Philadelphia, PA.

2. **Goetz, A.R.,** & Cougle, J.R. (2011, April). *Termination of washing compulsions: A problem of internal reference criteria or 'not just right' experience?* Symposium conducted at the Undergraduate Research Day in Psychology at Florida State University. Tallahassee, FL.

3. Cougle, J.R., Fitch, K.E., Hawkins, K.A., & **Goetz, A.R.** (2010, November). *An Examination of Disgust and Fear of Illness as Mediators of Contamination Avoidance and Washing Duration.* In Cisler, J. (Chair), Elucidating the Cognitive Mechanisms Mediating Contamination-Related Obsessive Compulsive Disorder. Symposium presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, San Francisco, CA.

4. Cougle, J.R., Fitch, K.E., & **Goetz, A.R.** (2010, June). *The contributions of obsessional beliefs and emotion dysregulation to OCD symptoms.* Symposium conducted at the meeting of the World Congress of Behavioral and Cognitive Therapies, Boston, MA.

18. **Goetz, A.R.,** & Cougle, J.R. (2010, April). *Guilt and compulsive washing: An experimental test of interrelationships.* Symposium conducted at the ACC Meeting of the Minds Conference at Georgia Tech University. Atlanta, GA.

CONFERENCE POSTERS

1. **Goetz, A.R.,** Lee, H.-J., & Cahill, S.P. (2015, November). Testing the benefit of expectancy violations under conditions of safety behavior use in exposure for contamination fear. Poster presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Chicago, IL.

2. Ricketts, E.J., **Goetz, A.R.,** Capriotti, M.R., Bauer, C., Brei, N., Espil, F., Ran, D., & Woods, D. (2014, November). A randomized wait-list controlled trial of voice over internet protocol-delivered behavior therapy for chronic tic disorders. Poster presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Philadelphia, PA.

3. **Goetz, A.R**., Siwiec, S.G., Davine, T.P., Turkel, J.E., & Lee, H.-J. (2014, November) Contamination-related safety behaviors and their association with experiential avoidance and general anxiety symptoms. Poster presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Philadelphia, PA.

4. **Goetz, A.R.,** Fahser, J.L., Counsell, A.E., & Lee, H.-J. (2013, November). The effects of preventive and restorative safety behaviors on contamination fear: An experimental examination. Poster presentation at the Annual meeting of the Association for Behavioral and Cognitive Therapies (ABCT) Convention, Nashville, TN.

5. **Goetz, A.R.** & Lee, H.-J. (2012, November). Preventative versus restorative safety behaviors: Implications for fear reduction among individuals with elevated washing symptoms. Poster presentation at the Annual meeting of the Association for Behavioral and Cognitive Therapies (ABCT) Convention, National Harbour, MD.

6. Lee, H.-J., **Goetz, A.R.,** & Cougle, J.R. (2012, November). Revisiting the factor structure of the 12-item Disgust Propensity and Sensitivity Scale-Revised: Evidence a moral/social subscale. Poster presentation at the Annual meeting of the Association for Behavioral and Cognitive Therapies (ABCT) Convention, National Harbour, MD.

7. **Goetz, A.R.,** Turkel, J.E., Cotter, S.P., Milliken, J.M., & Lee, H.-J. (2012, November). Anxiety sensitivity moderates the impact of health care seeking efforts on health anxiety. Poster presentation at the Annual meeting of the Association for Behavioral and Cognitive Therapies (ABCT) Convention, National Harbour, MD.

8. Lee, H.-J., Turkel, J.E., **Goetz, A.R.,** Ran, D., Grinwald, B., McDonnell, K. (2012, November). Deficits in response inhibition predict severity of OCD symptoms. Poster presentation at the Annual meeting of the Association for Behavioral and Cognitive Therapies (ABCT) Convention, National Harbour, MD.

9. Turkel, J.E., **Goetz, A.R.,** Cotter, S.P., Milliken, J.M., Cougle, J.R., & Lee, H.-J. (2012, April). *Attention Bias toward Personally Relevant Health-Threat Words.* Poster presentation at the Annual Anxiety Disorders Association of America, Washington, DC.

10. **Goetz, A.R.,** Turkel, J.E., Lee, H.-J., & Cougle, J.R. (2012, April). Disgust Propensity and Sensitivity: Differetial Relationships to OC Symptoms and Behavioral Performance. Poster presentation at the Annual Anxiety Disorders Association of America, Washington, DC.

11. **Goetz, A.R**., Hawkins, K.A. & Cougle, J.R. (2011, November). *A Behavioral Analysis of Disgust Reactions as Unique Predictors of Health Anxiety.* Poster presentation at the Annual meeting of the Association for Behavioral and Cognitive Therapies (ABCT) Convention, Toronto, ON.

12. Fitch, K.E., **Goetz, A.R.,** & Cougle, J.R. (March, 2011). *Information Processing Deficits in Nonclinical Compulsive Hoarding.* Poster presentation at the Annual Anxiety Disorders Association of America, New Orleans, LA.

13. **Goetz, A.R**., & Cougle, J.R. (2010, November). *Guilt and compulsive washing: An experimental test of interrelationships.* Poster presentation at the Annual meeting of the Association for Behavioral and Cognitive Therapies (ABCT) Convention – Anxiety Special Interest Group, San Francisco, CA.

RESEARCH EXPERIENCE

Graduate Student Research Assistant, Anxiety Disorders Laboratory, University of Wisconsin-Milwaukee
September 2011-Present

Responsibilities	Conduct original research projects; prepare manuscript findings for review in peer-reviewed journals; disseminate findings at national conferences; assist in preparation of grant proposals; conduct comprehensive structured clinical interviews with study participants; train and oversee research assistants in administration of protocol
Supervisor	Han-Joo Lee, Ph.D.

Graduate Student Research Assistant, Behavior Research and Therapy Laboratory, University of Wisconsin-Milwaukee
December 2012-August 2013

Responsibilities	Conducted structured clinical interviews for a grant-funded treatment outcome study examining the efficacy of comprehensive behavior therapy for tics delivered via videoconferencing platform (i.e., Skype). Additionally administered Wechsler Abbreviated

Scale of Intelligence-II (WASI-II) for determination of eligibility for study participation. Responsibilities included conducting baseline, pre-treatment and post-treatment assessments and manuscript preparation.

Supervisors Douglas W. Woods, Ph.D.; Emily J. Ricketts, M.S.

Research Assistant, Cougle Lab, Florida State University
May 2009-June 2011

Responsibilities Involved in several studies centered on examination of anxiety disorders and obsessive-compulsive spectrum disorders; administered structured clinical interviews and measures of intellectual functioning; conducted 35% CO_2 challenges; administered computerized cognitive bias modification programs; drafted and implemented protocol, developed coding schemes for behavioral tasks, maintained databases, performed statistical analyses, and drafted manuscripts.

Supervisor Jesse R. Cougle, Ph.D.

Research Assistant, Honors Thesis Research, Cougle Lab, Florida State University
January 2009-April 2010

Responsibilities Proposed and designed original project on relationship between guilt and washing behavior; recruited participants and administered study protocol, analyzed findings; developed poster and talk for various symposia.

Supervisor Jesse R. Cougle, Ph.D.

Research Assistant, Schmidt Lab, Florida State University
January 2009-August 2009

Responsibilities Involved in study examining smoking cessation and anxiety management; conducted literature searches and extensive reviews of literature.

Supervisor Brad Schmidt, Ph.D.; Meghan Keough, M.S.

Research Assistant, Kelley Lab, Florida State University
August 2008-April 2009

Responsibilities Administered protocol examining memory errors using varied situational contexts; coded memory errors and number of intrusive errors; conducted literature searches and review of previous research

Supervisor Colleen Kelley, Ph.D.

EDITORIAL SERVICE

Ad hoc Journal Reviewer
2015 *Anxiety, Stress, & Coping*

CLINICAL EXPERIENCE

Student Psychotherapist, Children's Hospital of Wisconsin, Department of Psychiatry and Behavioral Medicine
September 2015 – May 2016

Responsibilities Conducted intake evaluations for children, adolescents, and their families. Presenting concerns included anxiety and mood disorders, disruptive behavior disorders, attention deficit hyperactivity disorder, and concerns regarding medical treatment adherence. Conducted individual therapy utilizing behavioral and cognitive-behavioral approaches.

Supervisor Amy Ridley-Meyers, Ph.D.

Student Psychotherapist, Children's Hospital of Wisconsin, Feeding, Nutrition, and Swallowing Disorders Clinic, Department of Gastroenterology
September 2014 – August 2015

Responsibilities Provided individual behavioral feeding therapy for infants, preschool and school-aged children, and their families within inpatient, intensive outpatient, and outpatient settings. Client populations included children with feeding disorders of early infancy or childhood and other comorbid conditions (e.g., complex medical conditions, developmental difficulties, emotional and behavior difficulties, speech and language impairments). Conducted intake sessions, participated in multidisciplinary team meetings (accompanied by pediatric gastroenterology, nursing, speech-language pathology, clinical nutrition) for treatment planning and evaluation, and participated in follow-up team evaluations. Conducted individual behavioral feeding therapy and co-treatment with speech-language pathologist in order to advance feeding. Behavior therapy components involved caregiver teaching and training, exposure to novel and nonpreferred foods, stimulus control, extinction, shaping, differential attention, contingency management, remote coaching, and general behavioral management skills.

Supervisor Elizabeth Fischer, Ph.D.

Student Psychotherapist, Children's Hospital of Wisconsin, Department of Psychiatry and Behavioral Medicine
September 2014 – May 2015

Responsibilities Conducted psychoeducational evaluations for children, adolescents, and their families. Presenting concerns included attention deficit hyperactivity disorder, learning disorder, intellectual disabilities, psychotic disorders, and anxiety disorders. Received training in conducting comprehensive evaluations, including unstructured and structured interviews, scoring of measures, verbal feedback and provision of recommendations, and integrated report writing. Provided consultative services on cases to relevant providers including child psychiatry, nursing, social work, and clinical child psychology. Co-facilitated therapeutic services consisting of individual cognitive-behavioral therapy for youth with anxiety

disorders and Parent-Child Interaction Therapy for caregivers of youth with behavior problems and disruptive behavior disorders.

- Child and Adolescent Instruments included: Wechsler Intelligence Scale for Children-V (WISC-V), Woodcock Johnson Test of Achievement IV (WJ-IV-ACH), Wide Range Assessment of Memory and Learning-2 (WRAML-2), Wide Range Achievement Test 4 (WRAT 4), NEPSY-II, Achenbach Child Behavior Checklist (CBCL), Adaptive Behavior Assessment System II (ABAS-II), Conners' 3rd edition, Conners' Continuous Performance Test (CPT-II), Conners' Continuous Auditory Test of Attention (CATA), Eyberg Child Behavior Inventory (ECBI).

Supervisors Elizabeth Fischer, Ph.D., John Parkhurst, Ph.D.

Student Psychotherapist, University of Wisconsin-Milwaukee
June 2013 – Present
Responsibilities Provided individual treatment to children, adolescents, and adults in an outpatient clinic. Conducted diagnostic assessments using structured (e.g., ADIS, MINI-Kid, SCID) and unstructured measures. Presenting concerns included chronic tic disorders, trichotillomania, skin-picking, anxiety and mood disorders, and attention deficit hyperactivity disorder. Interventions involved cognitive-behavioral and behavioral approaches including exposure, stimulus control, habit reversal training, behavioral activation, cognitive restructuring, relaxation training, emotion regulation skills training, and structured problem solving. Additional experiences included weekly individual and group supervision meetings.
Supervisors Bonnie Klein-Tasman, Ph.D., Christopher Martell, Ph.D.

Psychological Trainee, Assessment Practicum**,** University of Wisconsin-Milwaukee
June 2013 – Present
Responsibilities Conducted psychoeducational assessments with children, adolescents, and adults within an outpatient clinic and urban charter school. Received training in administration of psychological assessment instruments, clinical interviewing, scoring, provision of feedback to clients and families, integrated report writing, and classroom behavior observation. Additionally served as consulting member on Individualized Education Plan teams.

- Child and Adolescent Instruments included: WISC-IV, WISC-V, WJ-III-ACH, WJ-III-COG, Differential Abilities Scale-II (DAS-II), Wechsler Individual Achievement Test-III (WIAT-III), WRAT 4, Children's Memory Scale (CMS), Cognitive Assessment System-2 (CAS-2), CPT-II, Behavior Rating Inventory of Executive Functioning (BRIEF), Behavior Assessment System for Children, 2nd edition (BASC-II),

Multidimensional Anxiety Scale for Children 2 (MASC 2), Conners' Parent and Teacher Rating Scales (CPRS, CTRS), NEPSY, Gray Oral Reading Test 4 (GORT-4), Mini International Neuropsychiatric Interview 6.0 (MINI-Kid), Anxiety Disorders Interview Schedule IV (ADIS-IV), Robert's Apperception Test for Children (Roberts-2).

- Adult Instruments included: Structured Clinical Interview for DSM-IV (SCID-I), SCID-II, MINI, Personality Assessment Inventory (PAI), Minnesota Multiphasic Personality Inventory-II (MMPI-II), Wechsler Adult Intelligence Scale -IV (WAIS-IV), Stroop, WIAT-III, WJ-III-ACH, WJ-III-COG, Conner's Adult ADHD Rating Scales (CAARS), California Verbal Learning Test, 2nd edition (CVLT).

Supervisors Bonnie Klein-Tasman, Ph.D., Han-Joo Lee, Ph.D.

OTHER CLINICAL EXPERIENCE

Student Clinical Supervisor, Practicum in Objective Assessment, University of Wisconsin-Milwaukee
June 2014 – June 2015

Responsibilities Performed live observation of six clinical psychologygraduate students who conducted psychoeducational assessments (including clinical and diagnostic interviews, intelligence and academic testing, provision of verbal feedback, supervision of students providing recommendations and findings at Individualized Education Plan team meetings) in an outpatient clinic and urban charter school. Monitored students via two-way mirror as they conducted assessments with children, adolescents, and adults. Provided immediate feedback to students as student clinical supervisor. Attended "supervision of supervision" meetings with licensed psychologist.

Supervisors Han-Joo Lee, Ph.D., Kristin D. Smith, Ph.D

TEACHING EXPERIENCE

Associate Instructor, Introduction to Psychology, University of Wisconsin-Milwaukee
September 2015– December 2015

Teaching Assistant, Psychopathology, University of Wisconsin-Milwaukee
January 2013– May 2013)

Guest Lecturer, Introduction to Psychology, University of Wisconsin-Milwaukee
Summer, 2012

Teaching Assistant, Introduction to Psychology, University of Wisconsin-Milwaukee
September 2011- December 2012

PROFESSIONAL AFFILIATIONS

2011-2013 *Anxiety and Depression (formerly Anxiety Disorders) Association of America (ADAA)*
2009-present *Association for Behavioral and Cognitive Therapies (ABCT)*