

Running Head: Inhibitory Learning in OCD

Exposure Therapy for Obsessive-Compulsive Disorder:
An Optimizing Inhibitory Learning Approach

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Despite substantial research demonstrating the efficacy of cognitive-behavioral therapy incorporating exposure with response prevention (ERP) in the treatment of obsessive compulsive disorder (OCD), quantitative reviews have concluded that most patients remain symptomatic after this intervention (J. S. Abramowitz, 1998; Loerinc, Meuret, Twohig, Rosenfield, & Craske, under review). In this paper, we present a promising approach to improving OCD treatment outcomes. Specifically, we show how to apply developments in basic learning, memory, and extinction research to the implementation of exposure therapy for OCD. We draw on Monica's case to demonstrate concretely how to apply this methodology to optimize inhibitory learning—the type of learning that occurs during exposure therapy (Craske, Kircanski, et al., 2008; Craske, Liao, Brown, & Vervliet, 2012).

Description of the Theoretical Model

The use of ERP in the treatment of OCD cases such as Monica's is derived from the learning theory view of (a) obsessional thoughts (and their external triggering stimuli) as conditioned stimuli that provoke fear and anxiety as conditioned responses; and (b) avoidance, compulsive rituals, and other safety cues, as strategies for managing obsessional fear that become negatively reinforced by the reduction in distress they engender. For many years, the efficacy of ERP was understood in terms of the highly influential emotional processing theory (Foa, Huppert, & Cahill, 2006; Foa & Kozak, 1986), which proposes that long-term outcomes in exposure therapy result from initially activating fear and then

sustaining the exposure until fear reduction (habituation) occurs both within and between exposure sessions. From the perspective of emotional processing theory, then, effective treatment would require activating Monica's fear of unnatural foods and products by having her confront these stimuli and use them in the ways that most people do on a daily basis. Monica would also be instructed to allow herself to imagine her feared consequences of doing so. Then, working our way up her fear hierarchy, a therapist following emotional processing theory would allow her fear to diminish within and between exposure sessions. This would result in extinction of her conditioned fear and anxiety responses to obsessional stimuli, at least over the short-term. Monica would also be helped to resist performing compulsive rituals and to cease engaging in other anxiety-reduction or avoidance behavior, all of which would interfere with extinction. Once her fear had habituated in the presence of each item on her hierarchy, and in the absence of rituals, her treatment would be considered a success according to emotional processing theory.

Assessing the scientific validity of emotional processing theory, however, reveals that its basic assumptions are not well supported by the research evidence (Craske, Kircanski, et al., 2008; Craske et al., 2012). Successful habituation during exposure therapy often fails to predict long-term outcomes. Conversely, successful long-term outcomes can occur in the absence of habituation during exposure therapy. How can this be? As we will see, emotional processing theory fails to incorporate numerous developments in basic learning and memory processes strongly relevant to exposure and extinction. These developments point toward *inhibitory learning* as the core mechanism of extinction (Bouton, 1993; Bouton, Woods, Moody, Sunsay, & Garcia-Gutierrez, 2006; Vervliet, Craske,

& Hermans, 2013) – the process driving long-term exposure therapy outcomes for OCD and other anxiety disorders (Craske, Kircanski, et al., 2008; Craske et al., 2012).

From the inhibitory learning perspective, the original danger-based association between the conditioned and unconditioned stimulus remains intact. In OCD, such associations concern not only external triggers of obsessions, but also the obsessional thoughts and doubts themselves (Abramowitz & Arch, 2014). For Monica, these associations would be “unnatural foods cause cancer,” and “uncertainty about becoming ill in the future is intolerable”. Through exposure therapy, competing non-danger-based associations between the conditioned and unconditioned stimulus are formed (“Unnatural foods are generally safe,” “Uncertainty is tolerable”). From an inhibitory learning perspective, the goal of exposure therapy for OCD is to optimize the likelihood that the non-danger associations successfully inhibit access to and retrieval of the threat associations over the long term. In other words, the goal is to maximize the strength, durability, and generalization of the learning that takes place during exposure. The degree to which threat-based *versus* non-threat based associations are expressed at retest (after finishing exposure therapy) depends on the strength of inhibitory learning across time and context – rather than, as put forth by emotional processing theory, the level of fear experienced during exposure (Craske, Kircanski, et al., 2008; Craske et al., 2012). People with anxiety disorders, as well as those at high risk for developing them, show deficits in inhibitory learning (e.g., Craske, Waters, et al., 2008; Lissek et al., 2010). Thus, optimizing inhibitory learning during exposure therapy offers the potential to enhance treatment efficacy as well as to compensate for the deficits that are likely present within anxious individuals prior to the start of treatment (see Craske et al, 2012).

In addition, we believe that increasing tolerance of fear, disgust, and uncertainty has important clinical value in treating OCD and complements the goal of inhibitory learning. Forsyth and colleagues (2006) argue that anxiety disorders are caused by rigid attempts to avoid and control the internal experiences of anxiety and fear rather than by the presence of anxiety and fear in themselves. From this perspective, exposure therapy for OCD should aim to increase tolerance of fear, disgust, and uncertainty, for at least two reasons. First, the goal of increasing tolerance for these experiences complements the goal of increasing inhibitory learning. To the degree that distress is tolerated (“fear of unnatural food is tolerable, so I don’t have to rid myself of this fear,” “Uncertainty about future illness is a fact of life, so I should learn to accept not knowing for sure”), inhibitory associations can be more robustly acquired (“if fear is tolerable, then I can push myself to eat more unnatural food and teach myself that I can manage this normal risk and uncertainty”) (see Arch & Craske, 2011).

Second, an optimizing inhibitory learning approach maximizes the likelihood that the non-threat associations fostered by exposure will be learned and retrieved across diverse contexts. Previously extinguished fears, however, can remain vulnerable to reinstatement—the return of fear following an encounter with a previously feared stimulus — following shifts in time and context. The clinical implication of reinstatement means that inhibitory learning may occasionally fail (albeit less often than if one pursues an emotional processing theory approach)(see Vervliet et al., 2013). Increasing tolerance for uncomfortable OCD-related experiences such as fear, disgust, and uncertainty during exposure therapy thus reduces the likelihood that a lapse in inhibitory learning will lead to a full-blown relapse.

Selecting and Setting Up Exposure Tasks

Drawing upon Monica's case of OCD, we illustrate how to conduct exposure therapy with the goal of optimizing inhibitory learning (see also J. S. Abramowitz & Arch, 2014). This approach would aim to enhance Monica's inhibitory learning, inhibitory regulation (approaches that engage the prefrontal cortex during exposure in a manner that enhances inhibitory learning; Craske, Kircanski, et al., 2008; Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014) and retrieval of non-danger associations (approaches that promote remembering new learning in diverse contexts and over time), using methods derived from the basic science of learning and memory. Extant evidence from clinical and analogue studies yields stronger support for some inhibitory optimizing methods than for others (Vervliet et al., 2013). To treat Monica's OCD, we present approaches to optimizing inhibitory learning for which some (human) clinical research evidence exists and that are implementable in a typical clinic context (e.g., we will omit recommendations to use pharmacological aids that may enhance inhibitory learning but are not available in most clinics or practice settings).

Enhancing Inhibitory Learning during Exposure

Treatment would aim to enhance Monica's inhibitory learning by designing exposure practices that violate her expectancies about threat and danger, use variable exposure practice and deepened extinction, and remove safety signals and behaviors. Before beginning exposure, however, that the following rationale would be presented:

The main goal of exposure therapy is to learn something new. In this case, we want you to learn two important things -- first, that unnatural foods and products are

generally safe enough to use. Second, we want you to learn that you can tolerate the fear and uncertainty that is provoked when you use these sorts of foods and products. In other words, there is no way to know exactly how something you eat today might affect you in the future. Most health-conscious people do their best to avoid harmful foods and products, but are able to manage the inevitable uncertainties of life. And plenty of health-conscious people eat and use the sorts of foods and products that make you fearful. By repeatedly confronting these fears, including the fear of uncertainty about your health, you will learn that you are able to manage these thoughts and feelings without the need to avoid or do compulsive rituals.

Once Monica understands this rationale for exposure, the therapist would work with her to construct a list of feared situations and stimuli, and rate how much anxiety each item on the list provokes – similar to constructing a traditional fear hierarchy. Traditional exposure moves steadily from lower item on the hierarchy to the highest, with each item repeated until anxiety diminishes or disappears (i.e., habituates). In contrast, after constructing the list of Monica's feared stimuli and ratings, her therapist would explain the following:

Sometimes therapists begin with exposure to your least feared situation – touching organic food – and then proceed steadily to your next least anxiety provoking situation – eating organic food that has touched non-organic food, and so on.

However, research suggests that what will be most powerful in terms of your long-

term improvement is using a more varied approach. If you feel the need to start exposure with the least anxiety provoking situation to show yourself that you can tolerate the anxiety it provokes, I'm okay with that. But after that, you'll benefit most if we vary the order, intensity, and duration of the feared situations on your list. Here's how that works. We'll assign a number to each of the behaviors on your list and then pick a number out of a hat to select which one to do next. So we'll proceed in random order to maximize variability in your experience during exposure. This will help you learn that you can tolerate all different levels of fear and uncertainty – a key skill to getting better and staying better in OCD. If your fears or obsessions happen to be triggered again in the future, you will be better able to tolerate them without resorting to OCD rituals or avoidance strategies, or having them affect you so much.

As Monica randomly selects each item for exposure, her therapist would ask her to state her initial expectations regarding how long she believes she can tolerate the exposure and at what intensity. The therapist would then explain: “now we'll do the exposure in a way that purposely challenges your expectations about what will happen.” Exposure would be conducted in a way that deliberately violates her baseline expectancy, which the therapist would help her to notice. The next step would be to check in to see if her expectancy about her capacity to tolerate the exposure (and at what intensity) has changed. If it has, the therapist would assess the new expectancy and continue the exposure (or repeat it) until she violates her new expectancy (rather than until anxiety subsides). This process would repeat several more times. The learning that occurs during

this expectancy-violation approach to exposure is then consolidated by discussing with Monica what she learned regarding the non-occurrence of the expected event, discrepancies between what was predicted and what occurred, and the degree of surprise from the exposure practice.

For Monica, as with many individuals with OCD, fear is often provoked by uncertainty about long-term outcomes (e.g., “what if I get sick 20 years from now because I ate certain food?”) as much as it is by specific stimuli (e.g., soap in public bathrooms). To address this type of obsession, the therapist must engineer exposures that violate expectancies about the ability to tolerate uncertainty and anxiety (as opposed to being able to immediately observe some feared event such as being stung by a bee). To illustrate, Monica confronted her fear of eating store-bought, non-organic fruit (e.g., blueberries, as opposed to certified organic fruit from a local farm). The therapist asked Monica how many blueberries she believed she could eat and how long she felt she could “sit with the anxiety and uncertainty” that the eating would evoke. Monica replied that she had tried this before on her own and could not bring herself to eat any store-bought, non-organic fruit. Moreover, she said that she “wouldn’t be able to stand” the anxiety and uncertainty if she did try the exposure. Accordingly, the therapist asked Monica to use this exposure to test whether she could eat five blueberries over a 5-minute period. Monica attempted the exposure and found that she was able to eat the 5 blueberries; doing so within 2 minutes. Then, the therapist asked Monica to reassess her predictions about what she could tolerate and Monica stated that she doubted she could consume more than 5 berries. Therefore, the exposure was lengthened to 10 minutes and 10 berries (and so on), which Monica accomplished. Over the course of 25 minutes, Monica ate 20 berries! Moreover, she was

surprised to learn that she could “stand” feeling uncomfortable and uncertain (for at least 20 minutes) about the possibility of illnesses resulting from this experience.

After the exposure, the therapist helped Monica consolidate her learning by using Socratic questioning, such as “You told me that you wouldn’t be able to *stand* the uncertainty if you ate these berries, and yet you survived! How do you explain that you’re doing very well even though you don’t know if the berries will eventually make you ill?” The therapist also asked Monica about how surprised she felt to get through the exposure, and what she learned from the experience and specifically how she learned it. The answer to this final question was discussed so that Monica recognized that she had learned that she could “stand” uncertainty and anxiety, and actually do quite well while experiencing these feelings. Finally, the therapist asked Monica ways she could vary this exposure task when she repeats it in the future (i.e., as homework).

Violating expectancies is consistent with traditional CBT approaches to exposure in which core beliefs are challenged via exposure and behavioral experiments. The main purpose of violating expectancies from an inhibitory learning perspective, however, is to increase the element of *surprise* during extinction – an element hypothesized to increase inhibitory learning (Rescorla, 1988; Rescorla & Wagner, 1972).

Having Monica conduct exposures in as many different places and contexts as possible, with and without the therapist present, is another important approach to promoting inhibitory learning. Using varied stimuli and practicing in varied contexts during exposure reduces fear reinstatement when feared stimuli are reencountered in new contexts (Rowe & Craske, 1998b; Vansteenwegen et al., 2007). Thus, we would want Monica to practice eating unnatural food in the therapy room, at home, at work, in

restaurants, while traveling, and on the run. Similarly, we would ask her to use unnatural hygiene products that she purchases, that her parents and friends use, and that are freely available in public locations (soap in a gym or motel room shower). Monica would also be instructed to use these products in diverse places - at home, at the gym, in a motel room, at a friend's house, and so forth. Moreover, individual exposures will *not* necessarily continue until fear diminishes. In fact, using diverse stimuli and contexts can elicit higher levels of physical arousal and reported anxiety during exposure (Lang & Craske, 2000) yet produces long term benefits. Moreover, recent evidence suggests that variability of fear responding – specifically, eliciting repeated peaks in fear arousal – maximizes inhibitory learning (Culver, Stoyanova, & Craske, 2012), including in an exposure study for contamination anxiety (Kircanski, Mortazavi, et al., 2012). Thus, Monica's therapist would emphasize that greater short-term discomfort yields greater long-term benefits.

Another strategy used in exposure from an inhibitory learning perspective is compound or “deepened extinction” (e.g., Rescorla, 2006), in which multiple fear cues are first extinguished separately before being combined during exposure. For Monica, fear was evoked by both situational (e.g., using unnatural soap products) and mental (e.g., images of becoming ill in 20 years) stimuli. Thus, the therapist would have Monica wash her hands with unnatural soap, only briefly rinse them, leaving some mild soap residue on her hands. Monica would then immediately consume an unnatural food product with her hands, thus consuming food that was “doubly contaminated” by both contacting the unnatural soap residue remaining on her hands and being sprayed with chemicals. (Note: These exposures – first, consuming unnatural food and second, eating a natural food with unnatural soap residue on her hands – would first be conducted separately prior to being combined.)

Alternatively, the therapist could separately conduct in-vivo and imaginal exposures and then combine them. For example, the therapist could have Monica separately wash her hands with unnatural soap and later imagine her obituary appearing in the newspaper as someone who died at the age of 28 from overuse of unnatural soap products. The therapist would then have Monica do both exposures simultaneously – washing with unnatural soap while imagining seeing this obituary.

Maximizing inhibitory learning also draws upon Bjork and Bjork's New Theory of Disuse (1992, 2006) in determining the time intervals at which we conduct Monica's exposure sessions. This theory states that progressively increasing the amount of time between learning sessions creates the most durable long-term learning. Thus, we would space Monica's first sessions closely together, i.e. several days apart, and then gradually expand therapist sessions to one week apart. After Monica regularly engages in extensive exposure practice in and out of sessions, we would expand the inter-session interval to two weeks. After she has exposed herself to everything or nearly everything on her list in a manner that optimizes inhibitory learning (see Tables 1 and 2), appointments with the therapist would be scheduled monthly. If possible, we would then conduct booster sessions at increasing intervals (3 months, 5 months, 9 months, etc.) to help her further consolidate and robustly retrieve what she has learned.

To optimize long-term learning, we would also ask Monica to refrain from using safety signals and behaviors during exposures and in life more generally. For example, Monica always carries her own "natural" products with her – a behavior we would ask her to reduce or eliminate. We would explain that safety behaviors such as carrying her own products with her at all times can interfere with the learning that takes place during

exposure, and especially with learning that she can tolerate uncertainty and fear about using unnatural or unknown products. The evidence for whether safety signals and behaviors negatively interfere with OCD related exposure outcomes is mixed, following a recent contamination exposure study that failed to replicate earlier findings of their deleterious effect (Rachman, Shafran, Radomsky, & Zysk, 2011). This finding, however, was limited to short term (2 week) outcomes in a nonclinical undergraduate sample. Thus, for now, we still recommend that Monica eliminate safety behaviors and cues.

Enhancing Inhibitory Regulation during Exposure

Recent work (Kircanski, Lieberman, & Craske, 2012) has demonstrated that affect labeling—stating one’s emotional responses without changing the responses—during exposure in spider-fearful individuals produced greater reductions in physiological arousal than did (a) exposure without affect labeling, (b) cognitive reappraisal, or (c) distraction; and produced greater approach behavior than distraction. Although this finding has yet to be replicated in an OCD sample, there is little reason to believe that this process would differ between phobias and obsessional problems given that both are fear-based conditions. Moreover, affect labeling instructions are sufficiently easy and straightforward to recommend to Monica, and could be incorporated as follows:

Learning from exposure can be enhanced by describing your feelings about the exposure out loud. Specifically, about 10 seconds into each exposure I’ll ask you to speak a sentence that includes a negative word to describe what you’re doing and a negative word or two to describe your emotional response to it. For example, if we

were having you wash with unnatural soap, you might say: “I feel anxious and afraid that this disgusting soap will give me cancer.”

Enhancing Retrieval of Inhibitory Learning

A major challenge in treating OCD is ensuring that, in the months and years after exposure treatment ends, patients will be able to retrieve what they learned across diverse contexts that cannot be anticipated during treatment. . Optimizing long-term inhibitory learning, therefore, requires helping Monica offset context renewal effects – that is, fear reinstatement when feared stimuli are encountered in a new context (see Vervliet et al., 2013). Because context renewal effects are hypothesized to account for a sizable portion of lapses following exposure, offsetting these effects can enhance long-term exposure outcomes. As noted, Monica’s exposures would be conducted in diverse contexts so that her inhibitory learning would generalize as broadly as possible. Conducting exposure in multiple contexts also has been shown to offset context renewal (Vansteenwegen et al., 2007), at least under some conditions (Vervliet et al., 2013). Specifically, exposure in diverse contexts can reduce the possibility that encountering unnatural foods or products in a new context will trigger a lapse in Monica’s OCD symptoms.

Another approach that shown to offset context renewal (in a spider-anxious sample) is instructing the patient to mentally “reinstate” what they learned during exposure when they reencounter the feared stimulus at 1-week follow-up (Mystkowski, Craske, Echiverri, & Labus, 2006). Mental reinstatement involves asking the patient to: “remember what happened and what you learned [during exposures] and where all of [the exposures] took place.” We would therefore teach Monica to practice mentally picturing the various places

in which she practiced exposure and remembering what she learned there. We would ask her to practice this mental reinstatement between sessions and after therapy finished, particularly when encountering unnatural foods and products. We would explain to Monica that mentally reinstating what she learned during exposure should enhance her capacity to “hang on” to this knowledge in an enduring way.

Promoting Fear Tolerance

The emotional processing theory of exposure therapy (Foa et al., 2006; Foa & Kozak, 1986) promotes fear reduction within and between exposure sessions. Thus, many exposure therapy manuals emphasize that clients should remain in the exposure until their fear significantly diminishes. This emphasis on short-term fear reduction, however, fails to enhance long-term inhibitory learning and may promote the return of fear (Craske, Kircanski, et al., 2008; Craske et al., 2012). For example, such an emphasis may increase the risk of relapse by teaching clients that success in exposure therapy means that they should feel little to no fear when they reencounter what they previously feared (Arch & Craske, 2011). Although our approach would aim to enhance Monica’s inhibitory learning, her previously conditioned fears may occasionally override her capacity to inhibit them. Thus, it would be important for the therapist to explain the following to Monica:

The treatment approach we are taking applies the latest scientific knowledge to enhance your learning that the risks of consuming and using unnatural foods and products, while not zero, are generally acceptable; and that you can manage the acceptable levels of uncertainty that accompany this risk—just like many other

people who take these risks on a daily basis. However, this same scientific knowledge also tells us that even after treatment ends, occasionally, old fears and obsessions can be retriggered. If this happens, it's normal. In fact, let's expect that at some point this WILL happen, so that you'll be prepared when it does. But just because your old fears or obsessions show up does NOT mean that you have to go back to having OCD – to avoiding unnatural foods and products and everything you associate with them. Instead, if old fears or obsessions pop up, know that they are part of the larger experience of obsessional intrusions, anxiety, and uncertainty -- normal and tolerable experiences that you don't need to "rid yourself of" to feel that treatment has been successful. You can learn to tolerate them without having to turn to avoidance, rituals, and other safety cues.

This stance echoes third-wave behavioral approaches, such as Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 1999, 2012), that emphasize radical acceptance and embrace of internal experience. We believe that ACT and related acceptance-based therapies (e.g., Linehan, 1993; Roemer & Orsillo, 2005) have positively shifted the broader CBT field towards a more acceptance-oriented therapeutic stance. The optimizing inhibitory learning approach, however, differs from ACT in at least two ways. On a foundational level, this approach is based on translational research on learning, memory, and extinction rather than on relational frame theory – the theory regarding the psychological functions and consequences of language that underlies ACT (Hayes, Barnes-Holmes, & Roche, 2001; Hayes, Luoma, Bond, Masuda, & Lillis, 2006). This leads to different emphases. Optimizing inhibitory learning uses exposure therapy to maximize

safety (non-danger) learning. That is, this approach leverages the power of translational science to maximize exposure therapy's power to produce long-lasting safety learning – to help people with OCD learn in an enduring and powerful way that the situations, stimuli, emotions, and uncertainty they once feared carry acceptable risk that is manageable. ACT, in contrast, does not emphasize safety learning. (Although ACT's emphasis on radical acceptance implies that all internal experience is safe – perhaps a kind of internal safety learning.) Lastly, our approach to optimizing inhibitory learning emphasizes fear tolerance as a complementary aim of inhibitory learning. However, ACT goes further in promoting radical embrace and acceptance of all internal experience.

Exposure “Dos and Don’ts”

Exposure is implemented differently in the optimizing inhibitory learning approach than in the classic emotional processing theory-based approach. As Table 1 presents, our approach emphasizes (a) tolerating fear and uncertainty over reducing fear in the short-term, (b) conducting exposure in variable contexts and with variable stimuli, and (c) proceeding through an exposure hierarchy (if the therapist uses one at all) in a variable manner. Similarly, we encourage repeated peaks in physiological arousal and subjective fear during exposures, and repeated violations of negative expectancies regarding feared objects, situation, and internal experiences (e.g., anxiety, uncertainty). We would thus recommend that Monica track her ongoing negative expectancies about the rate or severity of her feared outcomes (including not being able to tolerate uncertainty about future illnesses) and conduct exposure in a manner that repeatedly disconfirms them. Monica should learn how to put her feelings into words during exposure and conduct exposure sessions at increasing time intervals to enhance consolidation. Further, we would

encourage Monica to practice mentally reinstating what she learned in exposure therapy at places and times outside of exposure sessions, to enhance memory retrieval. Although we recommend safety signal and behavior elimination, we would not be overly concerned if Monica refuses to comply or partially complies, given recent suggestions that inhibitory learning can still occur in the presence of such signals.

Finally, instructing Monica to track her anxiety before, during, and after exposure can be helpful for several reasons. First, tracking in high anxiety exposures demonstrates to both the therapist and Monica that she can tolerate strong feelings of anxiety – thus informing the goal of learning fear tolerance. Second, anxiety tracking ascertains whether anxiety rises and falls repeatedly, a demonstrated correlate of inhibitory learning. Third, anxiety tracking informs whether randomly selected exposures are producing variable fear responses – that Monica’s anxiety is higher during some exposures than others. Note that the purpose of anxiety tracking is *not* for Monica to anticipate her anxiety linearly dropping during and between exposures. If Monica observes this, the therapist will say, “Yes, anxiety sometimes drops during exposure and sometimes it doesn’t... Either way, you’re OK, and either way it doesn’t seem to matter for long-term outcomes.”

If the number of recommendations presented in Table 1 seems overwhelming, do not panic – the reader need not enact all of them to enhance inhibitory learning. Most of the extant evidence supporting this model stems from studies examining only a single component of this model at a time. Adding any one of these recommendations holds the potential to increase inhibitory learning and thus the durability and power of Monica’s treatment.

[Insert Table 1 about here]

Ending Exposure

The overarching question that guides our evaluation of whether Monica has finished an exposure is: *Has Monica conducted the exposure in a manner that maximizes new learning and the chance that this learning will be retrieved in an enduring way across diverse contexts?* First, did Monica remain in the exposure long enough to violate her negative expectancies about the rate, frequency, or intensity of her feared outcome? If her expectancies changed during the exposure, did she remain engaged in the exposure long enough or in the manner required to *repeatedly* violate her (evolving) negative expectancies? Second, did Monica engage in a manner that optimized variability on all levels including variability in exposure stimuli as well as variability in the fear experience? For example, if Monica washed her hands with the soap provided in a mall restroom (which she ranked, for the sake of example, as an 8 out of 10 for difficulty), did she next wash her hands with soap at her friend's house (ranked a 4), with soap at a random gas station (ranked a 10), and with soap at her high school bathroom (ranked a 6)? Did she use unnatural soap in a way that facilitated repeated peaks in her anxiety level? For example, did she begin washing her hands with a tiny amount of soap and then in the middle of washing, add a large amount of soap, causing another spike in her anxiety? Third, did Monica notice that she was able to tolerate a broad range of uncomfortable experiences – anxiety, fear, uncertainty, discomfort – even when they reached high levels? Fourth, did she engage in exposure without use of safety signals and behaviors and without engaging in obsessional behavior afterwards? For example, did she wash without first studying the labels on the soap dispensers or researching their ingredients (types of safety behaviors)? Without rewashing her hands with “natural” soap afterwards? Fifth, did she label her

feelings approximately 10 seconds into the exposure by speaking aloud something like, “I feel out of control and like I’m going to get cancer when I touch this disgusting unnatural soap”?

Session debriefing would encompass these points, as well as a discussion guided by the questions mentioned previously (see Enhancing Inhibitory Learning During Exposure). In addition, before leaving the exposure session, Monica’s therapist should instruct her to practice mental reinstatement between exposure sessions when reencountering unnatural soap, by picturing what she learned during the exposure and where she learned it. If Monica had not yet practiced extensively without the therapist, the therapist would instruct and strategize with Monica how to use unnatural soap outside of the therapy session, in as many different contexts as possible. The therapist would explain: “the more different opportunities you have to use unnatural soap, the better. The broader the situations, the more diverse the types of soap, the variety of people who are or are not present when you use unnatural soap, and the more you practice mentally remembering what you learned here, the better.”

Conclusion

Optimizing inhibitory learning represents an exciting and evolving approach to exposure therapy. New research constantly emerges that helps to refine and update this approach. Thus, many of the current recommendations are subject to updating in response to new evidence of how to best enhance inhibitory learning. For example, only limited work to date has examined the synergistic effect of combining multiple different approaches to enhance inhibitory learning (e.g., Deacon et al., 2013). Further, most of our recommendations are supported by basic or human conditioning studies (in which

previously neutral objects are paired with aversive stimuli) but have been investigated in more limited ways in humans with preexisting fears, as in anxiety disorders. Yet the shortcomings of the influential emotional processing theory of exposure are increasingly evident (Craske, Kircanski, et al., 2008; Craske et al., 2012). Translational science on learning and memory offers strong potential to transform exposure therapy through pathways that improve the durability and strength of long-term outcomes.

The goal of the optimizing inhibitory learning approach to exposure therapy is clear – to maximize inhibitory learning and the long-term retrieval of that learning as powerfully as possible. Although we offer numerous suggestions for how to facilitate this goal, therapists can exercise some flexibility in applying these suggestions. As noted, most of the recommendations for how to enhance Monica’s exposure therapy outcomes have only been studied in isolation. At this point in the evidence base, therefore, therapists can select all or a subset of these recommendations – or even just one – and still stand a good chance of enhancing long-term outcomes for people like Monica.

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Table 1. Optimizing Inhibitory Learning: Prescribed and proscribed therapist behaviors during exposure.

Therapist “Dos”		Therapist “Don’ts”	
Prescribed Behavior	Empirical Support	Proscribed Behavior	Empirical Support
Do repeatedly disconfirm the client’s negative expectancies regarding the frequency and intensity with which feared outcomes will occur	(see Craske, Kircanski, et al., 2008; Craske et al., 2012; Deacon et al., 2013)	Do not merely conduct exposures until short-term fear diminishes	(see Craske, Kircanski, et al., 2008)
Do prescribe variability in exposure stimuli and contexts	(Lang & Craske, 2000; see Mystkowski & Mineka, 2007; Rowe & Craske, 1998b; Vansteenwegen et al., 2007)	Do not conduct exposure only with a single stimulus or in a single context, such as only within the therapy room or when the therapist is present	(Culver, Stoyanova, & Craske, 2011; Mineka, Mystkowski, Hladek, & Rodriguez, 1999; Mystkowski, Craske, & Echiverri, 2002; Mystkowski & Mineka, 2007)
Do proceed in a non-linear manner through the fear hierarchy (or do not use a hierarchy)	(see Craske, Kircanski, et al., 2008; Craske et al., 2014)	Do not proceed in order from the least to most feared items on the fear hierarchy	(see Craske, Kircanski, et al., 2008; Craske et al., 2014)
Do draw upon principles of compound (deepened) extinction by conducting exposures to individual feared stimuli or obsessions and then combining them	(Culver, Vervliet, & Craske, in press (pending))	Do not jump to conducting simultaneous exposure to multiple feared stimuli without first conducting separate exposures to one or both of them	(Vervliet, Vansteenwegen, Hermans, & Eelen, 2007)
Do encourage repeated peaks in physiological arousal and reported fear during exposures	(Culver et al., 2012; Kircanski, Mortazavi, et al., 2012)	Do not encourage a linear decrease in fear arousal or imply that this is ideal or expected	(see Craske, Kircanski, et al., 2008)
Do emphasize learning to tolerate fear and uncertainty	(see Craske, Kircanski, et al., 2008; Forsyth et al., 2006)	Do not emphasize fear reduction during exposures or between exposure sessions	(Craske et al., 2012; Craske, Waters, et al., 2008; Vervliet et al., 2013)
Do teach the client	(Kircanski,	Do not teach	Mixed but see

Inhibitory Learning in OCD

how to “put their feelings into words during exposure”	Lieberman, et al., 2012)	distraction during exposure	(Kircanski, Lieberman, et al., 2012)
Do aim to reduce or eliminate the client’s use of safety signals and behaviors	(Powers, Smits, & Telch, 2004; Salkovskis, Clark, Hackmann, Wells, & Gelder, 1999; Wells, Clark, Salkovskis, Ludgate, & et al., 1995)	But if the client refuses to eliminate <i>all</i> safety signals and behaviors, don’t assume that exposure will fail	(Rachman et al., 2011; Sy, Dixon, Lickel, Nelson, & Deacon, 2011; van den Hout, Engelhard, Toffolo, & van Uijen, 2011)
Do teach the client how to mentally reinstate exposure learning and have them practice it occasionally between sessions and after sessions end.	(Mystkowski et al., 2006)	Avoid inhibitory learning reminders that can easily become safety cues (e.g., a wrist band) and do not have the client practice mental reinstatement so often that it too becomes a safety cue.	(see Craske, Kircanski, et al., 2008)
Do conduct therapy in gradually increasing time intervals between sessions and include numerous booster sessions, also at increasing intervals	(Bjork & Bjork, 1992, 2006; Craske, Kircanski, et al., 2008; Rowe & Craske, 1998a)	Do not conduct massed exposure or conduct weekly therapy and then never see the client again	(Craske, Kircanski, et al., 2008; Rowe & Craske, 1998a; Tsao & Craske, 2000)

Note: The references cited above are illustrative rather than exhaustive. Some represent

clinical analogue studies or studies in anxiety disorder populations outside of OCD or

integrative reviews that promote a particular learning principal, reflecting the fact that the

specific recommendations to optimize inhibitory learning are evolving in response to

ongoing investigation.

Table 2. Optimizing Inhibitory Learning: Prescribed and proscribed client behaviors during exposure.

Client “Dos”		Client “Don’ts”	
Prescribed Behavior	Empirical Support	Proscribed Behavior	Empirical Support
The client should state her honest expectations regarding the frequency and intensity of the negative events that she predicts will occur during exposure. She should push herself to remain in the exposure until she’s exceeded her expectations, multiple times. The more strongly and often she surprises herself, the better.	(Craske, Kircanski, et al., 2008; Craske et al., 2012; Deacon et al., 2013)	The client should not expect or aim for short-term fear reduction.	(see Craske, Kircanski, et al., 2008; Craske et al., 2014)
The client should aim to expose herself to as many different types of feared stimuli in as many different contexts as possible, both with and without the therapist, alone and in the company of non-therapist others (friends, family, strangers).	(Lang & Craske, 2000; see Mystkowski & Mineka, 2007; Rowe & Craske, 1998b; Vansteenwegen et al., 2007)	The client should know that it will not suffice to conduct exposures only during exposure sessions with the therapist present, or only in the therapy room. She should insist on leaving the therapy room and conducting exposures in diverse real-world contexts and with diverse feared stimuli in various contexts.	(Culver et al., 2011; Mineka et al., 1999; Mystkowski et al., 2002; Mystkowski & Mineka, 2007)
The client should push to exposure herself to feared stimuli/ situations in a random manner – exposing herself to moderately feared stimuli followed by mildly feared stimuli followed by strongly feared stimuli, etc. – both within and between	(see Craske, Kircanski, et al., 2008; Craske et al., 2014)	The client should <i>not</i> conduct exposure in a linear manner, moving gradually from her least to most feared stimuli/ situations, either within or between sessions.	(see Craske, Kircanski, et al., 2008; Craske et al., 2014)

exposure sessions in order to promote inhibitory learning			
After exposing herself to individual feared stimuli/ situations, the client should expose herself to paired combinations of feared stimuli/ situations together in order to promote long-term learning. For example, washing with nonorganic soap and eating nonorganic blueberries immediately thereafter.	(Culver et al., in press (pending))	The client should not conduct exposure in combination until after she has exposed herself to one or both individually.	(Vervliet et al., 2007)
During exposures, the client should interact with the feared stimuli/ context in a manner that facilitates repeated peaks in physiological arousal and reported fear, such as eating one nonorganic blueberry at once, and then, during the same exposure, eating a full handful of nonorganic blueberries together, causing her fear to peak once again.	(Culver et al., 2012; Kircanski, Mortazavi, et al., 2012)	The client should not engage in exposure in a manner that only facilitates fear reduction, such as eating one blueberry and waiting for her fear to decline within each exposure.	(see Craske, Kircanski, et al., 2008; Craske et al., 2014)
The client should tell herself that the goal of exposure is to learn to live with and tolerate the fear and uncertainty that comes with living in the modern (chemical-filled) world. Thus, if the client feels strong fear throughout exposure therapy or if her fear spikes many times, she should resist the urge to escape or turn to safety behaviors, and remind herself that by learning to tolerate fear and uncertainty, she is	(see Craske, Kircanski, et al., 2008; Forsyth et al., 2006)	The client should not do anything – such as mentally disengage or turn to safety behaviors or reassurance-seeking (external or internal) - in order to reduce fear during exposure. She also should not feel she has failed if her fear level during exposure does not diminish.	(Craske et al., 2012; Craske, Waters, et al., 2008; Vervliet et al., 2013)

enhancing her long-term learning and recovery from OCD.			
About 10 seconds into each exposure, whenever possible the client should speak aloud a sentence describing the feared stimulus or situation she is confronting and her feelings about it.	(Kircanski, Lieberman, et al., 2012)	The client should avoid using distraction during exposure and instead, directly confront and speak her feelings out loud whenever possible.	Mixed but see (Kircanski, Lieberman, et al., 2012)
The client should reduce or eliminate her safety signals and behaviors.	(Powers et al., 2004; Salkovskis et al., 1999; Wells et al., 1995)	But if the client refuses to eliminate <i>all</i> safety signals and behaviors, she needn't assume that exposure will fail.	(Rachman et al., 2011; Sy et al., 2011; van den Hout et al., 2011)
In between exposure sessions, particularly when confronting feared stimuli/ situations, the client should practice remembering where exposure took place and what she learned there.	(Mystkowski et al., 2006)	The client should avoid using mental reinstatement as a safety behavior; thus she should use it only occasionally and regularly practice confronting feared stimuli without it. She should not expect that mental reinstatement will prevent her from ever feeling fear when confronting feared stimuli/ situations.	(see Craske, Kircanski, et al., 2008; Craske et al., 2014)
The client should commit herself to the principal of expanding practice and make room in her schedule to conduct therapy sessions closely together at the beginning of therapy and further apart as therapy continues. The client should also request multiple booster sessions after regular therapy ends.	(Bjork & Bjork, 1992, 2006; Craske, Kircanski, et al., 2008; Rowe & Craske, 1998a)	The client should avoid the temptation to conduct exposure therapy "all at once", that is, very intensely over several days or weeks without further exposure.	(Craske, Kircanski, et al., 2008; Rowe & Craske, 1998a; Tsao & Craske, 2000)

