



Measuring self-efficacy to approach contamination: Development and validation of the facing-contamination self-efficacy scale

Lori F. Merling¹ · Jedidiah Siev² · Keith Lit¹

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Abstract

Despite a rich literature on the effects of self-efficacy (SE) on various outcomes, there is little discussion of its effects on obsessive-compulsive disorder (OCD). The purpose of this study was to develop and validate the Facing-Contamination Self-Efficacy Scale (FC-SES), a measure of beliefs about one's capability to face OCD-relevant contamination triggers. The final sample consisted of 129 participants, age 18 and over, who were recruited through Amazon's Mechanical Turk. Factor structure, reliability, and validity were assessed using exploratory factor analysis, Cronbach's alpha, and correlational analyses, respectively. Factor analysis yielded 2 clearly interpretable factors: human-related contamination (9 items), and animal-related contamination (5 items). The 14-item FC-SES demonstrated very good internal consistency reliability ($\alpha = .87$), as well as good convergent and discriminant validity. Results suggest the FC-SES is a valid and reliable tool that can be used in future research exploring the relationship between SE and contamination-related OCD symptoms.

Keywords Self-efficacy · Contamination · Obsessive-compulsive disorder · Measure

Introduction

Self-efficacy (SE) – defined as “people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives” (Bandura 1994, p. 71) – has been explored extensively since its formal introduction to the field of psychology. SE has predicted a variety of behavioral outcomes in the contexts of health (e.g., exercise and smoking cessation) (Balmford et al. 2014; Chambliss and Murray 1979; Jeffrey et al. 1984), academics (Bandura and Schunk 1981; Hackett and Betz 1989; Lent et al. 1984; Parajes and Kranzler 1995), and psychopathology (Bandura 1977; Brown et al. 2014; Diehl and Prout 2002; Goldin et al. 2012; Hannesdóttir and Ollendick 2007; Rudy et al. 2012; Wheeler and Ladd 1982; Wilson et al. 2002; Zoellner et al. 2000). Of particular interest to clinical researchers is evidence that SE mediates or predicts treatment outcomes for a number of anxiety disorders, including

phobias (Bandura 1977; Zoellner et al. 2000), social anxiety (Ahmed and Westra 2009; Goldin et al. 2012; Rudy et al. 2012), posttraumatic stress disorder (Diehl and Prout 2002), and panic disorder with agoraphobia (Bouchard et al. 2007).

Despite this link between SE and anxiety disorders, researchers have not examined the role of SE in the treatment of obsessive-compulsive disorder (OCD). OCD is an anxiety disorder characterized by recurrent obsessive thoughts and excessive or unreasonable compulsions. The current gold standard in OCD treatment, exposure and response prevention (ERP), involves systematic exposure to obsession-provoking stimuli while refraining from performing compulsions (Rowa et al. 2007). For example, one common presentation of OCD involves intense anxiety in the face of physical or psychological contact with a perceived contaminant and the performance of compulsive cleansing rituals in order to alleviate this anxiety. In these cases, ERP entails exposure to perceived contaminants such as touching surfaces in a public bathroom, and refraining from hand washing or other decontamination rituals. Repeated exposure facilitates habituation – the reduction of anxiety in the presence of feared stimuli – and cognitive changes such as decreases in excessive, unrealistic estimates of danger (Foa et al. 2006). Numerous clinical trials have demonstrated strong positive outcomes for patients who complete a course of ERP (Foa et al. 2005; Olatunji et al. 2013); however, with attrition rates estimated at 18.7% (Ong et al. 2016) and other instances in which individuals relapse or fail

✉ Lori F. Merling
lm1675@mysnu.nova.edu

¹ College of Psychology, Nova Southeastern University, 3301 College Avenue, Fort Lauderdale, FL 33314, USA

² Department of Psychology, Swarthmore College, 500 College Avenue, Swarthmore, PA 19081, USA

to respond, only 50% of patients tend to benefit optimally from this form of CBT, even when combined with pharmacotherapy (Sookman and Steketee 2007). Because ERP requires patients to approach highly anxiety provoking stimuli, they may initially lack the belief that they are able to carry out the series of proposed behaviors that will eventually lead them to withstand the discomfort of facing their greatest fears. This aligns with Bandura's view that if individuals "believe themselves incapable of requisite attainments, they forsake the endeavor, and their beliefs about the outcomes such accomplishments could bring have little effect on their behavior" (Bandura 1986, p. 220). Similarly, one way that ERP may facilitate symptom relief is by increasing perceived SE to confront feared stimuli and tolerate the resultant anxiety, a possibility consistent with the inhibitory learning approach to exposure therapy (e.g., Craske et al. 2014). Investigating the impact of SE on ERP outcomes may, therefore, aid in understanding and improving engagement in, and benefit from, treatment.

Naturally, designing investigations of SE and ERP requires adequate measurement tools. In many previous studies relating to SE, researchers have utilized different general SE measures such as the General Self Efficacy Scale (GSE; Schwarzer and Jerusalem 1995), and the New General Self-Efficacy Scale (NGSE; Chen et al. 2001). Although these general measures may reflect overall patterns in SE, they tend to be insensitive to situational demands and circumstances, resulting in ambiguity in the construct being measured (Bandura 2006). Consequently, more specific measures have been created to examine SE beliefs relevant to particular contexts. For example, Fast et al. (2015), recently created a measure of portion control self-efficacy (PCSE) to investigate SE beliefs about controlling one's food intake. Other measures developed to assess context-specific SE beliefs include the Drug Taking Confidence Questionnaire (DTCQ; Annis and Martin 1985), the Tool to Measure Parenting Self-Efficacy (TOPSE; Kendall and Bloomfield 2005), and the Self-Efficacy Questionnaire for Depression in Adolescents (SEQ-DA; Tonge et al. 2005). The SEQ-DA, in particular, has been shown to be predictive of treatment outcome (Tonge et al. 2005).

Given the specificity of our interest – the potential effect of SE on engagement in ERP treatment – a similarly specific measure of OCD-relevant SE is required. Until recently, no such measures have been developed, although interest in this area appears to be growing. For example, Levy and Radomsky (2015) recently developed the Contamination Self-Efficacy Scale (CSES), a 14-item self-report instrument used to assess SE beliefs related to contamination fears. The CSES is administered for a specific contaminant (the participant chooses what they perceive as the most contaminated from four pictures of contaminated objects) and assesses confidence in the participant's ability to cope with the cognitive, behavioral, and

physiological effects of facing the contaminant. One potential limitation of the CSES is that, because of its focus on a single contaminant, it may fail to capture variability in SE beliefs across contaminant domains, especially if experimenters provide a limited range of stimulus choices to participants. That is, the CSES measures SE to approach a single object one perceives as most contaminated, but not more broadly one's SE to approach contamination. This is especially important because individuals who fear contamination tend to overestimate threat more so than do those with other types of obsessional fears (Tolin et al. 2003, 2008), and it has been suggested that individuals who tend to overestimate threat appear to be at risk for generalizing their fear (Kaczirkin and Lissek, 2013). It is thus likely that many individuals who fear contamination would be avoidant in the context of various contaminating stimuli as opposed to a single stimulus. As it stands, CSES scores would not account for this generalizability of fear or discomfort. Additionally, for researchers interested specifically in ERP, several items of the CSES appear to measure SE for behaviors that may be undesirable during treatment, such as trying to control one's thoughts or intentionally breathing normally (ERP emphasizes not avoiding anxiety symptoms). Therefore, the CSES may not focus adequately on the approach behavior that is critical to ERP.

The aim of the present study was to develop a measure of SE that was specifically focused on participation in a contamination-related behavioral approach task and that captured SE beliefs across multiple domains of contaminants. We also sought to examine the psychometric properties of this new measure, including its factor structure, internal consistency reliability, and convergent and discriminant validity.

Methods

Participants

158 participants were recruited through Amazon's Mechanical Turk (MTurk), a crowd sourcing website that provides individuals the opportunity to be compensated monetarily for their involvement in research. Participants were at least 18 years old and lived in the United States. Participants were required to check a box indicating voluntary consent to participate prior to continuing to the online survey. Individuals who did not respond to the FC-SES or failed to respond correctly to validity check items (e.g., "Please select option #2 as a response") were excluded, yielding a final sample of 129 participants. The mean age was 37.45 years ($SD = 13.48$). The sample was 57% women, and predominantly white (84%), not Hispanic/Latino (94%), heterosexual (88%), and with at least some college education (89%). The sample was sub-clinical with regard to OCD symptomatology, with a mean score of 17.70 on the Obsessive Compulsive Inventory-Revised (OCI-

R; Foa et al. 2002) (SD = 13.97), and a mean score of 16.52 on the Dimensional Obsessive Compulsive Scale (DOCS; Abramowitz et al. 2010) (SD = 13.34).

Measures

Facing Contamination – Self Efficacy Scale (FC-SES) The FC-SES is a self-report measure of self-efficacy beliefs about approaching contaminants. The original 20 items were constructed by tailoring items from examples of specific SE measures (Bandura 2006) to refer to common stimuli reported by OCD patients with contamination fears. Each item describes a different contaminating behavior (e.g., petting a foul-smelling camel at the zoo; licking the pole on a city bus) and respondents are asked to “rate your degree of confidence by recording a number from 0–100”, using a Likert-type scale, adopted from Bandura’s guide for creating SE scales (Bandura 2006). The higher the recorded number, the more confidence the respondent endorsed having for that particular item. Four university-affiliated professors with expertise in the research and treatment of OCD and related disorders were asked to assess the face validity of the initial 20-item measure, and provide feedback on those items, prior to administering the measure.

Generalized Self-Efficacy Scale (GSES; Schwarzer and Jerusalem 1995) The GSES is a 10-item self-report measure of perceived self-efficacy across a variety of stressful situations. Participants rate the truth of individual items on a scale from 1 (not at all true) to 4 (exactly true), yielding a total score between 10 and 40. The GSES has demonstrated excellent internal consistency, temporal stability, and construct validity across numerous samples that vary along cultural and clinical characteristics (Leganger et al. 2000; Luszczynska et al. 2005; Schwarzer et al. 1999).

Obsessive-Compulsive Inventory—Revised (OCI-R; Foa et al. 2002) The OCI-R is an 18-item self-report measure that assesses common symptoms of OCD across six domains: washing, checking, obsessing, neutralizing, ordering, and hoarding (Foa et al. 2002). Participants rate the degree to which they have been distressed or bothered by symptoms over the past month using a 5-point scale ranging from 0 (not at all) to 4 (extremely). Strong psychometric properties have been found with the OCI-R across clinical and non-clinical populations, including a stable factor structure, high internal consistency of total scores and subscale scores, adequate test-retest reliability, and good sensitivity and specificity in identifying individuals with OCD (Hajcak et al. 2004; Huppert et al. 2007; Foa et al. 2002).

Dimensional Obsessive Compulsive Scale (DOCS; Abramowitz et al. 2010) The DOCS is a 20-item self-report measure that assesses obsessive-compulsive symptoms along four

dimensions: contamination and washing, responsibility and checking, unacceptable thoughts, and symmetry. For each dimension, participants rate the time spent, extent of avoidance, distress level, disruption of daily routines, and difficulty disregarding thoughts related to that symptom dimension over the past month. Response options range from 0 (none/not at all) to 4 (extreme/severe) for each item. The DOCS has demonstrated a stable factor structure, good to excellent internal consistency, moderate test-retest reliability, convergent and discriminant validity, and utility for both diagnosis and treatment outcome tracking (Abramowitz et al. 2010; Thibodeau et al. 2015).

Disgust Scale – Version 1 (Haidt et al. 1994) The Disgust Scale – Version 1 is a 32-item self-report measure of disgust sensitivity across multiple domains of disgust-eliciting stimuli. These include food, animals, body products, sex, envelope violations, death, hygiene, and magic. For each domain, participants respond to two true-false items and two disgust-rating items. The Disgust Scale – Version 1 has demonstrated adequate reliability and convergent validity (Haidt et al. 1994).

Disgust Emotion Scale (DES; Walls and Kleinknecht 1996) The DES is a 30-item self-report measure of disgust sensitivity. Participants respond using a 5-point scale ranging from 0 (no disgust or repugnance at all) to 4 (extreme disgust or repugnance) to rate the degree of disgust they would feel if exposed to items across five domains of disgust-eliciting stimuli (animals, injections and blood draws, mutilation and death, rotting foods, and smells). The DES has demonstrated a stable factor structure and adequate internal consistency and convergent validity (Olatunji et al. 2007).

Penn State Worry Questionnaire (PSWQ; Meyer et al. 1990) The PSWQ is a 16-item self-report measure that assesses the intensity and pervasiveness of generic worrying. Participants rate the extent to which statements about worry are typical of themselves on a scale from 1 (not at all typical of me) to 5 (very typical of me). The PSWQ has shown good internal consistency and construct validity across several clinical and non-clinical samples (Meyer et al. 1990; van Risjoort et al. 1999).

Depression Anxiety Stress Scales (DASS-21; Lovibond and Lovibond 1995) The DASS-21 is a short version of the original DASS (Lovibond and Lovibond 1995), a self-report measure that assesses levels of depression, anxiety, and stress. Participants respond to items using a 4-point severity/frequency scale to rate the extent to which they have experienced each emotional state over the past week. Across numerous studies with both clinical and non-clinical samples, the DASS-21 has demonstrated a stable factor structure, good

convergent and discriminant validity, and adequate to excellent internal consistency and temporal stability (Antony et al. 1998; Brown et al. 1997; Crawford and Henry 2003; Lovibond and Lovibond 1995; Page et al. 2007).

Results

A multistep process was applied to examine the factor structure of the FC-SES. First, the factorability of the 20 FC-SES items was established by examining the Kaiser-Meyer Olkin measure of sampling adequacy ($KMO = 0.87$) and Bartlett's Test of Sphericity ($\chi^2 = 1146.09$, $df = 190$, $p < .001$). Next, parallel analysis (O'Connor 2000) was used to determine the maximum number of factors that could be retained. Three factors were considered retainable because their observed eigenvalues exceeded the 95th percentile of corresponding eigenvalues in a set of 5000 random permutations of the raw data. An exploratory factor analysis was then conducted, using principal axis factoring with promax rotation, in which three factors were retained. Items that did not load on any factor (below .40), loaded on more than one factor (.40 or above), or had loadings on more than one factor with a difference of less than .10, were eliminated. This resulted in a 14-item measure. A second factor analysis was run on these 14 items yielding a two-factor solution. The nine items of the first factor (loadings range: .60–.74) pertained to human-related contamination (e.g., putting a piece of already chewed gum in your mouth), and the five items in the second factor (loadings range: .51–.84) pertained to animal-related contamination (e.g., hooking a worm onto a fishing rod). See Table 1. Descriptive statistics of FC-SES total scores and subscale scores are provided in Table 2.

Internal consistency reliability for the subscales of the FC-SES, as well as for the composite measure, was high. For human-related contamination, $\alpha = .88$; for animal-related contamination, $\alpha = .82$; and for the total score, $\alpha = .87$.

Convergent and discriminant validity of the FC-SES were assessed using Pearson product moment correlation coefficients to evaluate the extent to which the total scores of the FC-SES correlate with measures of general SE, general and contamination-related OCD symptom severity, disgust, worry, anxiety, stress, and depression. Refer to Table 3 for descriptive statistics of symptom measures, and correlational analyses. The FC-SES was positively correlated with general SE, $r = .23$, $p < .01$. The FC-SES was negatively associated with OCD symptom measures, but the effect was small to moderate in magnitude: for the OCI-R total, $r = -.26$, $p < .01$; for the OCI-R contamination scale, $r = -.29$, $p < .01$; for the DOCS total, $r = -.24$, $p < .01$; and for the DOCS contamination scale, $r = -.36$, $p < .01$. These small to moderate correlations indicate that the FC-SES is not merely a gauge of general SE or OCD symptom severity.

As expected, the FC-SES was inversely related to disgust, and the correlation was large: for the DS, $r = -.63$, $p < .01$; and for the DES, $r = -.58$, $p < .01$. It was also weakly, negatively correlated with the PSWQ, $r = -.21$, $p < .05$. Evidence for discriminant validity was also established by the lack of significant correlations between the FCSES and the anxiety scale, $r = -.16$, $p = .09$; stress scale, $r = -.18$, $p = .05$; and depression scale, $r = -.03$, $p = .74$, on the DASS.

Discussion

The objective of this study was to develop a self-report measure of SE beliefs specifically about approaching perceived contaminants, and to assess its psychometric properties. Factor analysis of the initial items yielded a 14-item measure with two correlated subscales: human-related contamination SE and animal-related contamination SE. Internal consistency was good for both subscales and the total score. In terms of convergent and discriminant validity, FC-SES scores were positively correlated with general SE; negatively correlated with disgust sensitivity, OCD, and worry; and not significantly correlated with depression, anxiety, and stress. Of note, correlations between the FC-SES and OCD symptoms, including contamination scales, were small to moderate, suggesting that the FC-SES is not simply a measure of contamination symptoms. Similarly, the association between the FC-SES and general SE was small.

The FC-SES was created so that it could be utilized to explore the relationship between contamination-related SE and approach behavior in the context of ERP for contamination-related OCD. Despite a rich literature on the effects of SE on treatment outcomes in anxiety disorders, there has been little discussion of its effects on OCD treatment. ERP is extremely effective (Simpson et al. 2006) but it is a challenging therapy to undergo because patients often face intense anxiety (Fabricant et al. 2013). In fact, nearly one fifth of patients do not complete treatment as a result of refusal, dropout or lack of adherence (Ong et al. 2016). For these patients, treatment providers must adapt standard ERP methods and integrate therapeutic strategies aimed at increasing motivation and treatment engagement. One such strategy may be increasing positive SE beliefs specific to treatment procedures. Developing a measure of these beliefs is an essential first step in examining their relationship to treatment mechanisms and outcomes.

Recently, Levy and Radomsky (2015) developed and validated the Contamination Self-Efficacy Scale (CSES) to assess SE beliefs about coping with the effects of facing a feared contaminant. Although the CSES and the FC-SES share a focus on facing contaminants, they differ in two important ways. First, the CSES uses a single contamination stimulus chosen by the participant from an array of four stimuli. In contrast, the FC-SES measures SE beliefs about approaching

Table 1 Factor loadings from an exploratory factor analysis on the final 14-item measure

	Factor Loadings	
	Human Contamination	Animal Contamination
Having a goat eat out of your hand at a petting zoo and getting its saliva in the palm of your hand.	-.07	.84
Petting a foul smelling camel at the zoo.	.01	.78
Kissing a dolphin that jumps out of a tank at Sea World.	-.05	.61
Hooking a worm onto a fishing rod hook.	.14	.51
Wiping wet bird droppings off of your car with a tissue.	-.02	.75
Sitting down on a public toilet that has urine on the seat (if that were the only toilet in the bathroom and the seat would not be wiped off prior to use).	.74	-.02
Sitting down on a port-o-potty to go to the bathroom (seat would not be wiped prior to use).	.64	.14
Putting a piece of a stranger’s already chewed gum in your mouth.	.71	-.17
Licking a 20 dollar bill that you received as change.	.64	.11
Touching the doorknob on the way out of the doctor’s office after someone who sneezed in their hand just used it to open the door.	.62	.17
Using a fork at a restaurant that had not properly been cleaned in the dishwasher and appeared to have slight remnants of food on it.	.69	-.02
Having a sip of a drink out of a glass that someone you just met was drinking from.	.71	.01
Shaking someone’s hand after they just told you they are getting over the stomach flu.	.60	.10
Licking the pole on a city bus.	.72	-.20

Exploratory factor analysis using principal axis factoring with promax rotation

Factor loadings .40 or above in bold

14 stimuli from two different domains. These domains, human-related and animal-related contaminants, overlap strongly with three contagion-related disgust domains shown to predict contamination fears (Olatunji et al. 2004): body product, animal, and hygiene related contamination. This diversity within the measure is important for the purpose of assessing SE to approach contamination during treatment, as many patients with contamination-related OCD fear multiple types of contaminants (Matsunaga et al. 2002). The second difference between these measures relates to the specific types of beliefs they assess. Whereas the CSES measures SE beliefs about coping with the cognitive, behavioral, and physiological effects of facing contamination, the FC-SES measures beliefs specifically about the ability to approach contaminants. This is modeled after other general SE measures and reflects its purpose as a predictor of approach behavior in future studies on the influence of SE in treatment procedures.

Despite evidence for the FC-SES being a useful tool in a novel area of SE research, there are some limitations to the present study. Participants were recruited through Amazon’s

Mechanical Turk (MTurk) system, a reputable crowd sourcing website. Although MTurk samples tend to be more socio-economically and ethnically diverse than commonly recruited

Table 3 Descriptive statistics for symptom measures, and correlations with the FC-SES

Measures	M	SD	N	FCSES correlations
GSES	31.10	5.31	127	.23**
OCI-R	17.70	13.97	121	-.26**
DOCS	16.52	13.34	124	-.24**
OCI-R-c	2.61	2.90	119	-.29**
DOCS-c	4.79	3.84	127	-.36**
DS	17.71	5.72	122	-.63**
DES	42.46	19.91	122	-.58**
PSWQ	49.61	15.22	119	-.21*
DASS21-a	7.41	7.62	121	-.16
DASS21-s	12.13	9.01	121	-.18
DASS-21-d	10.45	10.76	121	-.03

FCSES, Facing Contamination Self-Efficacy Scale; GSES, General Self-Efficacy Scale; OCI-R, Obsessive Compulsive Inventory Revised; DOCS, Dimensional Obsessive Compulsive Scale; OCI-R-c, OCI-R contamination subscale; DOCS-c, DOCS contamination subscale; DS, Disgust Scale; DES, Disgust Emotion Scale; PSWQ, Penn State Worry Questionnaire; DASS21, Depression Anxiety Stress Scale 21; DASS21a, DASS21 anxiety subscale; DASS21s, DASS21 stress subscale; DASS21d, DASS21 depression subscale

* denotes $p < .05$, **denotes $p < .01$

Table 2 Descriptive statistics for the FC-SES total score and scale score

	N	Min.	Max.	M	SD
FC-SES Total	129	20.00	1400.00	593.07	256.15
Scale 1	124	.00	900.00	220.49	186.76
Scale 2	128	10.00	500.00	372.58	119.79

college samples (Casler et al. 2013), participants in the present study were predominantly white, with at least some college education or higher, which limits the generalizability of the results. Therefore, replication studies using a more diverse sample would be beneficial. In addition, the psychometric properties of the FC-SES await evaluation in a clinical sample, especially one with primary contamination symptoms. Moreover, further research is necessary to determine whether SE as reported in this measure predicts behavior in a non-clinical or clinical sample. Assuming it does, considering the large correlations between the FC-SES and disgust measures, future research should evaluate the degree to which the FC-SES predicts approach behavior beyond disgust. Finally, the FC-SES includes items related to the types of contamination concerns (e.g. bacteria, illness, feeling unclean) that generally comprise contamination subscales of common OCD symptom severity measures. The FC-SES, therefore, does not include items related to other forms of contamination, such as moral contamination (e.g. ‘catching’ others’ poor qualities or personality traits), magical contamination (e.g. contact with ‘bad luck’ items), or environmental contamination (e.g. being poisoned by chemicals in the air). The current evidence for the sound psychometric properties of the FC-SES suggests that it can be a useful tool in future research linking SE to contamination-related OCD symptoms and contamination-related approach behavior.

Compliance with Ethical Standards

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of Nova Southeastern University’s Institutional Review Board under the reference number: 2015MER01, and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

This article does not contain any studies with animals performed by any of the authors.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Conflict of Interests All authors declare that they have no conflict of interest with respect to this research.

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