



# The Dysmorphic Concern Questionnaire: Measurement invariance by gender and race/ethnicity among sexual minority adults



Kaitlin N. Rozzell<sup>a,\*</sup>, Chelsea Carter<sup>a</sup>, Alexandra D. Convertino<sup>b</sup>, Manuel Gonzales IV<sup>b</sup>, Aaron J. Blashill<sup>a,b</sup>

<sup>a</sup> Psychology Department, San Diego State University, San Diego, CA, United States

<sup>b</sup> San Diego State University/University of California, San Diego Joint Doctoral Program in Clinical Psychology, San Diego, CA, United States

## ARTICLE INFO

### Article history:

Received 9 March 2020

Received in revised form 22 August 2020

Accepted 25 August 2020

Available online 11 October 2020

### Keywords:

Body dysmorphic disorder  
Dysmorphic Concern Questionnaire  
Sexual minority  
Measurement invariance

## ABSTRACT

Sexual minority adults report heightened body image disturbances, and may be more likely to meet criteria for body dysmorphic disorder (BDD) than their heterosexual counterparts. Given the poor outcomes associated with BDD, it is important to validate measures assessing dysmorphic symptoms among this at-risk group. The Dysmorphic Concern Questionnaire (DCQ) is a seven-item self-report measure intended to assess dysmorphic symptoms. The present study investigated racial, ethnic, and gender measurement invariance properties of the DCQ in a racially and ethnically diverse sample of sexual minority adults. The current results lend initial support for use of the DCQ to potentially detect BDD symptoms among White, Black, Latino, and Asian sexual minority men and women. This may inform future studies that wish to utilize the DCQ, such as investigations of mean level differences in dysmorphic concern. These findings may have important clinical applications, given the heightened risk of appearance-related concerns among diverse sexual minority adults.

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## 1. Introduction

Body dysmorphic disorder (BDD) is characterized as extreme concern with one or more imagined or 'slight' defects in one's physical appearance that causes significant distress, and/or impairment in functioning (American Psychiatric Association, 2013). This preoccupation with one's appearance is intrusive, impairing, and triggers distressing emotions (Phillips, 2017). Prevalence estimates of BDD range from 1.9%–2.4% (Koran, Abujaoude, Large, & Serpe, 2008; Veale, Gledhill, Christodoulou, & Hodsoll, 2016). Of these studies, one found no significant difference in rates across gender (Koran et al., 2008) while the other reported significantly higher rates among women (2.1% vs. 1.6%) (Veale et al., 2016). BDD is also highly comorbid with major depressive disorder, suicide attempts, social anxiety disorder, and obsessive-compulsive disorder (Buhlmann et al., 2010; Toh et al., 2017). Given the prevalence of BDD and its associated outcomes, exploring the psychometric prop-

erties of measures which intend to assess dysmorphic concerns is warranted.

Sexual minority is an umbrella term meant to encompass individuals whose identity, behavior, and/or attraction is not exclusively heterosexual (e.g., gay, lesbian, bisexual, pansexual). Appearance concerns are heightened in sexual minority populations; one meta-analysis comparing body dissatisfaction among sexual minority and heterosexual individuals found significantly higher body dissatisfaction among sexual minority men as compared to heterosexual men, and comparable levels of body dissatisfaction among sexual minority and heterosexual women (Morrison, Morrison, & Sager, 2004). Support for increased body dissatisfaction among sexual minority men compared to their heterosexual counterparts has been bolstered by more recent findings (Calzo, Corliss, Blood, Field, & Austin, 2013; Frederick & Essayli, 2016). Among sexual minority women findings are less clear; however, some results suggest equivalent body dissatisfaction among sexual minority women and heterosexual women (Koff, Lucas, Migliorini, & Grossmith, 2010; Yean et al., 2013), and elevated rates of body dissatisfaction especially among bisexual women (Polimeni, Austin, & Kavanagh, 2009; Steele et al., 2019). Such heightened body dissatisfaction among this group may lead to greater risk of BDD, as preliminarily established in previous find-

\* Corresponding author at: Department of Psychology, San Diego State University San Diego State University/University of California, San Diego Joint Doctoral Program in Clinical Psychology, 6363 Alvarado Ct Suite 101, San Diego, CA, 92122, United States.

E-mail address: [ajblashill@sdsu.edu](mailto:ajblashill@sdsu.edu) (A.J. Blashill).

ings (Boroughs, Krawczyk, & Thompson, 2010; Oshana, Klimek, & Blashill, 2020).

Past literature indicates that sexual minority individuals may have significantly higher rates of BDD symptoms as compared to their heterosexual counterparts (Boroughs et al., 2010). Significantly elevated rates among sexual minority individuals in this study were largely due to estimates of BDD among sexual minority women at 7.7% compared to heterosexual women at 6.1%. Heterosexual men and sexual minority men had similar rates to one another and previous prevalence studies at 2.3 and 2.4% respectively (Boroughs et al., 2010). Notably, a more recent study that sampled young sexual minority men found 49.3% screened positive for BDD, as measured using an established cut score on the Dysmorphic Concern Questionnaire (Oshana et al., 2020). Though the literature specific to BDD symptoms among sexual minority individuals is limited, findings indicate this may be a vulnerable population at increased risk for the disorder. Thus, valid assessment of BDD symptoms among sexual minority individuals is necessary.

Racial and ethnic differences in BDD symptoms have not been well explored. One past study found that among men, there were no ethnic or racial differences in the prevalence of BDD, but among women, African Americans had significantly lower rates than both White and Latina women (Boroughs et al., 2010). In addition, Marques et al. (2011) found differences in the type of dysmorphic concerns between Asian and White samples, with Asian participants being more likely to endorse hair and skin concerns, and fewer concerns related to one's body (e.g. body shape, body fat) than White participants. There were no statistically significant differences found between White and Latino, or White and African American participants. Although certain ethnic and/or racial minority groups may experience higher rates of BDD, it is important to note that mean level differences are not necessarily indicative of a differing factor structure between compared groups on measures intended to assess BDD symptoms. However, past findings that suggest qualitative differences in appearance concerns among racial groups may potentially indicate group differences in measurement properties among assessments aimed to evaluate BDD symptoms. Despite scant literature, given the poor outcomes related to dysmorphic concerns, it is important that measures assessing BDD are validated among diverse samples, particularly among those that may be at an elevated risk.

The Dysmorphic Concern Questionnaire (DCQ; Oosthuizen, Lambert, & Castle, 1998) is a seven-item measure intended to quantify the severity of appearance-related concerns and behaviors to assess BDD symptoms. The structure of the DCQ is based upon the General Health Questionnaire (GHQ; Goldberg & Blackwell, 1970), a widely used and well-validated self-report measure used primarily in healthcare settings. The DCQ was initially validated among a sample of 63 Australian psychiatric inpatients diagnosed with a range of mental health disorders (Oosthuizen et al., 1998). In this sample, the measure showed good internal consistency ( $\alpha = 0.88$ ) and an exploratory factor analysis demonstrated that items loaded onto one factor with 58.4% of variance explained. No differences in dysmorphic concern scores were found based on age, sex, or other DSM diagnoses. As hypothesized, the DCQ showed a strong positive association with depressive symptoms and was not related to actual physical abnormalities (Oosthuizen et al., 1998). Following initial validation, the DCQ was assessed among a sample of BDD outpatients and undergraduates (Mancuso, Knoesen, & Castle, 2010). Within this sample, high sensitivity and specificity was obtained, indicating the DCQ is an appropriate tool for screening BDD (Mancuso et al., 2010). Since its development, other researchers have assessed the factor structure of the DCQ within both the general population and various subpopulations (Jorgensen, Castle, Roberts, & Groth-Marnat, 2001; Monzani et al., 2012; Stangier, Janich, Adam-Schwebe, Berger, & Wolter, 2003),

though no known studies have assessed its properties of measurement invariance.

The DCQ has been validated among diverse groups such as undergraduates, psychiatric inpatients, dermatological outpatients, and samples from various countries (Oosthuizen et al., 1998; Schieber et al., 2018; Stangier et al., 2003). Past findings using confirmatory factor analysis and principal component analysis have consistently pointed to a one-factor model structure (Monzani et al., 2012; Schieber et al., 2018) and high convergent validity (Mancuso et al., 2010; Stangier et al., 2003). While the aforementioned features of the DCQ have generally been stable among past studies, inconsistencies regarding other psychometric properties are also prevalent. Though a one factor structure of the DCQ has been supported, the DCQ has shown some low item loadings among various samples (Jorgensen et al., 2001; Stangier et al., 2003). Past studies on psychometric properties have been useful; however, none have examined measurement invariance properties of the DCQ.

Measurement invariance refers to psychometric equivalence of a construct across different groups (Putnick & Bornstein, 2016). Such equivalence would indicate a measure is assessing the same construct among compared groups, which is necessary to establish before assessing any potential differences in group means (Putnick & Bornstein, 2016). Despite the minimal research that has used the DCQ among diverse groups, based on these past findings, there may not be strong reason to expect the DCQ would function differently across various subgroups (i.e. gender, ethnicity, and/or race). Regardless of any a priori hypotheses assuming the DCQ may be measurement non-invariant, determining its utility among diverse populations is still warranted. Confirming measurement invariance of the DCQ can inform future work seeking to assess differences in levels of dysmorphic concern, and expand on its psychometric properties. This may be especially important to confirm among groups that display heightened levels of BDD (i.e. sexual minority individuals; Oshana et al., 2020).

The primary aim of the present study set was to test measurement invariance in DCQ scores across gender and race/ethnicity among a diverse sample of sexual minority individuals. No known studies to date have assessed the utility of the DCQ among sexual minority individuals, a group that is generally understudied in the BDD literature, and additionally has high levels of body image concerns compared to heterosexual individuals (Frederick & Essayli, 2016; Morrison et al., 2004; Yean et al., 2013). The present study sought to confirm previously identified unidimensional factor structure of the DCQ (Jorgensen et al., 2001; Monzani et al., 2012; Stangier et al., 2003). Given there are no known previous studies examining measurement invariance of DCQ scores, no directional hypotheses were made regarding the psychometric properties of the DCQ across gender and race/ethnicity.

## 2. Method

### 2.1. Participants

This was a secondary data analysis from a pre-existing parent study (Gonzales & Blashill, under review). The aim of the parent study was to examine prevalence of body image related disorders in racially and ethnically diverse sexual minority individuals. Though both papers utilize DCQ scores, the present paper differs from the parent study in that the current aim is a validation of the DCQ among a sexual minority population, which was not explored in other papers from this dataset.

Participants were 957 sexual minority individuals between 18–30 ( $M = 23.68$ ,  $SD = 3.73$ ) years of age residing in the United States. Participants were 52.5% men, and racially/ethnically diverse; 25. % White, 24.6% Black or African American, 25.9% Asian

American, and 24.4 % Hispanic/Latino. Participants were grouped in the Hispanic/Latino category if they identified as any race, in addition to Hispanic/Latino. All other groups were mono-racial. Participant sexual identity was as follows: 58.6 % bisexual, 34.9 % gay or lesbian, 4.4 % 'other', and 2.1 % asexual. Participants were individuals registered with Qualtrics to participate in online survey studies. Deidentified invitations to complete the survey were sent to potential participants through the Qualtrics platform if they met the following inclusion criteria: 1) between 18 and 30 years old; 2) self-identified as gay, lesbian, or bisexual; 3) self-identified as either African American, Non-Hispanic White, Asian American/Pacific Islander, or Hispanic with any other race; and 4) English speaking. Participants also had the option to choose 'other' for sexual identity and write in their preferred response. The invitation to participate did not include any identifying information about the study itself.

A preliminary survey was given to participants to confirm they met inclusion criteria. Participants were additionally provided information about the study and had the opportunity to provide consent to complete the survey. Reasons for exclusion included self-identifying as 'exclusively heterosexual.' Over the course of data collection, Qualtrics additionally excluded participants who completed the survey, but showed patterned responding ( $n = 34$ ), invalid responding to free response items ( $n = 44$ ), potential duplicate and responses from individuals outside of the US ( $n = 16$ ), and participants who did not self-identify as cisgender ( $n = 137$ ). Participants were provided \$4 US dollars in e-currency for completing the study, through Qualtrics. All procedures were reviewed and approved by the university's Institutional Review Board.

## 2.2. Measures

### 2.2.1. Dysmorphic Concern Questionnaire

The Dysmorphic Concern Questionnaire (DCQ) is a seven-item self-report measure developed by Oosthuizen et al. (1998) to assess symptoms of BDD. Responses are assessed on a four-point response scale ranging from 0 'Not at all' to 3 'Much more than most people.' All seven items of the DCQ can be summed to result in one total score with no subscales. No items are reverse scored. Higher scores indicate higher levels of disturbance regarding a facet of one's appearance or bodily functioning. An example item is "Have you ever spent a lot of time covering up defects in your physical appearance or bodily functioning?" The DCQ has shown strong psychometric properties, including high internal consistency, structural validity, and convergent validity with other measures as evidenced by strong positive correlations with feelings of ugliness, sadness, irritability, self-disgust and self-blame (Oosthuizen et al., 1998; Enander et al., 2018; Monzani et al., 2012; Schieber, Kollei, Zwaan, & Martin, 2018). The DCQ showed good internal consistency in the current sample ( $\alpha = 0.88$ ;  $\omega = 0.90$ ).

### 2.3. Statistical analysis

Analyses were performed in R version 4.0.0 with the Lavaan package (R Core Team, 2017; Rosseel, 2012). First, a confirmatory factor analysis utilizing the full sample of sexual minority individuals ( $N = 957$ ) was conducted to determine overall model fit and factor loadings. Individual factor loadings higher than 0.30 were considered acceptable, and loadings higher than 0.50 ideal (Comrey & Lee, 1992). Model fit was determined by calculating the standardized root mean square residual (SRMR), comparative fit index (CFI), and root mean square error of approximation (RMSEA). The model fit was deemed acceptable if two of the following three criteria were met: a value greater than 0.90 for CFI, and a value less than 0.08 for RMSEA and SRMR, though values above 0.95 for CFI and values below 0.05 for RMSEA and SRMR are preferred (Hu & Bentler, 1999).

The chi-square value was also reported, but not used to determine significance due to high sensitivity to model misspecification in large samples (Bentler & Bonnett, 1980). Normed chi-square values were additionally utilized to assess model fit, with values less than five indicating adequate fit (Schumacker & Lomax, 1996). To test factor structure invariance, a configural model was employed. Metric invariance was evaluated by constraining factor loadings to be equal, and threshold invariance was assessed by constraining item thresholds. Scalar invariance was assumed, if threshold invariance was met (Millsap & Yun-Tein, 2004).

Invariance was first tested between women and men in the sample. If these two groups were considered invariant, further race/ethnicity invariance tests would compare the White subsample against Black, Asian, and Latino subsamples, inclusive of men and women. The White subsample was chosen as the referent group given that past literature confirming validity of the DCQ has been with almost exclusively White samples (Jorgensen et al., 2001; Mancuso et al., 2010; Schieber et al., 2018). If the first model was not regarded as gender invariant, subsequent invariance tests would separate groups by both gender and race/ethnicity. Significant differences in factor loading invariance were assessed using the recommended values of  $\Delta CFI \leq -0.010$ ,  $\Delta RMSEA \leq 0.015$ , and  $\Delta SRMR \leq 0.030$  (Chen, 2007). Significant differences in threshold and scalar invariance were assessed using the recommended values of  $\Delta CFI \leq -0.010$ ,  $\Delta RMSEA \leq 0.015$ , and  $\Delta SRMR \leq 0.010$  (Chen, 2007). Change in  $\chi^2$  values was also reported, though given its sensitivity to sample size was not further interpreted.

## 3. Results

Univariate and multivariate normality were assessed to determine an appropriate estimator. Criteria put forth by Weston and Gore (2006) assumes univariate normality if skewness is  $< |3|$  and kurtosis  $< |10|$ . In the present sample, item skew ranged from  $-0.008$  to  $.593$ , while kurtosis ranged from  $-1.21$  to  $-.861$ , indicating univariate normality. Multivariate normality was assessed using criteria set forth by Byrne (2013), stating Mardia's coefficients higher than  $|5|$  are considered non-normal. In the present sample, multivariate skew was  $337.71$  and multivariate kurtosis was  $12.45$ , indicating data was not multivariate normal. Analyses to determine univariate and multivariate skew were performed in R version 4.0.0 with the MVR package (Korkmaz, Goksuluk, & Zararsiz, 2014). A robust weighted-least-squares estimator (WLSMV) was chosen to complete all analyses to account for multivariate non-normality. A weighted least squares estimator is typically appropriate for ordinal variables with less than five response options (Beauducel & Herzberg, 2006). The data were additionally assessed with a robust maximum likelihood estimator, and revealed a similar pattern of results. Results utilizing the WLSMV estimator were retained for the manuscript given its recommended use for scales with such properties.

It was determined that each subsample provided adequate power to detect invariance based on literature which has established  $N > 200$  is appropriate for multigroup CFA (Cheung & Rensvold, 2002). Alternate means to evaluate statistical power for multigroup CFA suggest ten participants per observed variable is adequate (Mueller, 1997). The number of participants in ethnic and racial subgroups ranged from  $N = 234$  to  $N = 249$  and the number of men and women sampled was  $N = 475$  and  $N = 482$ , respectively. Thus, all subgroup sample sizes were deemed large enough to conduct the proposed analyses. Missing data were listwise deleted, as is the standard in the Lavaan R package (Rosseel, 2012). Missing data accounted for less than 1% of the full sample. The aforementioned information follows best practice guidelines

**Table 1**  
Standardized Factor Loadings in Full Sample.

Item #	Standardized Factor loading
Item 1	.692
Item 2	.808
Item 3	.751
Item 4	.721
Item 5	.692
Item 6	.855
Item 7	.826

for validation of body image instruments proposed in Swami and Barron (2019).

Next, a one-factor confirmatory factor analysis was tested for the DCQ among the full sample of sexual minority individuals. This one-factor model did not fit well statistically ( $\chi^2$  [14],  $N = 957$ ) = 100.98,  $p < .001$ ; Normed  $\chi^2 = 7.21$ ), but did fit well descriptively (CFI = 0.988, RMSEA = 0.070, SRMR = 0.031). Standardized factor loadings were generally large and statistically significant for all items, with values ranging from 0.692 (item 1 and item 5) to .855 (item 6). Therefore, our hypothesis that there would be a one-factor structure was supported. All standardized individual factor loadings are reported in Table 1.

Confirmatory factor analyses among each subgroup (women, men, White, Asian, Black, and Latino individuals) were then tested. Each CFA supported a one factor model structure and showed good descriptive model fit. CFI ranged from 0.977 among the Latino sample to 0.991 among the White and Black samples. SRMR ranged from 0.033 among women and white samples, to 0.046 among the Latino sample. RMSEA ranged from 0.070 among the sample of women to 0.091 among the men. CFAs among men, Latino, and Asian groups did show RMSEA values slightly above the recommended values of 0.080, however, all models still met the criteria indicating two of three fit indices met standards for good model fit. Model fit statistics for each group CFA are reported in Table 2. Standardized factor loadings were medium-large and statistically significant for all items in each subsample, with values ranging from 0.641 (item 1 in the Latino sample) to 0.882 (item 6 in the Black sample).

Given the confirmatory factor analysis among the full sample, and the separate groups of men and women each demonstrated

**Table 2**  
Confirmatory Factor Analyses across Racial, Ethnic, and Gender Groups.

Group	$\chi^2$	Normed $\chi^2$	df	CFI	RMSEA	SRMR
Women	56.19	4.01	14	.989	.079	.033
Men	71.83	5.13	14	.984	.091	.040
White	30.58	2.18	14	.991	.070	.033
Latino	38.30	2.73	14	.977	.087	.046
Asian	39.74	2.84	14	.988	.086	.035
Black	32.16	2.30	14	.991	.075	.039

Note. RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; CFI = comparative fit index.

good descriptive model fit, invariance testing across gender were subsequently carried out. The results for all invariance testing across gender are presented in Table 3. The configural invariance model provided good descriptive model fit. The next two models examined factor loading and item threshold invariance across gender. Model fit results based on practical fit indices revealed that each  $\Delta$ CFI,  $\Delta$ RMSEA, and  $\Delta$ SRMR were smaller than the recommended cutoff (Chen, 2007). This suggests that scalar invariance was obtained, and the DCQ is invariant across gender. Given the DCQ shows measurement invariance across gender in the current sample, the following comparisons tested properties of invariance across race and ethnicity without separating groups by gender.

The results for invariance testing across ethnicity and race, comparing White and Latino, White and Black, and White and Asian sexual minority individuals are presented in Tables 4–6. Each of the three configural invariance models showed good descriptive model fit, with at least two of three model fit indices meeting established criteria for adequate fit. Models with constrained factor loadings and constrained item thresholds to assess metric and threshold invariance were subsequently examined. Each model showed changes in model fit smaller than or equal to criteria from Chen (2007), indicating invariance. Based on changes in practical fit indices in models with constrained factor loadings and item thresholds, scalar invariance can be assumed across White and Hispanic/Latino, White and Black, and White and Asian sexual minority adults in the present sample.

**Table 3**  
Model Fit Statistics Across Gender.

Model	$\chi^2$	Normed $\chi^2$	df	CFI	RMSEA	SRMR	$\Delta\chi^2$	$\Delta$ CFI	$\Delta$ RMSEA	$\Delta$ SRMR
Configural Invariance	131.80	4.71	28	.986	.088	.036	–	–	–	–
Metric Invariance	132.94	3.91	34	.987	.078	.042	1.14	.001	-.010	.006
Threshold Invariance	180.78	3.85	47	.982	.077	.037	47.84	-.005	.001	-.005

Note. RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; CFI = comparative fit index.

**Table 4**  
Model Fit Statistics Across Ethnicity (White & Latino).

Model	$\chi^2$	Normed $\chi^2$	df	CFI	RMSEA	SRMR	$\Delta\chi^2$	$\Delta$ CFI	$\Delta$ RMSEA	$\Delta$ SRMR
Configural Invariance	69.23	2.47	28	.986	.079	.033	–	–	–	–
Metric Invariance	76.96	2.26	34	.986	.073	.046	7.73	<0.001	-.006	.013
Threshold Invariance	84.33	1.79	47	.987	.058	.040	7.37	<0.001	-.014	-.006

Note. RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; CFI = comparative fit index.

**Table 5**  
Model Fit Statistics Across Race (White & Asian).

Model	$\chi^2$	Normed $\chi^2$	df	CFI	RMSEA	SRMR	$\Delta\chi^2$	$\Delta$ CFI	$\Delta$ RMSEA	$\Delta$ SRMR
Configural Invariance	70.36	2.51	28	.990	.079	.034	–	–	–	–
Metric Invariance	79.96	2.35	34	.989	.074	.042	9.60	<-0.001	-.005	.008
Threshold Invariance	91.47	1.95	47	.989	.062	.035	11.51	<-0.001	-.012	-.007

Note. RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; CFI = comparative fit index.

**Table 6**  
Model Fit Statistics Across Race (White & Black).

Model	$\chi^2$	Normed $\chi^2$	df	CFI	RMSEA	SRMR	$\Delta\chi^2$	$\Delta$ CFI	$\Delta$ RMSEA	$\Delta$ SRMR
Configural Invariance	62.67	2.24	28	.991	.072	.036	–	–	–	–
Metric Invariance	83.57	2.46	34	.988	.079	.048	20.90	–.003	.007	.012
Threshold Invariance	120.42	2.56	47	.982	.081	.038	36.85	–.006	.002	–.010

Note. RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; CFI = comparative fit index.

#### 4. Discussion

The present study investigated invariance properties of DCQ scores in a sexual minority sample, and to our knowledge, is the first study to assess measurement invariance of the DCQ scores in any sample. Given the heightened risk for body dissatisfaction and dysmorphic symptoms among sexual minority samples, it is essential to examine the utility of measures that assess these constructs. Confirmatory factor analyses among the full sample – and subsamples by race, Hispanic/Latino ethnicity, and gender – showed a unidimensional factor structure and good model fit. This replicates previous research that found a one-factor structure in non-clinical samples (Monzani et al., 2012; Schieber et al., 2018), and extends the literature by indicating the DCQ measures a single construct among sexual minorities. Results additionally showed the DCQ scores to be invariant across gender, Hispanic/Latino ethnicity, and race, demonstrating the scale measures the same construct for these subgroups.

The demographics of the current sample is a strength of the study in that it utilized a large number of racially and ethnically diverse (61.4% non-White, 24.3% Hispanic/Latino) sexual minority individuals. This allowed tests of invariance by race and Hispanic/Latino ethnicity and novel findings on the factor structure of the DCQ in non-White samples. Examining invariance properties of the DCQ among diverse groups is an important and necessary step in complete validation of the DCQ, and allows for future examination of true differences in dysmorphic concern among racially and ethnically diverse sexual minority individuals. Descriptive analyses showed that the present SM sample had a substantially higher average DCQ score ( $M = 8.78$ ) than non-clinical, and presumably mostly heterosexual, samples from previous studies ( $M = 2.8$ – $4.6$ ; Monzani et al., 2012; Mancuso et al., 2010; Schieber et al., 2018). This is in line with previous literature showing sexual minority individuals have higher rates of BDD than heterosexual individuals (Boroughs et al., 2010), and more broadly, elevated levels of body dissatisfaction (Morrison et al., 2004; Peplau et al., 2009). However, a limitation is that heterosexual individuals were not included, precluding further analyses to investigate structural invariance between heterosexual and sexual minority groups. Future studies may wish to examine the measurement invariance of the DCQ by sexual orientation. An additional limitation may be recruiting participants only within the United States. Findings on measurement invariance across gender, race, and Hispanic/Latino ethnicity in the present analyses may not generalize to countries outside the United States, and should be assessed in the future.

Given the current findings show invariance across gender, race, and ethnicity, future investigations could assess mean-level group differences on the DCQ in a sexual minority sample. Should gender, ethnic, and/or racial differences emerge in levels of dysmorphic concern, this may indicate the need for specialized outreach, prevention, and/or intervention efforts for at-risk groups. Further examinations of the DCQ should seek to replicate findings from this study, using alternate statistical methods of determining properties of invariance, perhaps using item response theory models.

In sum, the present study assessed whether the DCQ scores in a sexual minority sample demonstrate the same factor structure as previous samples, and the first known study to assess mea-

surement invariance of the DCQ scores in any sample. Overall, the findings display strong psychometric support for the unitary factor structure found in heterosexual samples, and demonstrate initial support that the DCQ can be used to compare the extent of BDD symptoms between diverse sexual minority groups. This may have important clinical implications, given sexual minority individuals have high rates of appearance-related concerns compared to the general population (Peplau et al., 2009). The current results lend initial support for use of the DCQ to potentially detect BDD symptoms among White, Black, Latino, and Asian sexual minority men and women.

#### Funding

This work was supported by the National Institutes of Health [grant number 5R25GM058906].

#### CRediT authorship contribution statement

**Kaitlin N. Rozzell:** Conceptualization, Formal analysis, Writing - original draft, Writing - review & editing. **Chelsea Carter:** Writing - original draft, Writing - review & editing. **Alexandra D. Convertino:** Formal analysis, Writing - review & editing. **Manuel Gonzales:** Funding acquisition, Writing - review & editing. **Aaron J. Blashill:** Conceptualization, Funding acquisition, Writing - review & editing, Supervision.

#### Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.bodyim.2020.08.010>.

#### Declaration of Competing Interest

The authors declare that they have no conflict of interest.

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