



Contents

<i>Invited Essay</i>		
Eunice Y. Chen and Daniel Le Grange	Subtyping adolescents with bulimia nervosa	2813
<i>Regular Papers</i>		
Nicole K.Y. Tang, Paul M. Salkovskis, Elena Poplavskaya, Kelly J. Wright, Magdi Hanna and Joan Hester	Increased use of safety-seeking behaviors in chronic back pain patients with high health anxiety	2821
Joshua C. Magee and Richard E. Zinbarg	Suppressing and focusing on a negative memory in social anxiety: Effects on unwanted thoughts and mood	2836
Randy F. Auerbach, John R.Z. Abela, Xiongzhao Zhu and Shuqiao Yao	A diathesis-stress model of engagement in risky behaviors in Chinese adolescents	2850
Carolya Black Becker, Ellen Darius and Katherine Schaumberg	An analog study of patient preferences for exposure versus alternative treatments for posttraumatic stress disorder	2861
Kelly C. Allison, Carlos M. Grilo, Robin M. Masheb and Albert J. Stunkard	High self-reported rates of neglect and emotional abuse, by persons with binge eating disorder and night eating syndrome	2874
Joshua C. Magee and Bethany A. Teachman	Why did the white bear return? Obsessive-compulsive symptoms and attributions for unsuccessful thought suppression	2884
Maja Nedeljkovic and Michael Kyrios	Confidence in memory and other cognitive processes in obsessive-compulsive disorder	2899

[Continued on outside back cover

Behav. Res. Ther. is indexed/abstracted in Biologic Data, Elsevier BIOBASE/Current Awareness in Biological Sciences, Curr. Cont. Soc. & Beh. Sci., EMBASE/Excerpta Medica, Intl. Med. LLBA, MEDLINE, PSYCAL, CMBIS Data, Psychol. Abstr., PSYSCAN, PsycINFO, PsycLIT, Res. Alert, Soc. Sci. Cit. Ind., Social Work Res. & Abstr. Also covered in the abstract and citation database SCOPUS®.

ISSN 0005-7967
45(12)2813-3104 (2007)

This article was published in an Elsevier journal. The attached copy is furnished to the author for non-commercial research and education use, including for instruction at the author's institution, sharing with colleagues and providing to institution administration.

Other uses, including reproduction and distribution, or selling or licensing copies, or posting to personal, institutional or third party websites are prohibited.

In most cases authors are permitted to post their version of the article (e.g. in Word or Tex form) to their personal website or institutional repository. Authors requiring further information regarding Elsevier's archiving and manuscript policies are encouraged to visit:

<http://www.elsevier.com/copyright>



Shorter communication

Identification and explanation of racial differences on contamination measures

Monnica T. Williams*, Eric Turkheimer

Department of Psychology, University of Virginia, Box 400400, Charlottesville, VA 22904, USA

Received 18 November 2006; received in revised form 28 August 2007; accepted 31 August 2007

Abstract

Compared with published norms, African Americans endorse significantly more items intended to assess pathological anxiety about contamination on self-report instruments for obsessive–compulsive disorder. The current study suggests that this is not due to greater psychopathology in African Americans, but rather to differences in normal attitudes about cleanliness that also influence responses to items intended to assess anxiety pathology. Contamination items from obsessive–compulsive disorder (OCD) scales including the Padua Inventory [Sanavio E. (1988). Obsessions and compulsions: The Padua Inventory. *Behaviour Research and Therapy*, 26(2), 169–177] were supplemented with cleanliness attitude items and administered to Black and White participants ($N = 1483$). An exploratory factor analysis suggested a three-factor solution: one factor that encompassed pathological anxiety, and two that expressed attitudes about cleanliness, grooming, and domestic animals. African Americans scored significantly higher on all three factors. A confirmatory factor analysis demonstrated that the difference between Black and White participants on the pathological anxiety factor was eliminated when differences on the attitude factors were controlled statistically.

© 2007 Elsevier Ltd. All rights reserved.

Keywords: Factor analysis; Assessment; Obsessive–compulsive disorder; Ethnic differences; Contamination; Anxiety; Attitudes**Introduction***OCD screening measures and racial differences*

Obsessive–compulsive disorder (OCD) is often identified via self-report screening tools, such as questionnaires or checklists that ask patients about obsessive–compulsive symptoms. Popular measures include the Maudsley Obsessional–Compulsive Inventory (MOCI; Hodgson & Rachman, 1977), the Padua Inventory and the Padua Inventory—Washington State University Revision (PI; Sanavio, 1988; PI-WSUR; Burns, Keortge, Formea, & Sternberger, 1996), and the Obsessive–Compulsive Inventory, short version (OCI-R; Foa et al., 2002). Validation studies for all these were performed on primarily White European/

*Corresponding author. Now at: Center for the Treatment and Study of Anxiety, University of Pennsylvania School of Medicine, 3535 Market St, 6th Fl, Philadelphia, PA 19104, USA. Tel.: +1 215 746 3341; fax: +1 215 746 3311.

E-mail addresses: monnica@mail.med.upenn.edu (M.T. Williams), ent3c@virginia.edu (E. Turkheimer).

European American participants. There has been little research done on the validity of these for minority populations in the US.

Prior research demonstrates that current measurement tools for OCD are inadequate for assessing racially and ethnically diverse populations. In an initial study, the MOCI was found to lack predictive validity for African Americans when administered to a large sample of college students, in part because of significantly greater endorsement of cleaning and checking items (Thomas, Turkheimer, & Oltmanns, 2000). Black students obtained scores on MOCI cleaning and checking scales that exceeded scores of White students by almost a standard deviation.

Our laboratory has since replicated this bias in the contamination scale of the PI (Williams, Turkheimer, Schmidt, & Oltmanns, 2005). Our analysis replicated the four-factor structure from Sternberger and Burns (1990): contamination, checking, impaired control over thoughts, and fear of losing control over impulses. As was the case in the Thomas et al. (2000) study, African Americans scored significantly higher than European Americans on the contamination factor of the PI in a non-clinical sample, and in fact as high as participants reporting an OCD diagnosis. Differential item functioning (DIF) analysis revealed five items that were more frequently endorsed by African Americans, conditional on their latent level of OCD, and two items that were biased in the opposite direction.

Racially biased screening tools can be problematic for many reasons. In a research setting, this could result in African Americans being overrepresented in groups with assumed psychopathology (Thomas et al., 2000). In a clinical setting, an incorrect diagnosis may result in improper treatment, unnecessary stigmatization, poorer therapeutic outcomes, and, in the case of an underrepresented minority, an increase in cultural mistrust (Whaley, 2001). The American Psychological Association's ethical guidelines mandate, "Psychologists who develop tests and other assessment techniques use appropriate psychometric procedures and current scientific or professional knowledge for test design, standardization, validation, reduction or elimination of bias" (APA, 2002). Therefore a better understanding of bias and cultural differences in the assessment of diverse groups is essential.

Causes of Black–White differences

Although Black–White differences in contamination concerns have been replicated several times (Thomas et al., 2000; Williams et al., 2005), little is known about the cause of the differences. Fear of contamination is evident in all cultures, however, and there are many and major cultural differences in the perception of pollution (Rachman, 2004). African Americans appear particularly reluctant to disclose OCD symptoms (Hatch, Friedman, & Paradis, 1996), and it has been suggested that contamination fear is the most common obsession in African Americans with OCD (Lewis-Hall, 1994).

As Helms, Jernigan, and Mascher (2005) have emphasized, it would be incorrect to assume that differences are caused by an abstraction called "race"; ultimately, they must be caused by some psychologically potent variables that are associated with race. Race and ethnicity can be problematic variables in research, as the terms may have different meanings in different situations. Although we use "race" in this study to distinguish between "Black" and "White" participants, it should be noted that these groups could just as easily be described in terms of ethnic group or ethnic identity. In the US, where this study was conducted, Black and White are synonymous with African American and European American cultural groups.

Purpose of this study

The current study examines the psychometric properties of the 10 contamination items from the PI and PI-WSUR (Burns et al., 1996; Sanavio, 1988), which also contain the three nearly identical, overlapping items that make up the washing scale of the OCI-R (Foa et al., 2002), in a new sample. This study extends earlier work by including a novel group of items intended to assess non-pathological individual differences in attitudes about cleanliness and contamination. Our hypothesis is that the observed Black–White differences on the contamination scale reflect differing cultural norms about cleaning attitudes, rather than clinical differences in diagnosable OCD.

Method

Participants

Participants were community residents from two distinct metropolitan areas and undergraduate students from three universities in Virginia. Of the 1483 participants, 22.9% self-identified as “Black or African American” and 77.1% as “White, Caucasian or European (not Hispanic).”

The gender composition of the sample was 40.6% male and 59.1% female. Undergraduates participating for course credit comprised 86.1% of participants, and 13.8% were community members receiving financial compensation for participation. The mean age for students was 19.0 years ($SD = 1.67$), and for community participants 42.6 years ($SD = 13.9$). Detailed information is provided in [Table 1](#).

Black and White student participants had comparable levels of education, but among community participants, the average education for African Americans was “some college or a 2-year degree” and for European Americans “college graduate or 4-year degree.” Among students, 1.6% were married, with over 90% single, living alone, or with parents. Among community participants, more African Americans (52.6%) were married than European Americans (32.6%). Of the sample, 22.3% reported ever having an anxiety disorder or visiting a professional for “concerns about anxiety or nerves.” Excluded were participants with recent symptoms of OCD (within the last month), participants who did not fit into either racial category, and those having lived in the US for less than 5 years.

Procedures

Participants were recruited over two study periods, separated by several months. Participants in the first group were recruited through local churches and community groups, undergraduate courses, e-mail lists, and the university student subject pool ($N = 972$). Those in the second group were recruited through direct mail, telephone solicitation, flyers, and the university student subject pool ($N = 511$).

Most participants completed paper and pencil measures, but undergraduates in the first study group were able to complete the measures online. Participants were not required to provide identifying information. All were provided informed consent and instructed that they could cease participation at any time.

Measures

Participants provided demographic information, mental health history, and completed a self-report instrument containing the 60 Padua items. The participants in study group 2 completed additional measures, including the Beck Anxiety Inventory (BAI; [Beck, 1990](#)) and the Center for Epidemiologic Studies Depression Scale (CESD; [Radloff, 1977](#)). The 10 PI contamination items are used in the current study, which include the three OCI-R washing items, as shown in [Table 2](#). The 5-item scale used from the Padua is rated based on the amount of distress caused by each item: 0: Not at all, 1: A little, 2: Quite a lot, 3: A lot, 4: Very much. Because of concern that wording of the middle category might be misunderstood by US participants relative to terms

Table 1
Race, source, gender, and age of sample

Racial group	Source	Gender	<i>N</i>	Mean age	Std. dev.
Black	Community	Male	48	41.00	12.90
		Female	107	42.16	14.08
	Student	Male	57	18.98	1.06
		Female	127	19.06	2.81
White	Community	Male	28	45.81	14.66
		Female	21	44.29	13.86
	Student	Male	469	19.25	1.62
		Female	622	18.76	1.39

Table 2
Padua Inventory contamination scale and OCI-R washing scale

PI	OCI-R	Description
P01		I feel my hands are dirty when I touch money.
P02		I think even slight contact with bodily secretions...may contaminate my clothes or somehow harm me.
P03	05	I find it difficult to touch an object when I know it has been touched by strangers or by certain people.
P04		I find it difficult to touch garbage or dirty things.
P05		I avoid using public toilets because I am afraid of disease and contamination.
P06		I avoid using public telephones because I am afraid of contagion and disease.
P07	17	I wash my hands more often and longer than necessary.
P08	11	I sometimes have to wash or clean myself simply because I think I may be dirty or "contaminated."
P09		If I touch something I think is "contaminated," I immediately have to wash or clean myself.
P10		If an animal touches me, I feel dirty and immediately have to wash myself or change my clothing.

Table 3
Novel cleanliness and grooming attitude items

Item	Description
A01	When I go out I am usually not concerned about my appearance.
A02	I would hate to wear the same clothes two days in a row.
A03	I would love to own a furry pet.
A04	I can't stand to be in my home if it's messy.
A05	I am extremely concerned about spreading germs to other people.
A06	I am afraid others will think I am untidy.
A07	It's very important that my working environment be orderly.
A08	I do not care to spend a great deal of time with animals.
A09	I am very concerned about how my hair looks.
A10	I make sure my clothes look clean and neat, no matter what I am doing.
A11	I only eat well-cooked meats because undercooked meat may be contaminated.
A12	I do not spend much money on hair products.

used for other categories intended to represent greater distress, "Quite a lot" was replaced with "Somewhat," as in our prior study (Williams et al., 2005).

Because our earlier study included only the Padua items, it was not possible to fully identify an attitude factor that might be contributing to group differences (Williams et al., 2005). We therefore developed 12 new cleanliness attitude items, shown in Table 3, to assess individual differences in non-pathological attitudes about cleanliness. One item was from the Leyton Obsessional Inventory (item A10, which is item 19 from Cooper, 1970); all others are original.

The attitude items were created through a multistep process, based on the hypothesis that Black Americans may have differences in non-pathological personal attitudes and values that are affecting contamination scores. Finding no relevant literature on racial differences in overall attitudes about contamination and washing, we examined each Padua contamination item individually. Once a documented Black–White difference was identified, a new item was created containing elements of both the contamination item and the documented difference.

For example, African Americans strongly over-endorsed item 10 on the PI: "If an animal touches me, I feel dirty and immediately have to wash myself or change my clothing" (Williams et al., 2005). We located a study that indicated African Americans were less likely to desire pets than European Americans, even after controlling for socioeconomic status (Siegel, 1995). We then created similar items, not indicative of psychopathology, i.e. (A03) "I would love to own a furry pet."

Another difference we uncovered involved food consumption practices, as a Centers for Disease Control report found that African Americans were less likely to eat rare meats (Yang et al., 1998). Padua item 5

involves avoidance of public toilets. We created an item (A11) where toilets were replaced by rare meats, so the item read, “I only eat well-cooked meats because undercooked meat may be contaminated.”

We examined spending habits of US households by racial group. Black families spend a larger portion of their income on laundry, cleaning supplies, and apparel than White families (US Department of Labor, 2002). Therefore, we created items intended to assess these tendencies that contained elements of Padua items 2 and 10, involving clothing and the general theme of personal cleanliness. The new item read, “I would hate to wear the same clothes two days in a row.” This process was repeated until we had developed enough hybrid items to conduct our study. It should be noted, however, that these new items are not intended as a free-standing scale.

Statistical methods

To establish a preliminary factor model to use as a baseline in a subsequent evaluation of racial differences on the Padua contamination scale, we conducted an exploratory factor analysis (EFA) on the entire sample, using the 10 Padua items and the 12 additional cleanliness attitude items. Mplus (Muthen & Muthen, 1998) was used to conduct the EFA and the subsequent confirmatory factor analysis (CFA), using a probit model to describe the ordered categorical items. MPlus also includes a model for missing data under missing at random (MAR) conditions; this model was employed for all analyses. No more than 5% of the data were missing for any item. Inspection of the scree plot of Eigenvalues, root mean square error of approximation values (RMSEA), and the interpretability of resulting solutions were used to select the number of factors to rotate, which were then rotated to a simple structure using promax rotation.

The preliminary model selected in the EFA was then subjected to a sequence of CFAs to identify differences in the factor structure in White and Black participants, establish an invariant structure that could be used to measure the same traits in both groups, and finally to use this model to analyze the structure of group differences in the factor means. Again, Mplus was used for the confirmatory analyses, using the same probit model for the ordered categorical items and weighted least-squares mean and variance adjusted (WLSMV) robust estimation. Model fit was evaluated with RMSEA and comparative fit index (CFI). Values of RMSEA < .05 are generally considered indicators of good fit, with values less than .08 considered acceptable. Values of CFI > .95 are considered indicative of good fit (Browne & Cudeck, 1993; Steiger, 1990).

Results

Descriptive analyses

Table 4 shows mean scores on each of the PI scales and the OCI-R washing scale, along with *t*-tests and the effect size (*d*) between the means of Black and White participants. Effect sizes were largest for washing and contamination scales. In examining the individual PI contamination items and the novel attitude items, there

Table 4
Mean scale scores by race

Item	White		Black		<i>N</i>	<i>t</i>	Pr > <i>t</i>	<i>d</i>	Item content
	Mean	SD	Mean	SD					
PICONT	7.08	6.07	11.84	8.03	1469	11.67	<.0001	.725	PI contamination scale
PICHECK	12.26	11.05	13.01	12.11	1470	1.21	.2264	.075	PI checking scale
PIMENTAL	15.28	12.49	14.53	13.30	1470	-.95	.3405	-.059	PI mental control scale
PIIMPULSE	4.31	5.26	3.09	4.67	1469	-3.82	.0001	-.237	PI fear of impulses
PITOTAL	36.02	26.73	39.21	29.24	1469	1.88	.0605	.117	All PI items
OCI-RWASH	1.50	1.89	2.86	2.76	1457	10.25	<.0001	.640	OCI-R washing scale

Note: For White participants *N* = 1127–1136 and for Black participants *N* = 332–336 due to occasional omitted items by respondents, who were permitted to skip questions they preferred not to answer. Scale scores were not computed for respondents, leaving more than 10% of items blank on a given scale.

was a substantial racial difference on all items, in the direction of Black participants expressing more concern regarding contamination and greater concern about cleanliness and personal appearance.

Exploratory factor analysis

The EFA suggested that a three- to five-factor solution would be required to adequately represent the structure of the items. Eigenvalues decreased sharply from one to three factors and then leveled off, but five factors had Eigenvalues greater than 1.0. However, for four- and five-factor solutions the fourth and/or fifth factors had only two indicators, so we decided to rotate and interpret the three-factor solution. The RMSEA for this solution indicated some lack of fit (.086), but we opted for the simpler solution because the finer structure of the cleanliness attitude items was not the focus of the analysis, the relatively small number of items, and the expectation that we would need to make some adjustments to the model in the two-group CFA. The latter consideration turned out to be accurate, as adequate fit was achieved in the CFA after the adjustments to the model were made, described in Section 3.3.

The first factor, which will be called the “Padua contamination” factor, consists of the 10 PI contamination items, in addition to two of the new items (A05 and A06). The second factor, which will be called the “cleanliness attitude” factor, consists of the remaining cleanliness attitude items, except for the two items about animals and pets. These two items, along with the animal-related item from the Padua, constitute the third factor, which is called the “animal attitudes” factor.

Alpha for the 12 Padua contamination items was .849 for Black participants and .866 for White participants. For the eight cleanliness attitude items, α was .669 for Black participants and .741 for White participants. For the three animal items, α was .577 for Black participants and .668 for White participants.

Confirmatory factor analyses

We then reproduced the EFA solution as a confirmatory model with three correlated factors, estimating the factor loadings shown to be greater than .30 in the EFA and setting the others to zero. All estimated parameters were allowed to differ between the races. The variances of the latent factors were set to 1.0 and the means to zero in both racial groups. The CFA showed some decrement in fit relative to the EFA, because the EFA was estimated in the combined sample rather than separately in the races, and also because small loadings that were estimated in the EFA were set to zero in the CFA. Because the fit indices for the preliminary CFA dropped somewhat below acceptable values (CFI = .889, RMSEA = .078), modification indices were used to identify non-zero residual correlations among items to improve preliminary model fit. Modification indices indicated that there were five such pairs, all comprising pairs of items with similar wording or content. Inclusion of the background correlations improved model fit close to acceptable levels (CFI = .943, RMSEA = .056).

We then investigated whether the same factor structure could be fit in Black and White participants by constraining the factor loadings in the two groups. Doing so did not produce a substantial decrement in fit, with resulting CFI = .956 and RMSEA = .053. With the loadings constrained to be equal, the factor variances could be freed from 1.0 in the second (White) group. All three variances were estimated to be slightly greater than 1.0 in the White group. Detailed CFA results for Black and White participants, estimated separately and with loadings constrained to be equal, are available from the corresponding author by request.

With the factor structure fixed to be equal across groups, it is possible to investigate whether the item intercepts can be set equal after allowing the factor means to differ between the groups. This model tests whether the group differences in items can be accounted for at the level of the latent factors. Fitting this model resulted in some loss of fit (CFI = .948, RMSEA = .059), so the modification indices were examined for items that did not appear to have equal intercepts across groups. The item with the largest group difference in intercepts was A11. Freeing the intercept for this item resulted in a better fit (CFI = .951, RMSEA = .057). Black participants were more likely than White participants to endorse this item conditional on their scores on the latent variables.

With the item intercepts (except for A11) fixed across groups, differences in the means of the latent factors can be estimated by fixing the mean of one group (Blacks) to zero and freeing the means of the latent factors in

the other group (Whites). Results showed that Black participants had substantially higher levels of all three factors. Black participants scored seven-tenths of a standard deviation higher than White participants on the Padua contamination factor (standardized difference equal to .77, SE = .07), and more than a standard deviation higher than White participants on the cleanliness (difference equal to 1.14, SE = .09) and animal (difference equal to 1.05, SE = .09) factors.

In the foregoing model the mean differences on the three factors were estimated independently of each other, i.e., the difference estimated for one was not conditional on the others. The goal of the current study is to understand how the group difference on the Padua factor might depend on the two attitude factors, and conversely, how differences on these factors might depend on each other and on the Padua factor. To estimate the effects, covariances between the Padua and attitude factors were modeled as regressions rather than as covariances. In this model, the Padua factor was regressed on the cleanliness and animal attitude factors, with the regression parameter set equal in the two racial groups. The model estimates the mean difference for the attitude factors, as above, and an intercept for the Padua factor that represents the residual racial difference on the Padua factor *with levels of the two attitude factors held constant*. This model is illustrated in Fig. 1.

This model continued to fit the data well (CFI = .943, RMSEA = .057). Scores on the Padua factor were significantly related to scores on the two attitude factors, as was expected based on the covariances between them in the previous model. Mean differences between Black and White groups on the attitude factors were essentially unchanged from previous models, but with scores on the attitude factors held constant, the group difference on the Padua factor approached zero (.016) and was no longer significant. This effect was not symmetrical: if the cleanliness attitude factor is regressed on the Padua factor and the animal factor, the residual group difference on the cleanliness attitude factor still showed Black participants significantly higher than White participants by almost a standard deviation (.811). Similarly, if the animal factor is regressed on the Padua and the cleanliness factor, the residual mean difference on the animal factor remained high (.859) and was highly significant. Thus, there was no racial difference on the Padua factor when scores on the attitude factors were held constant, but racial differences on the attitude factors remained when the Padua factor was held constant.

Post hoc ANOVAs

Both generalized anxiety and depression are strongly correlated with obsessive–compulsive symptoms. It could be argued that group differences in these symptoms account for the differences in contamination

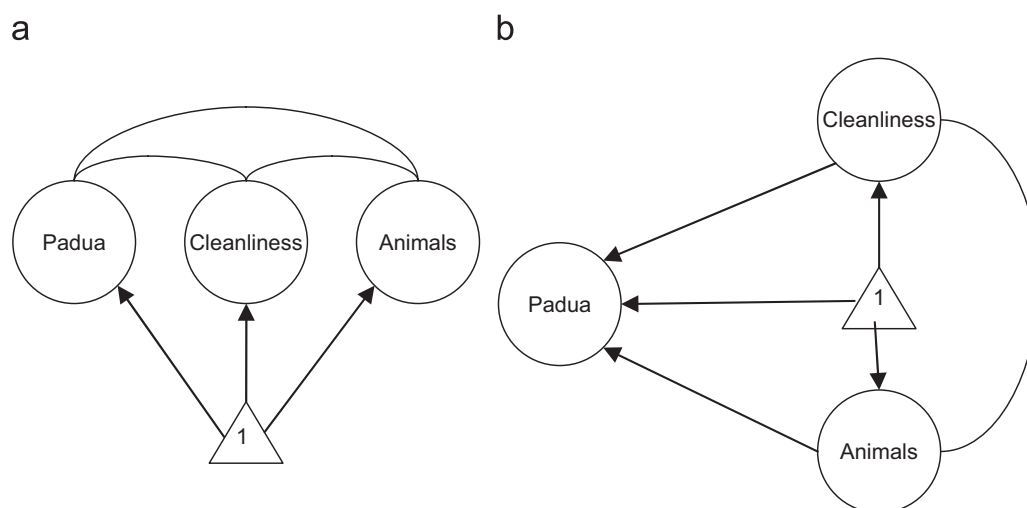


Fig. 1. (a) Typical parameterization of oblique factors, with factor relations represented as covariances, and mean differences on the factors independent of each other. Circles represent latent factors, and triangle containing a 1 represents racial difference in means of the factors, represented as arrows from the triangle for the intercept. (b) Alternative representation of oblique factors, with relations between Padua contamination and attitude factors represented as regressions. In this parameterization, the mean difference on the Padua factor represents the residual difference with differences in the attitude factors held constant.

concerns evidenced in our sample. To investigate this possibility, we analyzed scores on the CESD and the BAI in the second study group ($N = 511$; the first study group did not receive the CESD and BAI), as well as differences arising from student versus community status. Black participants exhibited more depressive symptoms than White participants as indicated by CESD scores, and females exhibited greater somatic anxiety than males as measured by the BAI.

To investigate the effects of these differences on the observed race difference in contamination, we conducted an ANOVA predicting the 10-item PI contamination scale score from race, gender, student/community status, BAI scores, CESD scores, and the two-way interactions from combining BAI scores, CESD scores, race, and gender. Predictors with non-significant contributions were removed from the model, leaving race ($F(1506) = 42.04, p < .0001$), gender ($F(1506) = 8.12, p = .005$), the interaction of race and gender ($F(1506) = 7.70, p = .006$), the CESD ($F(1506) = 4.88, p = .028$), and the BAI ($F(1506) = 32.54, p < .0001$).

Next, an attitude score was created equal to the unweighted sum of the cleaning and animal attitude items, and this variable was added to the previous model. As a result, the race ($p = .06$) and gender ($p = .46$) effects were greatly reduced and no longer significant, but the attitude score was highly significant, and was a better predictor of the PI contamination score than any of the other variables ($F(1495) = 152.02, p < .0001$).

Discussion

Attitudes explain differences in anxiety scales

Black participants score significantly higher than White participants on scales purporting to measure pathological anxiety about contamination and washing (Thomas et al., 2000; Williams et al., 2005). The current study has demonstrated that such scales are not only correlated with pathological anxiety, but also with attitudes about grooming, housekeeping, and animals. Racial differences on these attitude factors are at least as large as those on the Padua contamination factor. When the differences on these attitude factors are held constant, the apparent racial difference on the Padua factor disappears completely.

Causes of bias

Helms et al. (2005) warn that researchers should not posit race as the cause of group differences, proposing that racial differences should instead be explained by other factors, such as ethnic identification or education. Our findings are consistent with this framework. What appeared to be a difference in psychopathology by race was actually the consequence of differences in attitudes that happen to be correlated with race. Further discussion surrounding issues related to race-based work can be found in Helms et al. (2005). The new question, of course, is why racial groups differ in their attitudes about cleanliness.

One possibility is that African Americans over-endorse cleaning items to counteract negative stereotypes about cleanliness (Devine, 1989), resulting in a self-presentation bias in favor of exaggerated cleaning. However, if higher scores are due simply to positive self-presentation, Black participants should score lower on PI items describing an unreasonable and irrational behavior. This theory is only partially supported by the racial differences found on items in other PI scales (see Williams et al., 2005).

If such compensations were performed in response to the threat of evaluation, outside of the participants' conscious awareness, the phenomenon would bear some similarity to stereotype threat, a process whereby stigmatized groups underperform in the face of negative stereotypes about ability (Steele, 1997). Stereotype threat mechanisms have not previously been used to describe differences in reports of psychopathology, however, and the generalization of the concept from the ability to psychopathology domains remains to be worked out theoretically and empirically.

Another possibility is that differences in disgust sensitivity may be a factor. In a study by Haidt, McCauley, and Rozin (1994), African Americans scored higher on the Disgust Scale than White participants. Utilizing the PI and the same Disgust Scale, a significant positive relationship was found between disgust and washing behaviors in a non-clinical sample (Mancini, Gragnani, & D'Olimpio, 2001).

Greater concern with cleanliness may be a cultural norm for African Americans. Historically, segregation statutes prevented Black and White citizens from utilizing the same restrooms, drinking fountains, and

swimming facilities under the assumption that White people would be contaminated by shared use. Into the 20th century, the medical establishment considered African Americans carriers of disease, “a stubborn affront to modern notions of hygiene” (Wailoo, 2006). These restrictions and attitudes may have resulted in a cultural reaction whereby attitudes about the importance of cleanliness have been exaggerated to compensate.

Limitations of this study

The cleanliness attitude items employed in this study were newly created for that purpose. Although it seems likely that these attitudes are not indicators of pathological anxiety, further studies will be required to better establish the validity of the new items, and how the Padua and attitude items interact in the prediction of pathological anxiety. Although our analysis has demonstrated that the racial difference on contamination items is eliminated once scores on attitude items are controlled, our interpretation of this effect in terms of latent constructs of “pathological anxiety” and “cleanliness attitudes” must await further validation. Additional data on the actual cleaning behaviors of participants, independent of self-report, would be needed to completely validate a cleanliness scale. The use of behavioral approach-avoidance tasks may be another means of providing convergent validity for racial differences in contamination concerns.

The CFA was performed on the same group as the EFA. This approach was required due to the addition of the new items, and therefore there were no clear hypotheses about the resulting factor structure. Some preliminary hypothesis of the factor structure in the two groups was required as a basis for our subsequent multigroup CFA. Nonetheless, conducting the CFA in the same sample in which the EFA was estimated represents a limitation. A replication study with a new sample will be required before our conclusions can be considered definitive.

Improving validity of OCD assessment

Scales intended to measure pathological anxiety about cleanliness are less predictive of actual pathology in African Americans (Thomas et al., 2000). It remains to be determined whether it is possible to create scales to measure pathological anxiety without racial bias resulting from correlations with non-pathological attitudes. It is difficult to generate compulsive washing and contamination anxiety items that have no cleanliness attitude content, although it seems clear that questions about these symptoms should focus on subjective distress and time spent on compulsions rather than general attitudes about cleanliness and grooming.

Acknowledgment

Support from the Southern Regional Educational Board and NIH NRSA Pre-Doctoral Training Grant 1 F31 MH70175-01A1 is gratefully acknowledged.

References

- American Psychological Association. (2002). Ethical principles of psychologists and code of conduct. *American Psychologist*, 57(12), 1060–1073.
- Beck, A. T. (1990). *Beck Anxiety Inventory*. San Antonio, TX: The Psychological Corporation.
- Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen, & J. S. Long (Eds.), *Testing structural equation models*. Newbury Park, CA: Sage Publications, Inc.
- Burns, G. L., Keortge, S., Formea, G., & Sternberger, L. (1996). Revision of the Padua Inventory of obsessive-compulsive disorder symptoms: Distinctions between worry, obsessions, and compulsions. *Behaviour Research and Therapy*, 34, 163–173.
- Cooper, J. (1970). The Leyton Obsessional Inventory. *Psychological Medicine*, 1(1), 48–64.
- Devine, P. G. (1989). Stereotypes and prejudice: Their automatic and controlled components. *Journal of Personality and Social Psychology*, 56, 5–18.
- Foa, E. B., Huppert, J. D., Leiberg, S., Langner, R., Kichic, R., Hajcak, G., et al. (2002). The Obsessive-Compulsive Inventory: Development and validation of a short version. *Psychological Assessment*, 14(4), 485–495.
- Haidt, J., McCauley, C., & Rozin, P. (1994). Individual differences in sensitivity to disgust: A scale sampling seven domains of disgust elicitors. *Personality and Individual Differences*, 16, 701–713.

- Hatch, M. L., Friedman, S., & Paradis, C. M. (1996). Behavioral treatment of obsessive–compulsive disorder in African Americans. *Cognitive & Behavioral Practice*, 3(2), 303–315.
- Helms, J. E., Jernigan, M., & Mascher, J. (2005). The meaning of race in psychology and how to change it. *American Psychologist*, 60, 27–36.
- Hodgson, R. J., & Rachman, S. (1977). Obsessional–compulsive complaints. *Behaviour Research and Therapy*, 15, 389–395.
- Lewis-Hall, F. C. (1994). The use of DSM in the diagnosis of panic disorder and obsessive compulsive disorder. In S. Friedman (Ed.), *Anxiety disorders in African Americans* (pp. 102–116). New York: Springer Publishing Co.
- Mancini, F., Gagnani, A., & D'Olimpio, F. (2001). The connection between disgust and obsessions and compulsions in a non-clinical sample. *Personality and Individual Differences*, 31, 1173–1180.
- Muthen, L. K., & Muthen, B. O. (1998). *Mplus user's guide, version 2*. Los Angeles, CA.
- Rachman, S. (2004). Fear of contamination. *Behaviour Research and Therapy*, 42(11), 1227–1255.
- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385–401.
- Sanavio, E. (1988). Obsessions and compulsions: The Padua Inventory. *Behaviour Research and Therapy*, 26(2), 169–177.
- Siegel, J. M. (1995). Pet ownership and the importance of pets among adolescents. *Anthrozoos*, 8(4), 217–223.
- Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist*, 52(6), 613–629.
- Steiger, J. H. (1990). Structural model evaluation and modification: An interval estimation approach. *Multivariate Behavioral Research*, 25, 173–180.
- Sternberger, L. G., & Burns, G. L. (1990). Obsessions and compulsions: Psychometric properties of the Padua Inventory with an American college population. *Behaviour Research and Therapy*, 28(4), 341–345.
- Thomas, J., Turkheimer, E., & Oltmanns, T. F. (2000). Psychometric analysis of racial differences on the Maudsley Obsessional Compulsive Inventory. *Assessment*, 7(3), 247–258.
- US Department of Labor. (2002). *Consumer expenditures in 2000*. Bureau of Labor Statistics, Report 958 (supplementary tables), <<http://www.bls.gov/cex>>.
- Wailoo, K. (2006). Stigma, race, and disease in 20th century America. *The Lancet*, 367(9509), 531(3).
- Whaley, A. L. (2001). Cultural mistrust of White mental health clinicians among African Americans with severe mental illness. *American Journal of Orthopsychiatry*, 71(2), 252–256.
- Williams, M. T., Turkheimer, E., Schmidt, K. M., & Oltmanns, T. F. (2005). Ethnic identification biases responses to the Padua Inventory for obsessive–compulsive disorder. *Assessment*, 12(2), 174–185.
- Yang, S., Leff, M. G., McTague, D., Horvath, K. A., Jackson-Thompson, J., Murayi, T., et al. (1998). Multistate surveillance for food-handling, preparation, and consumption behaviors associated with foodborne diseases: 1995 and 1996 BRFSS food-safety questions. *Morbidity & Mortality Weekly Report: CDC Surveillance Summaries*, 47(4), 33–57.