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ORIGINAL ARTICLE

Tracing "Fearbola": Psychological Predictors of Anxious Responding to the Threat of Ebola

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Abstract Serious illnesses such as Ebola are often highly publicized in the mass media and can be associated with varying levels of anxiety and compensatory safety behavior (e.g., avoidance of air travel). The present study investigated psychological processes associated with Ebola-related anxiety and safety behaviors during the outbreak in late 2014. Between October 30 and December 3, 2014, which encompassed the peak of concerns and of the media's attention to this particular outbreak, 107 university students completed a battery of measures assessing fear of Ebola, performance of safety behaviors, factual knowledge of the virus, and psychological variables hypothesized to predict Ebola-related fear. We found that while our sample was generally not very fearful of contracting Ebola, the fear of this disease was correlated with general distress, contamination cognitions, disgust sensitivity, body vigilance, and anxiety sensitivity-related physical concerns. Regression analyses further indicated that anxiety sensitivity related to physical concerns and the tendency to overestimate the *severity* of contamination were unique predictors of both Ebola fear and associated safety behaviors. Implications for how concerns over serious illness outbreaks can be conceptualized and clinically managed are discussed.

Keywords Ebola · Health anxiety · Anxiety sensitivity · Safety behaviors · Anxiety · Body vigilance · Contamination

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Introduction

Health anxiety refers to inappropriate or excessive preoccupation and concerns about one's health status relative to his or her actual state of health (Abramowitz and Braddock 2010). People with health anxiety also engage in a number of behaviors that function to reduce their distress, such as frequently visiting doctors, excessively researching diseases and their symptoms on the internet, or seeking reassurance from loved ones. Although such health-related "safety behaviors" may reduce associated distress in the short-term (Abramowitz and Moore 2007), research suggests that these behaviors maintain anxiety in the long-term (see Helbig-Lang and Petermann 2010). Although a diagnostic entity in itself (i.e., Illness Anxiety Disorder [IAD]), health anxiety may be present in a number of psychological disorders, including obsessive–compulsive disorder (OCD), somatic symptom disorders, and other anxiety disorders (APA 2013). Clinically severe health anxiety and associated safety behaviors may result in significant distress and functional impairment (APA 2013). Researchers and clinicians have long observed increases in health anxiety referrals during times of mass media coverage of serious diseases, such as during the Ebola outbreak in late 2014.

First discovered in 1976 in the former Zaire (now the Democratic Republic of the Congo), the Ebola virus is a rare yet deadly animal-borne disease transmitted through direct contact with contaminated objects (i.e., needles) or bodily fluids (i.e., vomit, feces). Although experimental vaccines and treatments are in development, there is no FDA-approved medicine available for Ebola to date. The United States (U.S.) Centers for Disease Control (CDC) and Prevention have chronicled 35 Ebola virus outbreaks between 1976 and 2014, varying in severity (CDC 2014). The 2014 multinational outbreak in West Africa (i.e.,

Guinea, Liberia, Sierra Leone) has been deemed the largest outbreak, with at least 21,000 affected human cases accounting for nearly 9000 deaths worldwide (CDC 2014). Between September 30, 2014, and October 23, 2014, the CDC documented two imported cases, including one death, and two locally acquired cases in the U.S. (Dallas, TX, and New York, NY). Accordingly, the CDC activated its Emergency Operations Center, deployed public health experts to the affected regions, and issued an advisory against nonessential travel to West Africa (i.e., Level 3 travel notice).

The 2014 global outbreak and the single confirmed Ebola-related death in the U.S. prompted media coverage that may have both improved and compromised the U.S. public's knowledge and perception of Ebola. Specifically, constant communication regarding the disease may have promoted desirable health behaviors (e.g., hand-washing) and simultaneously (or *alternatively*) incited panic akin to that observed during the SARS, avian flu, and Swine flu epidemics over the last decade (Sandman 2009; Van den Bulck and Custers 2009). For example, during the height of the Ebola concern, certain U.S. shops, school districts, and state governments enacted substantial "precautionary measures" against a seemingly remote danger (Fox 2014). In Maine, one healthcare worker contested forced quarantine in her own home for 21 days after returning from Sierra Leone despite showing no symptoms and twice testing negative for Ebola. As of October 14, 2014, approximately two-thirds of U.S. residents surveyed reported fears about an Ebola outbreak in the U.S (Dennis and Craighill 2014).

There is empirical evidence that publicizing disease outbreaks can lead to mass hysteria and health anxiety even among the medically healthy (Taylor and Asmundson 2004). Anecdotally, in our clinics we assessed multiple patients whose presentation of OCD and IAD included concerns about contracting Ebola. Some criticized the media for exaggerating the risk of Ebola spreading to the U.S. and obfuscating the CDC's message that "Ebola poses no substantial risk to the U.S. general population" (CDC Health Alert Network 2014). Other groups in the popular press (e.g., Robbins 2014) even coined the term "Fearbola" to refer to the U.S. public's exaggerated collective response to the very low threat of a domestic Ebola outbreak. To this end, the American Psychological Association (APA 2014) disseminated tips for "managing your fear about Ebola" (i.e., keep things in perspective, get the facts); yet it is unclear if—or how—such counsel was effective.

Understanding the psychological factors that predict anxiety in response to the threat of a disease outbreak is vital, as it may inform treatment and prevention strategies for health-related anxiety (Bish and Michie 2010). Elevated levels of health anxiety may also be accompanied by safety behaviors performed to minimize the possibility or severity of illness (e.g., avoidance, excessive washing, or overutilization of medical resources), which may compound distress and functional impairment (e.g., Olatunji et al. 2011). Accordingly, we designed the present study during the height of U.S. concerns about Ebola to better understand the psychological factors associated with Fearbola and engagement in Ebola-related safety behaviors. Informed by the limited body of recent research on anxiety among students in response to pandemic illnesses such as SARS (e.g., Wong et al. 2007), avian flu (e.g., Lau et al. 2008), and H1N1 (e.g., Wheaton et al. 2012), we considered a variety of constructs that might predict the fear of Ebola, as we describe next.

One possible predictor is general distress (i.e., anxiety and depressive symptoms). Not only can general distress be associated with poor physical health (Scott et al. 2007; Niles et al. 2014), but both anxiety and depression involve negative interpretive biases that are often involved in anxiety related to health and illness (e.g., catastrophizing; Reif et al. 1998). Second, because Ebola is transmitted through bodily fluids, it is possible that those holding dysfunctional beliefs about contamination are more vulnerable to excessive fear of Ebola. In other words, Fearbola may reflect an overestimation of the likelihood and severity of contamination during a global outbreak. Third, disgust sensitivity, or one's propensity to experience disgust across multiple domains, has also been identified as a key feature of contamination fear (Cisler et al. 2010; Olatunji and Sawchuk 2005). Thus, we also considered heightened disgust responding as a potentially important process that may be related not only to contamination aversion broadly, but also to Ebola fear specifically.

Body vigilance, the tendency to carefully monitor body sensations (Schmidt et al. 1997), is also a candidate predictor of Ebola fear. That is, frequent and intense body scanning may increase opportunities to notice otherwise benign changes in the body (as well as its byproducts) and misinterpret them catastrophically (Olatunji et al. 2007a). Indeed, Olatunji et al. (2007a) found that body vigilance was strongly correlated with health anxiety symptoms in both clinical and nonclinical adult samples. Relatedly, anxiety sensitivity, the tendency to misconstrue benign anxious arousal sensations as dangerous (Taylor et al. 2007), may also predict Ebola fear and safety behavior performance. Specifically, the degree to which someone (mis)interprets unexplained body sensations (e.g., nausea) as catastrophic may be associated with his or her proclivity to register anxious arousal as a symptom of Ebola, which might generate anxiety and urges to engage in a variety of safety behaviors.

In light of the APA's suggestion that "getting the facts" would recalibrate U.S. residents' anxiety over Ebola (APA

2014), we also considered that factual knowledge of the disease (e.g., means of Ebola transmission) as well as the particulars of the 2014 outbreak (e.g., countries affected) might predict Ebola-related fear and engaging in excessive safety behaviors. Because cognitive models of pathological anxiety emphasize the therapeutic effects of corrective information (e.g., Abramowitz et al. 2011; Clark 1986), one might predict that those possessing greater understanding about Ebola would report less anxious responding to the possibility of a domestic outbreak.

As summarized above, the extant literature provides clues to the factors that might predict Ebola-related fear and safety behaviors. Accordingly, we hypothesized that less factual knowledge about the virus, but greater levels of general distress, contamination cognitions, disgust sensitivity, body vigilance, and anxiety sensitivity, would predict greater Ebola-related fear and engagement in Ebola-related safety behaviors.

Method

Participants

One hundred and thirty-seven undergraduate psychology students at the University of North Carolina at Chapel Hill (UNC-CH) participated in this study for course credit. The study was open to all Introductory Psychology students and was advertised through the Psychology Department-monitored online participant pool. Following data screening (described further in the "Method" Section below), 30 participants were excluded, bringing the final sample size to 107. The sample was mostly male ($n = 60$; 56.1 %) with a mean age of 18.93 years old ($SD = 1.08$, range 18–22). The majority of participants identified as white ($n = 85$; 79.4 %), with 8.4 % identifying as African American ($n = 9$), 5.6 % identifying as Asian ($n = 6$), and 5.6 % identifying with another racial/ethnic group ($n = 6$).

Procedure

Data were collected from October 30th through December 3rd, 2014. Undergraduate psychology students who consented online to participate in this study were directed to a survey link hosted by Qualtrics, a secure online survey development tool. Participants completed the measures described below in randomized order, followed by a demographics questionnaire. Three distractor items (e.g., "please answer *Always True* for this item") were also included among the measures to increase the probability that only valid responses from attentive participants would be included in analyses (Meade and Craig 2012). This study was approved by the university's Institutional Review Board and informed consent was obtained from all individual participants included in the study.

Measures

Ebola Fear Inventory (EFI)

The EFI is a nine-item measure designed for the present study to assess fear associated with the Ebola virus (psychometric and factor analytic properties are presented in the "Preliminary Analyses" Section below; items listed in Table 2). Items are rated from 1 (*not at all*) to 5 (*very much*) and were inspired by those used by Wheaton et al. (2012) to assess H1N1 (swine flu) fears. The EFI demonstrated good internal consistency ($\alpha = .86$) in the current sample.

Ebola Safety Behavior Checklist (ESBC)

The ESBC is a nine-item checklist assessing respondents' utilization of safety behaviors designed to prevent contracting Ebola (e.g., washing hands, checking the internet for information about Ebola, avoiding people). This instrument was also inspired by a similar measure designed by Wheaton et al. (2012). Participants rated the extent to which they engaged in activities due to concerns about Ebola on a 0 (*none*) to 10 (*extreme amount*) scale. The ESBC demonstrated good internal consistency ($\alpha = .84$) in the current sample.

Depression Anxiety Stress Scales-21 (DASS-21; Antony et al. 1998)

The DASS-21 is a short-form version of the 42-item DASS (Lovibond anf Lovibond, 1995) that assesses subjective distress over the past week along three subscales: depression, anxiety, and stress. Participants rate how each of the 21 statements (e.g., "I found it hard to wind down") apply to them on a 0 (*rarely*) to 4 (*very much, or most of the time*) scale. The DASS-21 has demonstrated good reliability and construct validity in both clinical and non-clinical samples (Henry and Crawford 2005). The DASS-21 showed excellent internal consistency ($\alpha = .93$) in the current sample.

Contamination Cognitions Scale (CCS; Deacon and Maack 2008)

The CCS is a measure of respondents' tendency to overestimate the likelihood and severity of contamination from a variety of commonplace objects (e.g., stairway railings). Participants separately rate the likelihood and severity of contamination for each item on a 0 (*not at all*) to 100

(*extremely*) scale. Because Ebola is an objectively serious illness, yet the prevalence was extremely low in the United States, we treated the likelihood (CCS-L) and severity (CCS-S) scales as independent constructs. Separate CCS-L and CCS-S subscale scores were formed by computing the average response for items falling on the CCS-L and CCS-S subscales, respectively. The internal consistency was excellent for the CCS-L ($\alpha = .96$) and CCS-S ($\alpha = .97$) in the current sample.

Disgust Scale-Revised (DS-R; Olatunji et al. 2007b)

The DS-R, revised from the original DS (Haidt et al. 1994), is a 25-item measure of respondents' propensity to experience disgust across multiple domains. Participants rate the degree to which they might find a number of scenarios (e.g., "you see maggots on a piece of meat in an outdoor garbage pail") disgusting on a scale of 0 (*strongly disagree*) to 4 (*strongly agree*). The DS-R has demonstrated adequate internal consistency and convergent validity in previous work (Olatunji et al. 2007b) and showed good internal consistency ($\alpha = .81$) in the current sample.

Body Vigilance Scale (BVS; Schmidt et al. 1997)

The BVI is a four-item measure of one's tendency to attend to anxiety-related body sensations. The first three items assess attentional focus to, sensitivity to changes in, and amount of time devoted to monitoring body sensations on a 0 (*not at all*) to 10 (*extremely*) scale. The fourth item requires the respondent to separately rate the extent to which he or she pays attention to 15 body sensations (e.g., heart rate) on a 0 (*none*) to 10 (*extreme*) scale, which are averaged to yield a single item score. The BVS has demonstrated good internal consistency and test–retest reliability in previous research (Olatunji et al. 2007b; Schmidt et al. 1997). The BVS showed excellent internal consistency ($\alpha = .97$) in the current sample.

Anxiety Sensitivity Index-3, Physical Concerns Subscale (ASI-3; Taylor et al. 2007)

The ASI-3 (derived from the original ASI; Reiss et al. 2008) is an 18-item measure of beliefs regarding the dangerousness of anxiety along physical (e.g., "it scares me when my heart beats rapidly"), cognitive (e.g., "it scares me when I am unable to keep my mind on a task"), and social (e.g., "it scares me when I blush in front of other people") domains. Participants rate their agreement with these statements on a 0 (*very little*) to 4 (*very much*) scale. The ASI-3 has demonstrated good three-factor structure with good internal consistency, convergent validity, discriminant validity, and criterion-related validity in previous research (Taylor et al. 2007). Because the social and cognitive subscales are not conceptually relevant to Ebola concerns addressed in the current study, only the physical concerns subscale was used in the below analyses. The ASI-3 physical concerns subscale showed good internal consistency ($\alpha = .82$) in the current sample.

Ebola Facts Quiz (EFQ; USA Today)

The EFQ is an eight-item multiple choice measure of knowledge about the Ebola virus and 2014 global outbreak. Participant responses are scored on a 0 (*incorrect*) to 1 (*correct*) coding scheme (possible scores range 0-8, with higher scores indicating greater knowledge about the Ebola virus and 2014 outbreak). The quiz was originally posted online on October 9, 2014, by USA Today (http://www.usatoday.com/story/news/nation-now/2014/10/09/ebola-virus-facts-quiz/16956413/).

Data Analytic Strategy

An item analysis (i.e., corrected item total correlations, internal consistency) of the EFI was first conducted to evaluate the measure's psychometric properties and suitability for further analyses. We then correlated the EFI and ESBC with all other study variables to explore the relationship between both Ebola fear and Ebola safety behavior use with relevant psychological constructs. Finally, to determine which psychological variables were significant and meaningful predictors of Ebola fear and Ebola safety behavior use, we tested a simultaneous linear regression model separately for each outcome measure, including the assessed psychological constructs as statistical predictors.

Data Screening

Of the 137 participants who completed the survey, 27 did not pass all three distractor items and were consequently excluded from further data analyses. Data were further screened to assess concordance with statistical assumptions. One case fell outside the possible range on a CCS-S item (participant reported 790; possible item range 0–100) and so was excluded from analyses. Distributions of scores on all of the study measures were free of significant skew (all values <2) and kurtosis (all values <4). No univariate outliers were detected,[1] but two multivariate outliers were noted (Mahalanobis distances fell beyond critical $\chi^2_{df=8}$ value of 26.125). Multivariate outlier status was driven by

[1] One participant scored >3.29 standard deviations above the sample mean on the DASS. Visual inspection of the data showed that this score was an extension of the sample distribution, so this observation was retained.

Table 1 Study measure descriptive statistics

Measure	*M*	(SD)	Min	Max	Skew	Kurtosis
EFI	13.92	(5.25)	9	31	1.36	1.39
ESBC	9.85	(11.63)	0	52	1.63	2.46
DASS-21	69.50	(20.48)	42	130	1.01	.41
CCS-L	34.94	(22.99)	.77	86.15	.44	−.79
CCS-S	36.19	(22.56)	0	100	.77	.05
DS-R	7.94	(.66)	6.68	9.68	.55	.06
BVS	19.85	(7.51)	4.08	36.96	.02	−.62
ASI-3 Physical	4.34	(4.29)	0	20	1.12	1.06
EFQ	4.79	(1.56)	1	8	.17	−.55

EFI Ebola Fear Inventory, *ESBC* Ebola Safety Behavior Checklist, *DASS-21* Depression Anxiety Stress Scales-21, *CCS-L* Contamination Cognitions Scale-Likelihood average, *CCS-S* Contamination Cognitions Scale-Severity average, *DS-R* Disgust Scale-Revised average, *ASI-3 Physical* Anxiety Sensitivity Inventory-3 Physical Concerns Subscale, *BVS* Body Vigilance Scale, *ASI-3* Anxiety Sensitivity Inventory-3, *EFQ* Ebola Facts Quiz

unusual combinations of scores on the DASS, BVS, CCS-L, and CCS-S for both participants. These two multivariate cases were excluded from analyses due to the possible bias of regression point estimates and sufficiently large sample. Score distributions of the remaining 107 participants were again tested after deleting the problematic cases; no significant skew, kurtosis, univariate outlier indices, or multivariate outlier indices were detected (see Table 1).

Results

Descriptive Statistics

Table 1 suggests that although participants were not highly fearful of the Ebola virus on average, the range in scores on the EFI indicated that some participants were at least moderately fearful. Our sample also varied in the degree to which they endorsed performing a number of safety behaviors due to the global Ebola outbreak, with the range in scores suggesting that overall, our participants were performing a moderate amount of Ebola related safety behaviors during the peak of U.S. Ebola concerns. Scores on our other measures fell within the typical range for nonclinical samples. Finally, Table 1 shows that participants had a variable degree of factual knowledge about the Ebola virus and the 2014 outbreak.

Preliminary Analyses

Item analyses were conducted according to guidelines set forth by DeVellis (1991) to assess the psychometric acceptability of the EFI. Three items ("6. How much exposure have you had to media coverage [e.g., newspaper, television, online] about Ebola," "7. If you did become infected with Ebola, to what extent are you concerned that you would die," and "11. How much information do you think you know about the Ebola virus") had corrected total-item correlations falling below the acceptable level of .30 (Nunnally and Bernstein 1994). Further, total scale reliability indices (Cronbach's α) were substantially improved following deletion of both items. These empirical findings, paired with the fact that a separate measure was administered to assess actual Ebola knowledge (i.e., the EFQ), justified exclusion of these three items from the EFI. The final 9-item EFI showed good reliability ($\alpha = .87$). The distribution of scores on the final EFI was also free of significant skew (1.36) and kurtosis (1.39) (Table 2).

Zero-Order Correlations

Two-tailed zero-order correlations were conducted to examine the relationship between Ebola virus concerns, Ebola virus safety behaviors, and other study variables.

Table 2 Item properties of the final (nine-item) Ebola fear inventory

Item	*M*	(SD)	Corrected item-total correlation	α if item deleted
1. To what extent are you concerned about Ebola virus?	1.88	(.93)	.70	.84
2. To what extent do you believe that Ebola could become a "pandemic" in the U.S.?	1.79	(.96)	.77	.82
3. How likely is it that you could become infected with Ebola?	1.48	(.62)	.71	.84
4. How likely is it that someone you know could become infected with Ebola?	1.63	(.70)	.69	.84
5. How quickly do you believe contamination from Ebola is spreading in the U.S.?	1.66	(.80)	.68	.84
8. To what extent has the threat of Ebola influenced your decisions to be around people?	1.22	(.57)	.49	.87
9. To what extent has the threat of Ebola influenced your travel plans?	1.37	(.85)	.70	.84
10. To what extent has the threat of Ebola influenced you to actually use decontamination aids (e.g., use hand sanitizer)?	1.40	(.82)	.77	.82
12. To what extent has the threat of Ebola influenced you to keep access to decontamination aids (e.g., access to hand sanitizer)?	1.38	(.75)	.71	.84

Table 3 Zero-order correlations between study measures

	EFI	ESBC	DASS-21	CCS-L	CCS-S	DS-R	BVS	ASI-3
ESBC	.60***	–						
DASS-21	.20*	.26**	–					
CCS-L	.23*	.27**	.11	–				
CCS-S	.41***	.46***	.19	.61***	–			
DS-R	.30**	.38***	.11	.34***	.33***	–		
BVS	.28**	.35***	.37***	.31***	.21***	.27**	–	
ASI-3 Physical	.37***	.41***	.42***	.20*	.27**	.36***	.37***	–
EFQ	.04	.05	.13	−.02	−.07	−.09	<.01	.08

EFI Ebola Fear Inventory, *ESBC* Ebola Safety Behavior Checklist, *DASS-21* Depression Anxiety Stress Scales-21, *CCS-L* Contamination Cognitions Scale-Likelihood average, *CCS-S* Contamination Cognitions Scale-Severity average, *DS-R* Disgust Scale-Revised average, *BVS* Body Vigilance Scale, *ASI-3 Physical* Anxiety Sensitivity Inventory-3 Physical Concerns Subscale, *EFQ* Ebola Facts Quiz

* $p < .05$; ** $p < .01$; *** $p < .005$

Table 4 Simultaneous linear regression predicting Ebola fear

Variable	B	SE_B	β	*t*	*p*	Zero-Order *r*	sr^2
DASS-21	−.004	.026	−.016	−.161	.873	.200	<.001
CCS-L	−.023	.026	−.101	−.886	.378	.231	.006
CCS-S	.082	.026	.354	3.122	.002	.406	.073
DS-R	.872	.792	.109	1.101	.274	.297	.009
BVS	.095	.071	.135	1.337	.184	.277	.013
ASI-3 Physical	.256	.129	.209	1.988	.050	.371	.030
EFQ	.169	.297	.051	.569	.570	.040	.002

EFI Ebola Fear Inventory, *ESBC* Ebola Safety Behavior Checklist, *DASS-21* Depression Anxiety Stress Scales-21, *CCS-L* Contamination Cognitions Scale-Likelihood average, *CCS-S* Contamination Cognitions Scale-Severity average, *DS-R* Disgust Scale-Revised average, *BVS* Body Vigilance Scale, *ASI-3 Physical* Anxiety Sensitivity Inventory-3 Physical Concerns Subscale, *EFQ* Ebola Facts Quiz, sr^2 squared semi-partial correlation

First, we found that the date of study completion was not significantly correlated with EFI scores, $r(107) = -.12$, $p = .229$. Next, as seen in Table 3, scores on the EFI were significantly associated with scores on the DASS, CCS-L, CCS-S, DS-R, BVS, and ASI-3 Physical; but not the EFQ. The ESBC was significantly related to all other variables except the EFQ, suggesting that there was not a statistically significant relationship between knowledge of the Ebola virus and either Ebola fear or Ebola safety behaviors. In fact, no significant relationship between Ebola knowledge and any study measure was detected.

Regression Analyses Predicting Ebola Fear

A simultaneous linear regression was conducted to explore which psychological variables independently predicted Ebola fear (see Table 4). Indices of multicollinearity were acceptable (all tolerance values ≥.57 and all VIF ≤ 1.75), suggesting a lack of redundancy in model predictors. The overall regression model was significant and accounted for approximately 27 % of variance in EFI scores, $F(7, 98) = 5.09$, $p < .001$.

Within the full model, only CCS-S and ASI-3 Physical Concerns Subscale scores uniquely and significantly (*p*s ≤ .05) predicted fear of the Ebola virus. Specifically, concerns regarding the severity of contamination uniquely accounted for 7.3 % of variability in EFI scores and anxiety sensitivity accounted for 3 % of variability in EFI scores. Neither the DASS, CCS-L, DS-R, BVS, nor EFQ were uniquely significant predictors of Ebola fear in the current sample (all *p*s ≥ .20).

Regression Analyses Predicting Ebola Safety Behaviors

A simultaneous linear regression was conducted to explore which psychological variables independently predicted Ebola-related safety behaviors (see Table 5). Indices of multicollinearity were also acceptable (all tolerance values ≥.57 and all VIF ≤ 1.75). The overall regression model

Table 5 Simultaneous linear regression predicting Ebola safety behaviors

Variable	B	SE_B	β	*t*	*p*	Zero-Order *r*	spr^2
DASS-21	.010	.054	.018	.194	.846	.255	<.001
CCS-L	−.060	.054	−.118	−1.108	.271	.268	.008
CCS-S	.196	.055	.380	3.580	.001	.455	.084
DS-R	3.260	1.643	.184	1.985	.050	.381	.026
BVS	.278	.147	.179	1.891	.062	.346	.023
ASI-3 Physical	.508	.267	.188	1.906	.060	.413	.024
EFQ	.497	.617	.067	.806	.422	.050	.004

EFI Ebola Fear Inventory, *ESBC* Ebola Safety Behavior Checklist, *DASS-21* Depression Anxiety Stress Scales-21, *CCS-L* Contamination Cognitions Scale-Likelihood average, *CCS-S* Contamination Cognitions Scale-Severity average, *DS-R* Disgust Scale-Revised average, *BVS* Body Vigilance Scale, *ASI-3 Physical* Anxiety Sensitivity Inventory-3 Physical Concerns Subscale, *EFQ* Ebola Facts Quiz, sr^2 squared semi-partial correlation

was significant and accounted for approximately 35.8 % of variance in ESBC scores, $F(7, 98) = 7.82$, $p < .001$.

Within the full model, CCS-S and DS-R scores significantly ($ps \leq .05$) predicted Ebola safety behavior use. Specifically, concerns regarding the severity of contamination uniquely accounted for 8.4 % of variability in ESBC scores, and disgust sensitivity uniquely accounted for 2.6 % of ESBC score variance. Neither the DASS, CCS-L, BVS, ASI-3 Physical Concerns Subscale, nor EFQ were significant individual predictors of Ebola safety behaviors in the current sample (all *p* values ≥.060).

Discussion

The present study was designed to identify psychological predictors of anxious responding to the 2014 Ebola outbreak. We hypothesized that in our unselected U.S. university student sample, greater anxiety sensitivity, body vigilance, disgust sensitivity, contamination concerns, and general psychological distress would predict greater Ebola fear and engagement in safety behaviors (e.g., avoiding airports) with the intention of preventing infection. We also hypothesized that having more factual knowledge about the Ebola virus and the details of the 2014 outbreak would predict less Ebola-related fear and safety behavior use. To address the study's aim, we developed brief measures of Ebola related fear and safety behavior use, which both demonstrated acceptable psychometric properties. Consistent with our predictions, Ebola fear and safety behaviors were correlated with general distress, contamination cognitions, disgust sensitivity, body vigilance, and anxiety sensitivity related to physical concerns. Contrary to our predictions, fear of the disease was not associated with knowledge about the Ebola virus and the 2014 outbreak. When considered simultaneously in our regression model, the tendency to overestimate the *severity* of contamination emerged as the only significant predictors of both Ebola fear and associated safety behaviors. Physical anxiety sensitivity concerns significantly predicted Ebola fear but only marginally predicted Ebola safety behaviors, and disgust sensitivity only significantly predicted safety behavior use. Body vigilance only marginally significantly predicted engagement in Ebola related safety behaviors. Overall, our findings provided partial support for our hypotheses.

To date, little research has been conducted on anxious responding to the threat of a serious illness outbreak, such as that associated with the 2014 Ebola outbreak in West Africa. Given our access to a large unselected population of young adults exposed to media coverage of the Ebola outbreak, we were well positioned to identify the predictors of Ebola-related fear and safety behaviors. Clarifying the factors that might contribute to such anxiety is valuable in understanding how the public responds to large-scale illness threats more generally and identifying individuals who might be vulnerable to maladaptive responses (i.e., health anxiety). It may also be of service in developing prevention programs and clinical intervention strategies should the threat of another global panic surface. That is, our study's findings suggest that contamination concerns and physical concerns related to anxiety sensitivity may be especially important in the experience of Ebola-related anxiety and safety behaviors, regardless of accurate factual understanding of the disease.

Anxiety sensitivity along physical domains significantly predicted Ebola fear, but only marginally predicted Ebola safety behavior use. Although our findings are cross-sectional, one way anxiety sensitivity might contribute to fearful responding to the Ebola virus is through the misperception of benign (and universal) body sensations as dangerous. Such a perception might especially lead to fear considering that many body sensations associated with anxiety mirror the symptoms of Ebola (e.g., nausea). It is

also not surprising that concerns regarding the severity of contamination significantly predicted Ebola fear and safety behavior use. Ebola is indeed a severe illness with extremely unpleasant symptoms (e.g., fever and hemorrhaging), but it is possible that the frequent, widespread media coverage in the U.S. led residents to *overestimate* the severity of the disease. Similar possibilities were discussed in a study of undergraduates' fearful responding to the heavily publicized H1N1 pandemic in 2009–2010 (Wheaton et al. 2012). Findings from our study cannot, however, provide causal evidence for the role of increased media coverage on increased Ebola fear and safety behavior use.

It is interesting that factual knowledge about Ebola was unrelated to respondents' degree of Ebola fear and engagement in related safety behaviors. Our findings, however, can be seen as consistent with previous work suggesting that accurate information (e.g., illness incidence statistics) is unrelated to anxiety symptoms (e.g., Moritz and Pohl 2009). Our EFQ items were derived from a quiz posted to a popular online media source (www.usatoday.com). Although the psychometric properties of this measure are unknown, the distribution of scores in our sample was free of skew or kurtosis and approximated normality. Ebola is a serious disease, and the 2014 outbreak was appropriately declared a "public health emergency of international concern" by the World Health Organization (WHO Ebola Response Team 2014). Yet as National Institute of Allergy and Infectious Diseases director Anthony Fauci noted, "what we're seeing is a catastrophic health crisis in West Africa, and an epidemic of fear here" (C-SPAN2 2014). In this sense, the U.S. Fearbola outbreak was arguably a greater threat to the wellbeing of U.S. residents than the actual Ebola virus itself.

Our findings that knowledge did not predict Ebola-related fear or safety behaviors suggest that increasing awareness and understanding about a remote epidemic may not, in fact, alleviate exaggerated fear of its local outbreak. This possibility carries clinical relevance, for cognitive models posit that dysfunctional beliefs (e.g., threat overestimates) are meaningful factors in the etiology of pathological anxiety that should be targeted during treatment (e.g., Fergus 2014; Obsessive–Compulsive Cognitions Working Group 1997, 2003, 2005; Salkovskis and Warwick 2001; Taylor and Asmundson 2004). An alternative explanation for our finding is that some participants coped with their fear of Ebola by seeking out knowledge and information about the disease (akin to reassurance-seeking in health anxiety), thus washing out the hypothesized effect. Therefore, findings from our study may inform cognitive interventions, as providing accurate information regarding the nature and severity of focal disease outbreaks may be insufficient to adequately challenge dysfunctional health- and illness-related beliefs. Because our study included a nonclinical sample, however, future research utilizing healthy and health anxious individuals would help determine whether providing accurate information about the risk of disease outbreaks in the U.S. is sufficient to mitigate such illness fears in clinical practice.

Our study measures were largely inspired by those designed by Wheaton et al. (2012) in their investigation of anxious responding to the H1N1 influenza outbreak of 2009–2010. These authors reported that contamination cognitions (both likelihood and severity overestimates), disgust sensitivity, and health anxiety significantly predicted H1N1 fear, but that physical concern-related anxiety sensitivity, body vigilance, and general distress did not. Therefore, our findings are somewhat consistent with Wheaton and colleagues. One possible explanation for the discrepant findings relates to disgust-related elements (e.g., sympathetic magic) differentially associated with the H1N1 and Ebola viruses. The peak of the 2014 Fearbola panic saw only four total U.S. human cases (only two of which were contracted locally), yet 2009–2010 witnessed approximately 60.8 million H1N1 U.S. cases (Shrestha et al. 2011). Therefore, Ebola may have been perceived as more distant and remote a threat than the H1N1 virus was in 2009–2010. Another consideration is that H1N1 is a more communicable virus than Ebola, which would make disgust a more powerful predictor of anxious responding to H1N1 than Ebola. In contrast, mechanisms such as the laws of contagion, similarity, or sympathetic magic (see Cisler et al. 2009) may have been more relevant for U.S. residents reporting greater Ebola fear. Unfortunately, this study did not assess participants' perceptions of contagion related to the Ebola outbreak specifically, so such explanations are purely speculative. Future research investigating the degree to which certain outbreaks are specifically perceived as disgusting, dangerous, and controllable are warranted.

This study's findings should be interpreted with some caution in light of the following limitations. First, participants were undergraduate students; as such, this sample was presumably healthy on average—physically and psychologically. Therefore, our findings may not apply to individuals with clinical levels of health anxiety (e.g., hypochondriasis, OCD) or medical vulnerability (e.g., autoimmune diseases). However, this study's findings may nevertheless be useful in informing clinical interventions for disease outbreak-related fears among otherwise healthy individuals. A second limitation is that participants in our study were recruited from a single southeastern university. Individuals living in less populated areas (e.g., Wyoming) or in states with confirmed Ebola cases (e.g., Texas) may have experienced different levels of concern. Similar studies utilizing more geographically representative samples would be desirable. A third limitation is that all data were obtained via self-report, which might inflate

associations among variables. Future studies utilizing multi-method assessment are warranted.

Finally, the cross-sectional design of this study precludes causal or directional conclusions. It is possible that individuals with greater contamination concerns are more prone to respond fearfully to Ebola, that those with higher Ebola fear were more likely to develop contamination concerns, or that one or more other factors (e.g., observational learning, informational transmission) contributed to both high contamination concerns and Ebola fear. Future longitudinal studies are necessary to determine which constructs prospectively predict the onset of health anxiety in response to the threat of a serious disease. Similarly, the possibility that safety behaviors generate or exacerbate Ebola concerns is especially worthy of consideration in light of research showing that deliberately engaging in health-related safety behaviors (e.g., avoiding public contaminants) causes individuals to become more concerned with the risks of contamination (Deacon and Maack 2008; Olatunji et al. 2011). Although these limitations somewhat qualify the generalizability of our findings, the present study offers data relevant to understanding the psychological predictors of anxious responding to publicized epidemics.

Conflict of Interest Shannon M. Blakey, Lillian Reuman, Ryan J. Jacoby, and Jonathan S. Abramowitz declare that they have no conflict of interest.

Informed Consent All procedures performed in this study, which involved human participants, were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Institutional Review Board (IRB) approval was obtained and informed consent was obtained from all individual participants included in the study.

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

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