Development and validation of a new Italian short measure of disgust propensity: The Disgust Propensity Questionnaire (DPQ)

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Abstract

Although a few measures of disgust propensity (DP) are available in Italy, most of them take a long to administer and/or have not shown replicable and sound psychometric properties. In the present study, the authors developed an Italian 9-item self-report measure of DP, the Disgust Propensity Questionnaire (DPQ), to address the limitations of currently available measures. In Study 1, the DPQ was developed through exploratory and confirmatory factor analyses from an initial pool of 33 items that were administered to 784 non-clinical participants. The DPQ showed evidence of an adequate factorial and construct validity as well as internal consistency and temporal stability. In Study 2, additional evidence of the sound psychometric properties of the DPQ was provided by analysing an independent sample of 315 non-clinical participants and a sample of 208 patients with obsessive compulsive-disorder (OCD). This study also showed that the DPQ can discriminate between OCD patients with and without contamination-related concerns, patients with anxiety disorders and non-clinical participants.

Keywords: disgust propensity, assessment, measure, self-report

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Key practitioner message

- An Italian 9-item self-report measure of disgust propensity was developed to address the limitations of currently available tools.
- The Disgust Propensity Questionnaire (DPQ) was evaluated using two independent studies in non-clinical and clinical samples.
- The DPQ showed adequate factorial and construct validity, internal consistency and temporal stability.
- It could discriminate between OCD patients with contamination-related concerns and all other groups.
- It is a very short and psychometrically sound measure to assess disgust propensity in Italian samples.

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Introduction

Although Ekman, Sorenson and Friesen (1969) included disgust among the six “basic” emotions that can be cross-culturally recognised, it has been described as the “forgotten emotion” in experimental psychopathology (Phillips, Senior, Fahy, & David, 1998). In the last two decades however, a growing number of studies have investigated its relevance and correlates, and disgust is now considered an important emotion in the aetiology of various psychological disorders, including phobias (Matchett & Davey, 1991; Sawchuk, Lohr, Tolin, Lee, & Kleinknecht, 2000) and eating disorders (Troop, Murphy, Bramon, & Treasure, 2000).

The disgust emotion

Research has supported the role of disgust in the development and maintenance of contamination fear, a common symptom of obsessive-compulsive disorder (OCD; Davey, 2011; Olatunji, Sawchuk, Lohr, & de Jong, 2004; Schienle, Stark, Walter, & Vaitl, 2003). Previous studies have found significant associations between disgust propensity and obsessive-compulsive washing even when indicators of negative affect were controlled (Davey & Bond, 2006; Melli, Bulli, Carraresi, & Stopani, 2014; Melli, Chiorri, Carraresi, Stopani, & Bulli, 2015a; Melli et al., 2015; Olatunji et al., 2007). Longitudinal studies also supported an association between disgust propensity and contamination concerns (Olatunji, 2010). Behavioural studies have shown that disgust proneness mediates the association between contamination fear and avoidance of repulsive stimuli (Deacon & Olatunji, 2007; Olatunji, Lohr, Sawchuk, & Tolin, 2007). Reduced disgust propensity is additionally associated with improvement in contamination/washing symptoms in OCD when negative affect levels are controlled (Athey et al., 2015; Olatunji, 2010). Finally, there is evidence that disgust avoidance is one of the main motivational dimension of contamination fear (Melli, Chiorri, Carraresi, Stopani, & Bulli, 2015b).

Although disgust was originally conceptualized in the context of contaminated food (Rozin, Fallon, & Mandell, 1984), subsequent research extended the definition of the construct to include a broader range of contextual elicitors (Haidt, McCauley, & Rozin, 1994; Rozin, Haidt, & McCauley, 2008). In particular, Rozin and Fallon (1987) as well as Haidt et al. (1994) specifically described a specific disgust subtype, called “core disgust”, which is directed to three basic kinds of stimuli: food, animals and body fluids. Animal reminder disgust (i.e., feelings of disgust induced by triggers which remind the animal nature of human beings, such as: sex, death, deformity, hygiene, etc.) was later added to the definition (Rozin, Lowery, & Ebert, 1994; Rozin et al., 2008). A socio-moral disgust has also been proposed. It is induced by a moral violation that makes the person disgusting because of her/his inhuman behaviour (Haidt , Rozin, McCauley, & Imada, 1997; Rozin et al., 2008).

Research on the role of disgust in psychopathology (Woody & Tolin, 2002) has moreover raised the need to make a distinction between trait-disgust (a general tendency to become disgusted) and state-disgust (the feeling elicited by disgusting triggers). Cavanagh and Davey (2000) specifically suggested that trait-disgust is formed by two personality traits: “disgust propensity” (referring to the frequency and intensity of experiencing disgust in specific situations) and “disgust sensitivity” (concerning perceived harmful or distressing consequences of experiencing disgust). The term “disgust sensitivity” has unfortunately been used with the same meaning as “disgust propensity” (e.g., Rozin et al., 2008) for a long time and this has contributed to the confusion about the operational definition of the construct.

Measures of disgust propensity

To the best of our knowledge, the first measure of disgust propensity to emerge from research literature was the Disgust Questionnaire (DQ; Rozin et al., 1984), which was developed to assess similarities and differences between children and parents attitudes toward specific foods. Of the three sections of the questionnaire, the one about disgust propensity included 24 items rated on a 9-point Likert-type scale. There is a paucity of published studies examining the psychometric properties of the DQ (i.e., Merckelbach, de Jong, Arntz, & Schouten, 1993; Mulkens, de Jong, & Merckelbach, 1996), and the tests of the validity of this measure are largely limited to studies assessing the association between disgust propensity and specific phobias (i.e., Arrindell, Mulkens, Kok, & Vollenbroek, 1999; Mulkens et al., 1996). Another important limitation of this scale is that it only assesses the degree of disgust toward some specific foods.

The Disgust Scale (DS; Haidt et al., 1994) has been developed to address the content limitations of the DQ, and it is a self-report scale which assesses disgust propensity across eight domains: (a) spoiled food; (b) slimy animals; (c) body products, including body odors, faeces and mucus; (d) body violation or mutilation; (e) death and dead bodies; (f) sex, including culturally deviant sexual behaviours; (g) lack of hygiene; (h) sympathetic magic which involved stimuli without infectious qualities that resemble contaminants (e.g., faeces-shaped candy). The DS consists of 32 items, equally split into two sections. The first section assesses avoidance behaviours and emotional reactions to disgust elicitors, and the response format is true-false. The second section includes disgust scenarios and participants are asked to rate the degree of disgust experienced on a 3-point Likert-type scale (not-slightly-very). The main limitation of this scale is the absence of a comprehensive examination of its psychometric properties and the only validation study (Haidt et al., 1994) reported poor internal consistency of the eight subscales (Cronbach's alphas ranged from .27 to .63 in two independent samples). Moreover, there are limited data about test-retest reliability and some studies have questioned the discriminant validity of the DS (Davey & Bond, 2006).

Olatunji and coworkers (2007) developed a revised version of the DS, called Disgust Scale-Revised (DS-R), consisting of 25 items rated on a 5-point Likert-type scale. The examination of its psychometric properties has yielded empirical evidence for a three-factor structure of the scale (Core Disgust, Animal Reminder Disgust, and Contamination-Based Disgust), adequate internal consistency and adequate construct validity (Olatunji et al., 2007; Olatunji, Ebesutani, Haidt, & Sawchuk, 2014; Overveld, de Jong, Peters, & Schouten, 2011). The Italian version of the DS-R

(Melli, Chiorri, & Smurra, 2013) showed adequate psychometric properties in terms of internal consistency and construct validity, but a one-factor structure was found to be a more parsimonious measurement model than the three-factor structure proposed by Olatunji et al. (2007). Moreover, the scale is relatively long and participants often find its items odd, since some of the situations described appear to be unrealistic (e.g., the item about the flyswatter) or unlikely (e.g., the item about sleeping in the hotel room where a man died the night before), thus potentially undermining the face validity of the scale.

Other measures of disgust include the Disgust Emotion Scale (DES; Walls & Kleinknecht, 1996) and the Disgust Propensity and Sensitivity Scale (DPSS; Cavanagh & Davey, 2000). The DES assesses disgust propensity across five domains: animals, injection and blood draws, mutilation and death, rotting foods and smells. Participants are asked to rate their degree of disgust or repugnance for each of the 30 items, using a 5-point Likert-type scale. Studies have shown that the DES total score has very good internal consistency (e.g., Kleinknecht, Kleinknecht, & Thorndike, 1997; Sawchuck et al., 2000). Olatunji, Sawchuk, de Jong, and Lohr (2007) and Muris et al. (2012) found evidence that the proposed five-factor structure was replicable by studying university students and children aged 8-12 respectively. Olatunji, Ebesutani, and Reise (2012) have however recently examined the degree to which these components yield reliable scores that are distinct from a general disgust dimension using bifactor models and have found that subscales reliability significantly drops when accounting for such general factor. This general factor was also significantly associated with an OCD symptom latent factor and with an OCD Washing Concern latent factor, suggesting that the assessment of a generalized disgust proneness is likely to be sufficient in predicting OCD, but not necessarily other symptoms, such as fears, for which specific subscales could be more useful. Mixed or no evidence was nevertheless found for the reliability or validity of the subscales.

The DPSS is the only published measure designed to assess both disgust propensity and disgust sensitivity. This 32-item questionnaire has shown good psychometric properties, with a good internal consistency and good convergent validity (Cavanagh & Davey, 2000; Davey & Bond, 2006). Van Overveld, de Jong, Peters, Cavanagh and Davey (2006) examined its psychometric properties in a large Dutch sample and, based on data-driven considerations, developed a revised scale (DPSS-R) composed by 16 items. The DPSS-R has shown good psychometric properties in the examination carried out in the Dutch sample (van Overveld et al., 2006) as well as in an American sample (Olatunji, Cisler, Deacon, Connolly, & Lohr, 2007), but the two factor structure was not replicated in the two studies. Fergus and Valentiner (2009) proposed a further shortened version (12 items) of the DPSS-R, which was developed by removing problematic and unreliable items that in the previous studies loaded on different factors. This version of the scale showed a satisfying fit to data in the Fergus and Valentiner's study, but more recently Goetz, Cougle, and Lee (2013) could not replicate the expected two-factor structure. They Instead found that a three-factor measurement model (disgust propensity, disgust sensitivity, and self-focused/ruminative disgust) provided the best model fit compared to the other alternative models for the DPSS-R. The DPSS-R is somehow unique as it does not rely on specific elicitors, but it is designed to index an individual's tendency in a way that is generalizable across diverse contexts. Because of this, the items of this scale that assess disgust propensity are very generic (e.g., “I avoid disgusting things”, “I experience disgust”) and do not offer examples of specific disgusting triggers. Hence, it is not clear to which definition of disgust examinees refer to when they are asked to report about the frequency with which they experience it. Moreover, the three-factor structure was observed in non-clinical samples and there is no evidence so far of its being replicable in clinical samples with relevant psychiatric conditions (e.g., OCD).

Tybur, Lieberman, and Griskevicius (2009) have more recently developed a multidimensional measure of disgust sensitivity, the Three-Domain Disgust Scale (TDDS). It is a 21-item self-administered measure which assesses the pathogen domain (i.e., avoidance of infectious microorganisms), the sexual domain (i.e., avoidance of costly sexual behaviours), and the moral domain (i.e., social avoidance of antisocial norm violators). Tybur et al. (2009, 2011) provided evidence of the three-factor measurement model's robustness and of the TDDS's construct validity. A study by Olatunji et al. (2012), however, pointed out that the pathogen disgust scale involves cockroaches, body odour, or mould, thus reflecting a fear of contact with disgust stimuli rather than of the spreading of disease due to contact. They also found that the moral disgust scale was unrelated to disgust proneness, as assessed by the DS-R, and suggested that moral transgressions may not be accurately assessed on the same disgust spectrum as other repugnant stimuli. Finally, TDDS's scores significantly dropped over a 12-week period, thus raising issues about the stability of any individual differences that may be observed on the TDDS and whether the TDDS is a trait or state measure.

Given the shortcomings of existing measures and the lack of a short, valid, and reliable measure that can be confidently employed in Italian clinical and research settings to assess disgust propensity, this study was aimed at developing and validating a psychometrically sound Italian self-report measure of disgust propensity, called the Disgust Propensity Questionnaire (DPQ).

Study 1

The aims of this study were: (1) to develop an initial item pool, to administer it to a large sample of participants and to refine the questionnaire until a short, internally-consistent scale was obtained and (2) to test its construct validity. Although, as noted earlier, disgust propensity and contamination fear are strictly related, they cannot be considered as overlapping, since fears of contamination include also washing/cleaning compulsions that are motivated by other feelings (e.g., anxiety) and not necessarily by disgust. Hence, it was expected that the score on the new measure would be more correlated with another established measure of disgust propensity, such as the DS-R (convergent measure), than with measures of contamination-based OCD, anxiety and depression symptomatology (discriminant measures).

Method

Item development

A preliminary version of the DPQ was designed according to recommendations for scale development (Furr, 2011) and consisted of thirty-three items generated by the authors of this paper on the basis of a literature review, their expert knowledge and clinical experience, and patients' reports. The apparent peculiarity of some items (e.g., "Even if I was hungry, I would not drink a bowl of my favourite soup it if had been stirred with a used but thoroughly washed flyswatter") is a potential issue with the DS-R as it could jeopardize the face validity of the scale. We therefore tried to develop items that describe common life circumstances in which an Italian person could experience disgust. The scenarios involve animal stimuli (e.g., finding a dead cockroach next to one's own slippers), body fluids' triggers (e.g., stepping on a spit while walking in the street), dirty person triggers (e.g., shaking hands with someone with dirty nails), and triggers associated to death (e.g., touching a dead person). These initial items were then sent, along with a definition of the construct, to six graduate students in clinical psychology and to a group of experts in clinical psychology and psychometricians not otherwise involved in the study. They were all asked to provide feedback on the degree to which the items were relevant to and representative of the construct (Haynes, Richards & Kubany, 1995) and on the readability and comprehensibility of the items. Following the feedbacks, some items were amended to improve clarity, specificity and relevance.

The final DPQ item pool consisted of thirty-three items[1]. No reverse-scored items were included. Reverse items can produce artifactual response factors consisting exclusively of negatively worded items and this seems especially true for children (Benson & Hocevar, 1985), preadolescents (Marsh, 1986), students (Barnette, 1996) and adults with lower educational levels

[1] The complete set of items is available upon request to the corresponding author.

(Melnick & Gable, 1990). We chose not to include reverse items as we aimed to have a large as possible target population, which possibly included these categories.

The DPQ instructions were: “Below you will find some common hypothetical situations. Please rate how much disgust you would feel if you would find yourself in each of the following situations using a number between 0 and 4, where 0 = not at all, 1 = a little, 2 = moderately, 3 = much and 4 = very much”.

Participants

A group of 784 Italian community participants took part to Study 1. Sampling was based on the "snowball" method. Volunteers were solicited by undergraduate students to participate in the study and were encouraged to recruit their acquaintances to participate as well. To be included in the study, they had to be at least 18 years old, have at least a primary school education, and report having never received a diagnosis or treatment for a psychiatric disorder. Demographic information about the sample is reported in Table 1.

[Table 1]

All participants completed the DPQ. A subgroup of 141 participants accepted to complete also a series of questionnaire described in the Measures section; another subgroup of 95 participants completed the DPQ twice at a 4-week interval and their data were used to test temporal stability of scores. Socio-demographic characteristics of these subgroups were similar to those of the full group.

Measures

In addition to the 33-item DPQ (described above), the following measures were used in this study.

Disgust Scale-Revised (DS-R; Olatunji et al., 2007). This 25-item scale assesses disgust propensity asking participants to rate their agreement with each of the 25 items on a 5-point Likert-type scale ranging from 0 (“completely disagree”) to 4 (“completely agree”). The Italian DS-R (Melli et al., 2013) has been found to be unidimensional, with very good internal consistency (α =

.88) and test-retest reliability (ICC = .91), and adequate construct validity (r = .40 with Obsessive Compulsive Inventory-Revised Washing [OCI-R] subscale, correlations from -.04 to .22 with the other OCI-R subscales).

Vancouver Obsessive Compulsive Inventory-Contamination scale (VOCI-C; Thordarson et al., 2004). The VOCI-C is a 12-item subscale of the VOCI that assesses fears of contamination and washing urges. Participants are asked to rate how much each item is true of them on a 5-point Likert-type scale from 0 (“not at all”) to 4 (“very much”). The Italian validation of the VOCI (Chiorri, Melli, & Smurra, 2011) reported for the VOCI-C adequate internal consistency (α = .83), test-retest reliability (r = .92), and convergent validity with the Padua Inventory-Becoming contaminated scale (r = .48).

Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a 21-item self-report questionnaire designed to assess the presence and severity of the affective, cognitive, motivational, psychomotor, and vegetative components of depression. Each item presents four statements about a specific symptom of depression arranged in order of severity. Participants are asked to choose the statement that most closely matches how they have felt in the last two weeks. Statement choices are scored from 0 (“absent”) to 3 (“severe”). The Italian version of the BDI-II (Sica & Ghisi, 2007) has been found to have a one-factor structure, good internal consistency (α = .87) and test-retest reliability (r = .76).

Beck Anxiety Inventory (BAI; Beck & Steer, 1990). The BAI is a 21-item self-report inventory that assesses the severity of state anxiety. Participants are asked to rate how much they have been bothered by the symptom described by each item during the past month on a 4-point Likert-type severity scale from 0 = “not at all” to 3 = “severely”. A series of studies has shown that the Italian version of the BAI has a one-factor structure, good internal consistency (α > .80), adequate test-retest reliability (r > .62), and good construct validity (Sica, Coradeschi, Ghisi, & Sanavio, 2006; Sica & Ghisi, 2007).

Procedure

All participants volunteered to take part in the study after being presented with a detailed description of the procedure, signed a written informed consent and were treated in accordance with the Ethical Principles of Psychologists and Code of Conduct (American Psychological Association, 2010). Questionnaires were administered in a single session at the premises of a department of psychology in a North-Western Italian university, with the supervision of trainee psychologists. The scales used for testing construct validity were administered in counterbalanced fashion to control for order and sequence effects. Administration time ranged from 4 to 8 minutes for the DPQ only and from 25 to 40 minutes for the battery.

Results

Item reduction

The sample was randomly divided into two groups (G0 and G1) using the SPSS 20.0 "Random sample of cases" function (option "Approximately 50% of all cases"). We then conducted an exploratory factor analysis (EFA) using data from G1 (n = 388). In order to determine the optimal number of factors to retain, we performed a dimensionality analysis using the *psych* package (Revelle, 2015) in R (R Core Team, 2014). We considered the scree-plot and results from Parallel Analysis (PA; Horn, 1965) and Minimum Average Partial Correlation Statistic (MAP; Velicer, 1976). The scree-plot clearly suggested a 1-factor solution (first ten eigenvalues: 11.86, 2.24, 1.82, 1.60, 1.27, 1.16, 1.03, 0.95, 0.92, 0.75), the ratio of the first to the second eigenvalues was greater than 2 (i.e., 5.29; Hattie, 1985) and the solution explained 36% of variance. Both PA and MAP suggested to extract 4 factors. We thus performed EFAs (Principal Axis Factoring) setting the number of factors to extract from 1 to 4 (Oblimin rotation). The 33 items all loaded on the single factor (factor loadings ranged from .27 to .74). The 2-, 3- and 4-solutions showed some evidence of simple structure, but they revealed very high factor correlations (they ranged from .63 to .74) that suggested that additional factors might have a very limited discriminant validity. In fact, factor interpretation was problematic, as item grouping did not appear to be due to a clear common content, but rather to some non-construct specificity (e.g., common wording). We then concluded that items were more likely to reflect a single latent construct, although with redundancies.

In a subsequent confirmatory factor analysis (CFA) performed on the other random subsample (G2, $n = 396$) we specified a single latent variable defined by all the 33 items of the initial item pool. Given the relative non-normality of the distribution of the item scores (skewness ranged from -.60 to .79, median = -0.04; kurtosis ranged from -1.05 to -0.26, median = -.85) maximum likelihood parameter estimates with standard errors and a chi-square test statistic that are robust to non-normality were obtained with the MLR estimator available in Mplus 7 (Muthén & Muthén, 1998-2012). Following Marsh, Hau, and Wen (2004) we considered values ≥ .90 as acceptable and ≥ .95 as optimal for TLI and CFI, and values ≤ .08 as acceptable and ≤ .06 as optimal for RMSEA. The use of multiple indices provides a conservative and reliable evaluation of model fit relative to the use of a single-fit index.

The single-factor model had a very poor fit ($\chi^2(494) = 2339.01$, p <.001, CFI = .691, TLI = .670, RMSEA = .097 [.093-.101]). We thus examined modification indices for correlated uniquenesses (error variances). A high modification index for these parameters indicates that a substantial amount of covariance between two items is not accounted for by the latent variable, but may be due to other causes (e.g., the abovementioned non-construct specificity). Hence, as suggested by Brown (2006), we identified those pairs of items with the highest modification indices and retained the ones that referred to a situation more likely to be experienced by participants and/or had a less skewed and/or kurtotic distribution of scores. For instance, in the first CFA model tested we found that the highest modification index for correlated uniquenesses was the one for items 18 ("To carry away a dead mouse that you found in your home") and 19 ("To find some worms in your pantry"). In this case the authors discussed each item to reach a consensus, so that an item was selected only when it was unanimously agreed that it would be included. For instance, the authors agreed to exclude item 18 since it is more likely that a person can experience the situation described in item 19. We then re-tested the model with the remaining 32 items, and, since the fit was still not adequate ($\chi^2(463) = 2198.66$, p <.001, CFI = .699, TLI = .677, RMSEA = .097 [.093-.101]), we re-examined the modification indices for correlated uniquenesses, and found that the highest modification index was the one for items 26 ("To find some hairs on bed sheets in a hotel") and 17 ("To find someone else's hair in your dish"). Item 17 was retained as the situation can be considered more likely. Following this procedure, we excluded further 20 items. Two more items were excluded since they showed low discriminativity, as indexed by a corrected item-total correlation lower than .20. The final item pool of 9 items (see Table 2)[2] had adequate fit ($\chi^2(27) = 68.88$, p <.001, CFI = .959, TLI = .945, RMSEA = .063 [.045-.079]) and the factor score determinacy (FSD, i.e., a validity coefficient that informs about the correlation between the factor score estimate and its respective factor; Grice, 2001) was .93. According to Gorsuch (1983), a FSD higher than .80 indicates an acceptably small magnitude of indeterminacy. As in applied assessment and clinical settings the unit-weighted sum-of-item score (i.e., scale observed score) is almost always used, we computed the correlation of this score with the factor score estimated by the CFA model, which was .99. This result suggests a nearly perfect overlap of the two scores.

Item analyses and reliability

Item descriptive statistics, item analyses and standardized factor loadings from the confirmatory factor analysis are reported in Table 1 and Table 2.

[Table 2]

The 9-item DPQ showed adequate internal consistency (α = .85), mean inter-item correlation (in the .40-.60 range recommended for specific constructs; Clark & Watson, 1995), mean corrected item-total correlation (i.e., higher than .20; Nunnally & Bernstein, 1994), mean squared multiple correlation (i.e., more than 10% of the variability in the responses in each item could be predicted from the responses on other items) and factor loadings on the single factor (i.e., higher than .30). No alpha-if-item-deleted value was higher than the Cronbach's alpha.

[2] The scale has been translated into English through a mixed forward- and back-translation procedure. It is available for further validation studies free of charge from the corresponding author.

As stated above, 95 participants completed the retest after a 4-week interval. Temporal stability of the DPQ scores was assessed through the intraclass correlation coefficient (ICC), which was computed as single measure using a two-way random effect model with an absolute agreement definition (McGraw & Wong, 1996). The findings indicated that DPQ scores were stable over the 4-week interval (ICC = .85, 95% confidence interval .78-.90; Time 1 α = .85, Time 2 α = .85). A paired-sample *t*-test also revealed that the mean difference of scores from Time 1 (M = 18.65, SD = 6.68) to Time 2 (M = 18.25, SD = 7.12) was not statistically different from zero ($t(94) = 1.024$, p = .308, d = .06).

Construct validity

The $Z_{contrast}$ test (Meng, Rosenthal, & Rubin, 1992; Westen & Rosenthal, 2003) was used to test the construct validity of the DPQ.

[Table 3]

Using contrast coefficients, we then tested whether the correlation between DPQ and DS-R (convergent validity) was higher than that with all other measures taken as a whole (discriminant validity). This test was significant (Z = 7.28, p < .001). Further *Z*-contrasts that tested whether the correlation between DPQ and DS-R was stronger than the correlation between DPQ and each of the other measures, were also significant (VOCI-C: Z = 3.69, Bonferroni-Holm-adjusted-*p* [BH-adj-*p*] < .001; BDI: Z = 7.72, BH-adj-*p* < .001; BAI: Z = 6.42, BH-adj-*p* < .001). The association of DPQ with the DS-R (partial r = .68, p < .001) and with the VOCI-C (partial r = .37, p < .001) remained significant also after using BAI and BDI scores as control variables. The correlation between DPQ and DS-R was .69 and they showed highly similar associations with the other measures of psychopathology (.42 and .41 with contamination [Z = 0.14, BH-adj-*p* = .890]; .01 and -.01 with depression [Z = 0.18, BH-adj-*p* = .890]; .15 and .21 with anxiety [Z = -0.57, BH-adj-*p* = .890]). This suggested that the DPQ basically measures the same construct as the Italian version of the DS-R, but with one third of the items.

Association with demographic variables

The association of DPQ scores with demographic variables was tested through a general linear model that specified gender, age, years of education, marital status and occupation as predictors. Interactions effects among factors (gender, marital status and occupation) were not specified. No significant effects were found, except a small effect of marital status (F(3,771) = 3.195, p = .023, η^2 = .01). However, after the BH-correction for multiple comparisons, no post-hoc comparisons were significant, suggesting that the effect can be considered negligible - as suggested also by the very small effect size.

Study 2

In Study 1 the process of refinement of the scale was data-driven, since it relied on modification indices. The measurement model for the DPQ items was developed on a random subsample and then replicated on another random subsample. Although the observations of the two subsamples could formally be considered as independent, they were collected with the same sampling procedure. Hence, we could not fully rule out the possibility that we capitalized on chance characteristics of the total sample, thus jeopardizing the generalizability of results (e.g., MacCallum, Roznowski, & Necowitz, 1992).

The first aim of this study was to test whether the factor structure of the DPQ could be replicated in an (actually) independent sample of non-clinical participants recruited in a different geographical region. In this sample we also further assessed DPQ discriminant validity with a different measure of obsessive-compulsive symptoms, the Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002). In Study 1, evidence for discriminant validity with contamination fear and washing symptoms was found, but DPQ discriminant validity with the other dimensions of OCD was not tested. Olatunji et al. (2007) found that the DS-R total score was significantly correlated not only with OCI-R-Washing (r = .45), but also, although to a lesser extent, with Checking (r = .35), Ordering (r = .26) and Neutralizing (r = .19), while the correlations with the other two subscales of OCI-R were negligible (Obsessing: r = -.07; Hoarding: r = .12). Hence, it was expected to find a similar pattern of results, replicating Melli et al. (2013)'s results on the Italian version of the DS-R.

The second aim of this study was to confirm the adequacy of the one-factor structure of the DPQ in a sample of OCD participants. We tested the construct validity of the DPQ also in this sample using measures of OCD symptomatology, depression and anxiety. We hypothesized that the correlation of DPQ scores with measures of contamination obsessions and washing compulsions would be higher than those with measures of other OCD dimensions, depression and anxiety.

The third aim of this study was to examine group differences on the DPQ score between OCD participants with and without washing concerns, patients with other anxiety disorders (OAD) and non-clinical participants with no previous psychological diagnosis. Since previous research has suggested that disgust domains related to contagion may have a specific association with contamination obsessions and washing compulsions (e.g., Olatunji, Williams, Lohr, & Sawchuk, 2005), we expected that DPQ scores of patients with OCD who have washing concerns would be higher than those of patients with OCD who do not have washing concerns, of patients with OAD and of non-clinical participants. This result would be consistent with the prediction that disgust domains may be associated (but not fully overlapped) with contamination obsessions and washing compulsions.

Method

Participants

In Study 2 we enrolled 554 adult participants, including 208 diagnosed with OCD, 31 diagnosed with other anxiety disorders (OADs) and 315 non-clinical participants (NCP) recruited from the Italian general population. The recruiting procedure and the inclusion criteria for the non-clinical sample were the same of Study 1, except that the non-clinical participants were recruited in urban and surrounding areas of a middle-size city in Central Italy.

OCD and OAD participants were referred to an Italian private center for adult psychotherapy for evaluation and treatment. Participants were excluded if they were under 18 years old. The presence of psychosis, current mania, and/or substance dependence were other exclusionary criteria. During the routine assessment phase clinical participants were interviewed by one of the members of authors' research team (all were doctoral-level psychologists experienced in diagnosing psychiatric disorders) using the Anxiety Disorder Interview Schedule IV (ADIS-IV; Brown, Di Nardo, & Barlow, 1994) to establish diagnoses. Each case was audio-recorded and carefully reviewed in supervisory meetings, and all diagnoses were confirmed by second-rater consensus. All participants in the OAD group met the DSM–IV–TR (American Psychiatric Association, 2000) criteria for at least one anxiety disorder (primary diagnoses were Social Phobia [*n* = 12], Panic Disorder [*n* = 13], or Generalized Anxiety Disorder [*n* = 6]). An exclusionary criterion for those in the OADs group was the presence of sub-clinical levels of OCD. Participants who met the diagnostic criteria for OCD as a primary diagnosis were administered the Yale-Brown Obsessive-Compulsive Scale-Second Edition Symptoms Checklist (Y-BOCS-II-SC; Storch et al., 2010; Italian version in Melli et al., 2015) and they were divided into two subgroups for the purposes of determining the criterion validity of the scale. Those who reported contamination-related symptoms or concerns as a primary complaint (*n* = 53) were assigned to the OCD Contamination (OCD-C) sub-group; participants who met the diagnostic criteria for primary OCD, but who did not report contamination-related symptoms or concerns as primary complaint (*n* = 155) were assigned to the OCD Non-Contamination (OCD-NC) sub-group.

Demographic characteristics of all participants are reported in Table 1.

Measures

9-item Disgust Propensity Questionnaire (DPQ). As described in Study 1.

Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002). The OCI-R is a brief 18-item self-report questionnaire designed to assess obsessive-compulsive symptom presence and distress. Participants are asked to rate each item on a 5-point Likert-type scale, from 0 (“not at all disturbed”) to 4 (“extremely disturbed”). The OCI-R provides a total score and scores in six different subscales: washing (WAS), checking (CHK), ordering (ORD), obsessing (OBS), hoarding

(HOA), and mental neutralizing (MNT). The Italian version of the OCI-R has replicated the six-factor structure of the original version and demonstrated good internal consistency (α = .85) and excellent test-retest reliability (r = .93) for the total score, and adequate internal consistency (α's = .60-.80) and test-retest reliability (r's = .76-.99) for each subscale (Sica et al., 2008).

Dimensional Obsessive-Compulsive Scale (DOCS; Abramowitz et al., 2010). The DOCS is a 20-item scale that assesses the main obsessive-compulsive symptom dimensions of OCD, namely contamination obsessions and washing/cleaning compulsions (CNT); obsessions about responsibility for causing harm and checking compulsions (RSP); obsessions about order and symmetry and ordering/arranging compulsions (SYM); repugnant obsessional thoughts and mental compulsive rituals or other covert neutralizing strategies (UNT). Within each symptom dimension, items are rated on a 5-point Likert-type scale ranging from 0 (“no symptoms”) to 4 (“extreme symptoms”). The Italian version of the DOCS (Melli et al., 2015) has replicated the four-factor structure of the original version in both clinical and non-clinical samples and showed adequate internal consistency (α > .80 in all subscales), temporal stability (ICC > .75 in all scales), and construct validity.

Beck Depression Inventory-II (BDI-II; Beck et al., 1996). As described in Study 1.

Beck Anxiety Inventory (BAI; Beck & Steer, 1990). As described in Study 1.

Procedure

In addition to the 9-item DPQ, participants in the NCP group completed the OCI-R. OCD participants also completed the BDI-II and the BAI, the OCI-R and the DOCS. OAD participants completed only the DPQ. All participants were administered the questionnaires in a single session at the premises of a psychotherapy institute in Central Italy, with the supervision of trainee psychologists. Depending on the number of scales to be filled in, administration time could range from 5 to 30 minutes. The scales were administered in a randomized order to control for order and sequence effects.

Results

Factor structure and item analysis

Following the criteria reported in Study 1, in the NCP sample the unidimensional model showed an adequate fit ($\chi^2(27) = 64.85$, *p* <.001, CFI = .962, TLI = .950, RMSEA = .067 [.056-.078]), the FSD was .95 and the correlation between raw scores and factor scores was 1.00. With the exception of the RMSEA, fit indices were adequate also in the OCD sample ($\chi^2(27) = 86.15$, *p* <.001, CFI = .933, TLI = .910, RMSEA = .103 [.079-.127]). The FSD was .96 and the correlation between raw scores and factor scores was .99. Subsequent fit diagnostic evaluation indicated that the points of ill fit pertained to the error covariances of Items 3 and 6. Examination of Item 3 content (i.e., “To see a drop of saliva from another person that reaches you during a conversation”) suggested that the item contained a similar focus on oral excretions such as Item 6 (i.e., “To hear someone coughing and excreting some snot”). Since this was the highest modification index pertaining to error covariances, the CFA model was respecified correlating the uniquenesses of the item pair. The revised model provided a better and adequate fit to the data ($\chi^2(26) = 65.16$, *p* <.001, CFI = .955, TLI = .938, RMSEA = .085 [.059-.111]). The FSD was .96 and the correlation between raw scores and factor scores was .99. As a further check, we explored alternative explanations for this finding. First, we looked for multivariate outliers in the DPQ data using the mvoutlier package in R (Peter Filzmoser & Gschwandtner, 2014), but none of the methods implemented in this package consistently identified some cases as outliers. Next, to investigate the possibility that model fit could be improved by specifying more factors, we conducted an EFA on the same data and considered the scree-plot and results from PA (Horn, 1965) and MAP (Velicer, 1976). The scree-plot (first eigenvalues: 5.18, 0.81, 0.72, 0.53, 0.48, 0.38, 0.34, 0.30, 0.27), PA and MAP clearly suggested a 1-factor solution, and it accounted for 52% of variance. This suggests that the RMSEA was not impaired because the type and number of factors for the clinical sample were different from the factor structure in the NCP sample. Given these findings, and considering that other fit indices consistently indicated a good fit, we concluded that the single-factor model had acceptable fit in the clinical sample.

As in Study 1, item analysis statistics revealed adequate internal consistency, mean inter-item correlation, corrected item-total correlations, squared multiple correlations, and alpha without the item in the NCP group and in all patients groups (OCD and OAD) and subgroups (OCD-NC and OCD-C). Factor loadings on the single factor in the NCP and OCD groups were always higher than .30 (see Table 2).

Construct validity

In the NCP group, we found a pattern of correlations of the DPQ with the scales of the OCI-R (Table 4) very similar to that of the DS-R (Melli et al., 2013; Olatunji et al., 2007).

[Table 4]

The highest correlation was, as expected, the one with the OCI-R-Washing subscale, but significant weak correlations were also found with the other OCI-R subscales. The $Z_{contrast}$ test that compared the correlation between DPQ and OCI-R-Washing against the correlation between DPQ and the other OCI-R subscales, taken as a whole, was significant (Z = 5.14, p < .001). $Z_{contrast}$ tests that compared the correlation between DPQ and OCI-R-Washing against each single correlation between DPQ and the other OCI-R subscales were also significant (OBS: Z = 4.72, BH-adj-p < .001; HOA: Z = 4.75, BH-adj-p < .001; ORD: Z = 2.75, BH-adj-p = .006; CHE: Z = 2.77, BH-adj-p = .006; NEU: Z = 4.91, BH-adj-p < .001).

Correlations of the DPQ with other measures of OCD symptomatology, depression and anxiety in the OCD group are reported in Table 5.

[Table 5]

We tested whether the correlations between DPQ and DOCS-Contamination and between DPQ and OCI-R-Washing were higher than those between DPQ and all other measures. This comparison was statistically significant (Z = 9.17, p < .001). We then performed $Z_{contrast}$ tests to see whether the correlation between DPQ and DOCS-Contamination was larger than the correlation between DPQ and each of the other measures. All comparisons were significant (DOCS-RSP: Z = 5.95, BH-adj-p < .001; DOCS-UNT: Z = 6.74, BH-adj-p < .001; DOCS-SYM: Z = 3.51, BH-adj-p = .001; OCI-R-OBS: Z = 5.84, BH-adj-p < .001; OCI-R-HOA: Z = 5.27, BH-adj-p < .001; OCI-R-ORD: Z = 2.38, BH-adj-p = .019; OCI-R-CHE: Z = 2.89, BH-adj-p = .005; OCI-R-NEU: Z = 3.99, BH-adj-p < .001; BDI: Z = 4.46, BH-adj-p < .001; BAI: Z = 4.34, BH-adj-p < .001) except for the OCI-R-Washing one (Z = 0.97, BH-adj-p = .333). The same result was obtained when we compared the correlation between DPQ and OCI-R-Washing with the correlations between DPQ and each of the other measures (DOCS-RSP: Z = 6.93, BH-adj-p < .001; DOCS-UNT: Z = 7.72, BH-adj-p < .001; DOCS-SYM: Z = 4.48, BH-adj-p < .001; OCI-R-OBS: Z = 6.81, BH-adj-p < .001; OCI-R-HOA: Z = 6.24, BH-adj-p < .001; OCI-R-ORD: Z = 3.36, BH-adj-p = .001; OCI-R-CHE: Z = 3.87, BH-adj-p < .001; OCI-R-NEU: Z = 4.96, BH-adj-p < .001; BDI: Z = 5.43, BH-adj-p < .001; BAI: Z = 5.32, BH-adj-p < .001).

Criterion validity

Differences in DPQ scores among the four known groups of participants were tested through a general linear model that specified group as a focal variable and gender, age, years of education, marital status and occupation as control variables. Interactions effects were not specified. We found a significant main effect of group ($F(3,538) = 19.14$, $p < .001$, $\eta^2 = .09$). BH-corrected post-hoc tests revealed that, as expected, OCD-C patients scores were significantly higher than each of the other groups (OCD-NC: $t(538) = 7.52$, BH-adj-p < .001; OAD: $t(538) = 4.70$, BH-adj-p < .001, NCP: $t(538) = 6.01$, BH-adj-p < .001), which, in turn, did not differ among them (see also Table 1). Moreover, women's scores (Estimated Marginal Mean [*EMM*] = 19.53, Standard Error [*SE*] = 0.91) were significantly higher than men's (*EMM* = 15.86, *SE* = 1.00; $F(1,538) = 27.59$, $p < .001$, $\eta^2 = .04$) and there was a significant negative association of DPQ score with years of education ($\beta = -.39$; $F(1,538) = 17.35$, $p < .001$, $\eta^2 = .03$). We also specified a model with two-way interactions of group with the other predictors, but none was statistically significant.

Discussion

Given the shortcomings of the existing Italian measures of disgust propensity described in the Introduction, the aim of the studies reported in this paper was to develop a new short measure of the construct for Italian population and provide evidence of its psychometric properties.

In Study 1 we used a cross-validation approach to refine the initial item pool of 33 newly developed items that describe common situations in which the person may experience disgust. The scale was administered to a large non-clinical sample and the final outcome was a 9-item scale, the Disgust Propensity Questionnaire (DPQ). Even though previous studies suggested that disgust (in relation to specific eliciting stimuli) is multidimensional, the results showed that the DPQ is unidimensional. This result is consistent with a study performed using the Italian adaptation of the DS-R (Melli et al., 2013), which found that a single-factor measurement model was a more parsimonious alternative to the three-factor model found by previous North-American studies. Melli et al. (2013) used a version of the DS-R in which items had to be rated on a 5-point Likert-type scale (the same used in this paper), but a previous cross-cultural study on the DS-R (Olatunji et al. 2009) with the original scoring system (13 true/false items [scored 0 or 1] and 12 items that are rated on a 3-point scale [scored 0, 0.5, 1] with regard to the extent that participants find the experience not disgusting at all, slightly disgusting, or very disgusting) showed that Italy was, together with Sweden, the only country in which the one-factor model yielded an acceptable fit (RMSEA = 0.04, CFI = 0.92) – although a 3-correlated-factor model had a better fit (RMSEA = 0.03, CFI = 0.95). A more recent study also revealed that the Ghanese version of the DS-R did not support the expected three-factor structure (Skolnick & Dzokoto, 2013). Studies focusing on different measures of disgust (Olatunji, Ebetusani, & Kim, 2015; Olatunji, Ebetusani, & Reise, 2015) used a bifactor modeling strategy to test whether a global construct of disgust exists as a unitary dimension underlying the answers to all items and coexists with multiple more specific disgust facets defined by the part of the items that is unexplained by the global factor. Olatunji and coworkers' studies showed that a global disgust dimension accounts for about half of the variability in the items of the total score and, grounding on model-based reliability, it can be justified despite the confirmed multidimensional structure of disgust. Moreover, none of the subscale dimensions predicted an obsessive-compulsive disorder symptom latent factor - a clinical condition closely related to disgust proneness - above and beyond the global disgust dimension. These results seem to suggest that a general score of disgust might not be unreasonable, although they also provide convincing evidence of the factorial validity of subscale scores. When we tested (exploratory) bifactor models on our Study 1 data, we failed to find such evidence for subscales, as the residual covariance not explained by the global factor was negligible for many items and the grouping of the items was not substantively consistent (e.g., in the 3-factor solution, the items "touch a garbage bin with your hands" and "retrieve something from the garbage pail with your own hands" loaded on different subfactors). Summarizing, although we are not denying the multidimensional nature of disgust as a construct, our evidence suggests that when using self-report measures of disgust with Italian participants a neat distinction between different dimensions might not be warranted.

The seemingly idiosyncratic factor structure of Italian disgust propensity measures might be explained in terms of cross-cultural differences. Speltini and Passini (2014) argued that something as private and intimate as cleaning practices and fears of contamination have their roots and their "aberrations" in the social context and in cultural practices. Elias (1978) suggested that the "threshold of repugnance" is variable through historic periods and cultures - what is accepted at a certain time or in a certain culture can be repulsive in another time and in another culture. This threshold of repugnance is not only historically determined. Within the same culture and in the same historical period, the sensitivity to smell and dirt can be different for specific social classes. Italians have always been Catholic. As reported by Speltini and Passini (2014), an 18th century Italian doctor, Bernardino Ramazzini, argued that in Italy the baths had fallen into disuse (whereas they had flourished in the pagan Roman era) because the Catholic religion focused much more on the health of the soul than on that of the body. As reported by Green (2007) at the time of Inquisition to be recognized as a good Catholic it was necessary to smell. It could be hypothesized that in Italy there is a longstanding tradition of separation between the "purity" of the soul and the "dirtiness" of the body that was supported by the idea that, in order to be pure, people should not wash, and so touch, themselves. Although times have changed, as there have been deep changes in the social representation of the body (Jodelet, 1983), with the transition, in the Sixties, from a biological-mechanic tradition that had its roots in the fear of pain and illnesses to more psychological and hedonistic conceptions, in Italy the distinction between the "classical" components of disgust propensity (body products, waste, contamination, animals) might not have emerged since they can be subsumed by a general propensity to experience disgust for anything that could be considered inconsistent with the ideal of "purity".

The DPQ also showed adequate reliability (both as internal consistency and as temporal stability of scores) and construct validity. Specifically, its correlation with another established measure of disgust propensity, such as the DS-R (r = .69), was significantly higher than those with measures of contamination-based OCD, anxiety and depression symptomatology. Although the correlation with DS-R may suggest an overlap of the two measures, the DPQ has one-third of the items, allowing a substantial reduction of administration time without any loss in terms of reliability and validity.

In Study 2 we sought to replicate the adequacy of the psychometric properties of the DPQ in an independent sample of non-clinical participants and in sample of patients diagnosed with OCD. We found evidence of the replicability of the 1-factor measurement model of the DPQ in both samples. In the patient sample the RMSEA of the model was larger than the value commonly accepted as adequate, while the other fit indices were acceptable. Possible explanations of this result are the arguably inadequate sample size of the OCD group for CFA analyses. Muthén and Muthén (2002) argued that there is no rule of thumb for determining the adequacy of a sample size in CFA analyses that applies to all situations, since the sample size needed for a study depends on a number of factors including the size of the model, distribution of the variables, amount of missing data, reliability of the variables, and strength of the relationships among the variables. Moreover, Chen, Curran, Bollen, Kirby, and Paxton (2008), did not found empirical support for the use of universal cut-off points of RMSEA and recommended considering RMSEA only in the context of other fit indices to inform model fit. Anyway, we also performed statistical checks of the adequacy of the 1-factor model and the results supported it. Following modification indices we then freed an error covariance between two items that focused on oral excretions, and this allowed the model to achieve an adequate fit. Interestingly, the same issue did not occur with the non-clinical samples. Since we did not have a replication sample for the patients, and hence we could not rule out the possibility that this result was merely due to chance, we choose to not further refine the scale. Hopefully, future studies will shed light on this issue.

Study 2 also provided further evidence of the construct validity of the DPQ. In the non-clinical sample the DPQ was more strongly correlated with the subscale of the OCI-R that assesses washing concerns than with the subscales that assess the other OCD symptom dimensions. The same result was found in the clinical sample. Additionally, in patients the correlation of DPQ with DOCS-Contamination and OCI-R-Washing did not differ, and was higher than the correlation with any other measure of OCD symptomatology, anxiety and depression.

As for the criterion validity of the DPQ, we also found that its scores discriminated well between OCD patients with contamination-related symptoms and OCD patients who did not report contamination-related symptoms or concerns as primary complaint, patients with other anxiety disorders and non-clinical participants. These results supported the criterion validity of the scale and, consistent with existent literature (e.g., Melli et al., 2015), indicate that disgust propensity has an important and specific role in contamination-related OCD.

Tests of the association of DPQ scores with demographic variables did not seem to be conclusive, and thus suggest that further research should be carried out. We did not find any significant association in Study 1; in Study 2, consistent with previous studies (Melli et al., 2013; Olatunji et al., 2007), women's scores were significantly higher than men's, and there was a significant negative association of DPQ score with years of education. The first result is in line with the so-called "compensatory behavioural prophylaxis hypothesis" (e.g., Fessler, Eng, & Navarrete, 2005). This hypothesis claims that the immunosuppression during both pregnancy and the luteal phase of the menstrual cycle leads women to overcompensate for it through increased disgust propensity and other forms of behavioural disease avoidance. The negative correlation of the DPQ score with years of education replicates the result obtained by Melli et al. (2013) with the Italian version of the DS-R, and it is consistent with the finding of Doctoroff and McCauley (1996, cited in Rozin et al., 2008) that disgust is inversely related to education. However, given the difficulty to find information about the association of these two variables in the literature, we cannot conclusively rule out the hypothesis that this result might be related to the Italian context in which the studies were carried out. The lack of association of DPQ score with age is also consistent with previous studies. As reported in Oaten, Stevenson and Case (2009), an increase in age is associated with a heightened threat of illness, and disgust might be expected to increase during aging. However, some studies reported that disgust decreases with age (e.g., Björklund & Hursti, 2004). Oaten et al. (2009) suggest two factors that can account for this inconsistency: (i) any increase in disgust as a response to illness vulnerability might be masked by concomitant decreases in sensitivity driven by exposure, since as age increases there is a more extensive exposure history to disgust; (ii) the elderly may not able to sustain the energy-based costs associated with maintaining a high defensive stance. It must be pointed out as a further limitation of this project that we relied on convenience, albeit relatively large, samples. Further studies that employ nationally representative samples are encouraged in order to allow a reliable estimation of the association of DPQ scores with demographic variables.

Beyond the need of a replication sample for patients and of nationally representative samples for non-clinical participants, another limitation of this work is that we could not test the temporal stability of scores in non-treated patients or their sensitivity to change in treated patients. Addressing this issue is crucial in order to establish whether the DPQ can be used as a measure of therapeutic change and/or over longer periods of time.

Other limitations of this work have to be pointed out. The DPQ is not to be intended as a general measure of disgust proneness that indexes one's reactivity to all possible groupings of disgust elicitors, as items represent specific elicitors that do not tap into disgust domains other than pathogen disgust, such as interpersonal, sexual, and socio-moral disgust (Olatunji & Sawchuk, 2005; Rozin, Haidt, & McCauley, 2000; Tybur et al., 2009, 2011). Furthermore, in Study 1 the researchers decided which item had to be removed at each step of the scale refinement grounding on CFA modification indices and choosing by consesus the item content that was most likely to occur. Researchers' decision might have some limited generalizability to the target population, hence, a potentially superior method would have been to have an independent sample of participants to rate each item for the perceived likelihood of occurrence. However, to address this issue, the representativeness of this sample should have been granted.

In addition, despite the high correlation between DPQ score and DS-R scores, it might be argued that nine items could be unsufficient to index the wide breadth of pathogen disgust responses that previous research had uncovered. However, it must be noted that a tool that had to assess the entire range of possible disgust elicitors would be lengthy or cumbersome. A typical approach is to develop instruments containing items assessing (necessarily) specific and quintessential types of elicitors. In order to avoid (statistical) redundancy and to limit the number of items, one usually relies on item and factor analysis to refine the measure, thus obtaining a relatively short list of items. The severity of the problem for respondents with more circumscribed types of elicitors, which are not included in the scale, may however fail to be detected. The issue cannot be fully solved by listing all possible elicitors, but a different approach to scale construction would be needed. For instance, one may provide general descriptions and inclusive examples of elicitors without presenting items assessing specific elicitors, as does Abramowitz et al. (2010)'s Dimensional Obsessive-Compulsive Scale to assess OCD symptom dimensions. This approach would also allow to overcome cross-cultural differences in disgust elicitors, since examples of elicitors could be customized without loss of content validity. The DPSS-R appears to be consistent with this approach, but while its items do not rely on specific elicitors, it lacks examples that help examinees to stick to a common definition of disgust. It is not entirely clear therefore what they are thinking when they are asked to report on the frequency of experiencing some specific disgust symptoms. The DPQ should nevertheless be considered as a shorter alternative to other measures of disgust propensity that rely on specific elicitors.

In order to be considered fully valid, the mean comparisons we performed to test criterion validity in Study 2 would require testing measurement invariance of the DPQ across groups. The limited sample sizes of the patients' groups (especially OCD-C: n = 53 and OAD: n = 31) did not unfortunately supply sufficient statistical power to test this property through multiple group CFA. Again concerning this matter, the need to specify correlated error variances on patients' data in order to reach an acceptable model fit raises the issue of the DPQ factor structure being replicable in patients' populations. This is an issue which we recommend to address in future studies.

The nomological net of the DPQ can also be further explored. For instance, Cisler, Olatunji and Lohr (2009) recommended the inclusion of emotion regulation into the theory of disgust in certain anxiety disorders, since they showed that general emotion dysregulation and disgust sensitivity might be possible mechanisms that strengthen the influence of disgust propensity on contamination fear and other types of fear.

In conclusion, bearing in mind the limitations described above, the studies presented here provided evidence that the DPQ has sound psychometric properties and can be confidently employed in Italian clinical and research settings in which disgust propensity is of interest. Given its brevity, we recommend the use of the DPQ as an important measure in comprehensive assessment batteries in addition to scales assessing contamination-related OCD symptoms. Indeed, psychological treatments for OCD, including Exposure and Response Prevention (ERP) and Cognitive Therapy have been found to be effective in a number of randomized controlled trials (Cottraux et al., 2001; De Hann et al., 1997; Foa et al., 2005; Greist et al., 2002). However, the high drop-out rates (De Hann et al., 1997; Foa et al., 2005) and the lack of statistically reliable reductions in symptomology (Abramowitz, Taylor, & McKay, 2009) are problematic. These data may be explained by the fact that contamination-related OCD symptoms connected with feelings of disgust rather than anxiety or fear, are less responsive to cognitive behavioral therapy (CBT) techniques (Mason & Richardson, 2010). In particular, it has been found that disgust demonstrated greater resistance to extinction than fear, potentially rendering ERP interventions less effective. Hence, a quick to administer, reliable and valid measure to assess disgust propensity, used together with other measures, may provide valuable additional information in planning psychoeducation and treatment when working with individuals reporting contamination-related symptomatology.

References

Abramowitz, J. S., Deacon, B. J., Olatunji, B. O., Wheaton, M. G., Berman, N. C., & Losardo, D. (2010). Assessment of obsessive-compulsive symptom dimensions: development and evaluation of the Dimensional Obsessive-Compulsive Scale. *Psychological Assessment, 22*, 180-198. doi:10.1037/a0018260.

Abramowitz, J. S., Taylor, S., & McKay, D. (2009). Obsessive-compulsive disorder. *The Lancet, 347*, 491-499. doi:10.1016/S0140-6736(09)60240-3.

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders (4th ed. Text Revision)*. Washington, DC: American Psychiatric Association.

American Psychological Association (2010). *Ethical principles of psychologists and code of conduct*. Washington: American Psychological Association. http://www.apa.org/ethics/code/principles.pdf

Arrindell, W. A., Mulkens, S., Kok, J., & Vollenbroek, J. (1999). Disgust sensitivity and the sex difference in fears to common indigenous animals. *Behaviour Research and Therapy, 37*, 273–280. doi:10.1016/S0005-7967(98)00129-6.

Athey, A. J., Elias, J. A., Crosby, J. M., Jenike, M. A., Pope Jr., H. G., Hudson, J. I., & Brennan, B. P. (2015). Reduced disgust propensity is associated with improvement in contamination/washing symptoms in obsessive–compulsive disorder. *Journal of Obsessive-Compulsive and Related Disorders, 4,* 20-24. doi:10.1016/j.jocrd.2014.11.001.

Barnette, J. J. (1996). Responses that may indicate nonattending behaviors in three self-administered educational attitude surveys. *Research in the Schools, 3,* 49–59.

Beck, J. S., & Steer, R. A. (1990). *Beck anxiety inventory manual.* San Antonio, TX: Psychological Corporation.

Beck, J. S., Steer, R. A., & Brown, G. K. (1996). *Manual for the beck depression inventory-II*. San Antonio,TX: Psychological Corporation.

Benson, J., & Hocevar, D. (1985). The impact of item phrasing on the validity of attitude scales for elementary school children. *Journal of Educational Measurement*, *22*(3), 231–240. doi:10.1111/j.1745-3984.1985.tb01061.x

Björklund , F., & Hursti, T. J. (2004). A Swedish translation and validation of the Disgust Scale: A measure of disgust sensitivity. *Scandinavian Journal of Psychology, 45,* 279 –284. doi:10.1111/j.1467-9450.2004.00406.x.

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York: Guilford Press.

Brown, T. A., Di Nardo, P. A., & Barlow, D. H. (1994). *Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV)*. San Antonio, TX: Psychological Corporation/Graywind Publications Incorporated.

Cavanagh, K., & Davey, G. C. L. (2000). *The development of a measure of individual differences in disgust*. Winchester, UK: British Psychological Society.

Chen, F., Curran, P. J., Bollen, K. A., Kirby, J., & Paxton, P. (2008). An empirical evaluation of the use of fixed cutoff points in RMSEA test statistic in structural equation models. *Sociological Methods & Research, 36*, 462–494. doi:10.1177/0049124108314720.

Chiorri, C., Melli, G., & Smurra, R. (2011). Second-order factor structure of the Vancouver Obsessive Compulsive Inventory (VOCI) in a non-clinical sample. *Behavioral and Cognitive Psychotherapy, 39*, 561-577. doi:10.1017/S1352465810000913.

Cisler, J. M., Olatunji, B. O., & Lohr, J. M. (2009). Disgust sensitivity and emotion regulation potentiate the effect of disgust propensity on spider fear, blood-injection-injury fear, and contamination fear. *Journal of Behavior Therapy and Experimental Psychiatry*, *40*, 219–229. doi:10.1016/j.jbtep.2008.10.002.

Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment*, *7*, 309–319. doi:10.1037/1040-3590.7.3.309.

Cottraux, J., Note, I., Yao, S. N., Lafont, S., Note, B., & Mollard, E. (2001). A randomized controlled trial of cognitive therapy versus intensive behaviour therapy in obsessive compulsive disorder. *Psychotherapy and Psychosomatics, 70*, 288-297. doi:10.1159/000056269.

Davey, G. C. L. (2011). Disgust: The disease-avoidance emotion and its dysfunctions. *Philosophical Transactions of the Royal Society B*, *366*, 3453–3465. doi:10.1098/rstb.2011.0039

Davey, G. C. L., & Bond, N. (2006). Using controlled comparisons in disgust psychopathology research: The case of disgust. *Journal of Behavior Therapy and Experimental Psychiatry, 37,* 4-15. doi:10.1016/j.jbtep.2005.09.001.

De Haan, E., van Oppen, P., van Balkom, A. J. L. M., Spinhoven, P., Hoogduin, K. A. L., & van Dyck, R. (1997). Prediction of outcome and early vs. late improvement in OCD patients treated with cognitive behaviour therapy and pharmacotherapy. *Acta Psychiatrica Scandinavica, 96,* 354-361. doi:10.1111/j.1600-0447.1997.tb09929.x.

Deacon, B., & Olatunji, B. O. (2007). Specificity of disgust sensitivity in the prediction of behavioural avoidance in contamination fear. *Behaviour Research and Therapy, 45*, 2110-2120. doi:10.1016/j.brat.2007.03.008.

Doctoroff, G., & McCauley, C. (1996). Demographic differences in sensitivity to disgust. *Poster presented at the annual meeting of the Eastern Psychological Association, Providence, RI*.

Ekman, P., Sorenson, E. R., & Friesen, W. V. (1969). Pan-cultural elements in facial displays of emotion. *Science, 164*, 86-88. doi:10.1126/science.164.3875.86.

Elias, N. (1978). *The civilizing process: The history of manners*. Oxford: Blackwell.

Fergus, T. A., & Valentiner, D. P. (2009). The Disgust Propensity and Sensitivity Scale-Revised: An examination of a reduced-item version. *Journal of Anxiety Disorders*, *23*, 703-710. doi:10.1016/j.janxdis.2009.02.009.

Fessler, D. M. T., Eng, S. J., & Navarrete, C. D. (2005). Elevated disgust sensitivity in the first trimester of pregnancy: Evidence supporting the compensatory prophylaxis hypothesis. *Evolution and Human Behavior*, *26*, 344-351. doi:0.1016/j.evolhumbehav.2004.12.001.

Filzmoser, P., & Gschwandtner, M. (2014). *Mvoutlier: Multivariate outlier detection based on robust methods*. R package version 2.0.5. http://CRAN.R-project.org/package=mvoutlier

Foa, E. B., Huppert, J. D., Leiberg, S., Langner, R., Kichic, R., Hajcak, G., & Salkovskis, P. M. (2002). The Obsessive-Compulsive Inventory: Development and validation of a short version. *Psychological Assessment*, *14*, 485-496. doi:10.1037/1040-3590.14.4.485.

Foa, E. B., Liebowitz, M. R., Kozak, M. J., Davies, S., Campeas, R., & Franklin, M. E. (2005). Randomized, placebo-controlled trial of exposure and ritual prevention, clomipramine, and their combination in the treatment of obsessive compulsive disorder. *American Journal of Psychiatry*, *162*, 151-161. doi:10.1176/appi.ajp.162.1.151

Furr, R. M. (2011). *Scale Construction and Psychometrics for Social and Personality Psychology*. London, UK: Sage Publications.

Goetz, A. R., Cougle, J. R., & Lee, H. (2013). Revisiting the factor structure of the 12-item Disgust Propensity and Sensitivity Scale-Revised: Evidence for a third component. *Personality and Individual Differences*, *55*, 579-584. doi:10.1016/j.paid.2013.04.029.

Gorsuch, R. L. (1983). *Factor Analysis (2nd ed.)*. Hillsdale, NJ: Erlbaum.

Green, T. (2007). *Inquisition: The reign of fear*. London: Macmillan.

Greist, J. H., Marks, I. M., Baer, L., Kobak, K. A., Wenzel, K. W., & Hirsch, M. J. (2002). Behaviour therapy for obsessive compulsive disorder guided by a computer or by a clinician compared with relaxation as a control. *Journal of Clinical Psychiatry*, *63*, 138-145. doi:10.4088/JCP.v63n0209.

Grice, J. W. (2001). Computing and evaluating factor scores. *Psychological Methods, 6*, 430-450. doi:10.1037/1082-989X.6.4.430.

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. doi:10.1016/0191-8869(94)90212-7.

Haidt, J., Rozin, P., McCauley, C., & Imada, S. (1997). Body, psyche and culture: The relationship between disgust and morality. *Psychology and Developing Societies, 9*, 107-131. doi:10.1177/097133369700900105.

Hattie, J. (1985). Methodology review: Assessing unidimensionality of tests and items. *Applied Psychological Measurement, 9*, 139-164. doi:10.1177/014662168500900204.

Haynes, S. N., Richard, D. C. S., & Kubany, E. S. (1995). Content validity in psychological assessment: A functional approach to concepts and methods. *Psychological Assessment, 7*, 238–247. doi:10.1037/1040-3590.7.3.238.

Horn, J. (1965) A rationale and test for the number of factors in factor analysis. *Psychometrika, 30*, 179-185. doi:10.1007/BF02289447.

Jodelet, D. (1983). Les représentations du corps. ses enjeux privés et sociaux. In J. Hainard, R. Kaehr (eds.), *Le corps enjeu* (pp. 127-140). Neuchâtel: Musée d'Ethnographie.

Kleinknecht, R. A., Kleinknecht, E. E., & Thorndike, R. M. (1997). The role of disgust and fear in blood and injection-related fainting symptoms: A structural equation model. *Behaviour Research and Therapy, 35*, 1075–1087. doi:10.1016/S0005-7967(97)80002-2.

MacCallum, R. C., Roznowski, M., & Necowitz, L. B. (1992). Model modifications in covariance structure analysis: The problem of capitalization on chance. *Psychological Bulletin, 111*, 490–504. doi:10.1037/0033-2909.111.3.490

Marsh, H. W. (1986). Negative item bias in ratings scales for preadolescent children: A cognitive-developmental phenomenon. *Developmental Psychology*, *22*(1), 37–49. doi:10.1037/0012-1649.22.1.37

Marsh, H. W., Hau, K. T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis testing approaches to setting cutoff values for fit indexes and dangers in overgeneralising Hu & Bentler's (1999) findings. *Structural Equation Modeling*, *11*, 320–341. doi:10.1207/s15328007sem1103_2.

Mason, E. C., & Richardson, R. (2010). Looking beyond fear: the extinction of other emotions implicated in anxiety disorders. *Journal of anxiety disorders*, *24*, 63-70.

Matchett, G., & Davey, G. C. (1991). A test of the disease-avoidance model of animal phobias. *Behavior Research and Therapy, 29,* 91-94. doi:10.1016/S0005-7967(09)80011-9.

McGraw, K. O., & Wong, S. P. (1996). Forming inferences about some intraclass correlation coefficients. *Psychological Methods, 1*, 30-46. doi:10.1037/1082-989X.1.1.30.

Melli, G., Avallone, E., Moulding, R., Pinto, A., Micheli, E., & Carraresi, C. (2015). Validation of the Italian version of the Yale–Brown Obsessive Compulsive Scale–Second Edition (Y-BOCS-II) in a clinical sample. *Comprehensive Psychiatry, 60,* 86-92. doi:10.1016/j.comppsych.2015.03.005.

Melli, G., Bulli, F., Carraresi, C., & Stopani, E. (2014). Disgust propensity and contamination-related OCD symptoms: The mediating role of mental contamination. *Journal of Obsessive-Compulsive and Related Disorders, 3,* 77-82. doi:10.1016/j.jocrd.2014.01.002

Melli, G., Chiorri, C., & Smurra, R. (2013). Further revision and psychometric properties of an Italian version of the «Disgust Scale-Revised». *Italian Journal of Cognitive and Behavioral Psychotherapy, 19*, 63-93.

Melli, G., Chiorri, C., Bulli, F., Carraresi, C., Stopani, E., & Abramowitz, J. S. (2015). Factor congruence and psychometric properties of the Italian version of the Dimensional Obsessive-Compulsive Scale (DOCS) across non-clinical and clinical samples. *Journal of Psychopathology and Behavioral Assessment, 37*, 329-339. doi:10.1007/s10862-014-9450-1.

Melli, G., Chiorri, C., Carraresi, C., Stopani, E., & Bulli, F. (2015a). The role of disgust propensity and trait guilt in OCD symptoms: A multiple regression model in a clinical sample. *Journal of Obsessive-Compulsive and Related Disorders, 5*, 43-48. doi:10.1016/j.jocrd.2015.01.007.

Melli, G., Chiorri, C., Carraresi, C., Stopani, E., & Bulli, F. (2015b). The two dimensions of contamination fear in obsessive-compulsive disorder: Harm avoidance and disgust avoidance. *Journal of Obsessive-Compulsive and Related Disorders, 6*, 124-131. doi:10.1016/j.jocrd.2015.07.001.

Melli, G., Gremigni, P., Elwood, L. S., Stopani, E., Bulli, F., & Carraresi, C. (2015). The relationship between trait guilt, disgust propensity, and contamination fear. *International Journal of Cognitive Therapy, 8*, 1-13. doi:10.1521/ijct_2015_8_01.

Melnick, S. A., & Gable, R. K. (1990). The use of negative item stems: A cautionary note. *Educational Research Quarterly, 14*, 31–36.

Meng, X., Rosenthal, R., & Rubin, D. B. (1992). Comparing correlated correlation coefficients. *Psychological Bulletin*, *111*(1), 172–175. doi:10.1037/0033-2909.111.1.172.

Merckelbach, H., de Jong, P. J., Arntz, A., & Schouten, E. (1993). The role of evaluative learning and disgust sensitivity in the etiology and treatment of spider phobia. *Advances in Behaviour Research and Therapy, 15*, 243-255. doi:10.1016/0146-6402(93)90011-P.

Mulkens, S., de Jong, P. J., & Merckelbach, H. (1996). Disgust and spider phobia. *Journal of Abnormal Psychology, 105*, 464-468. doi:10.1037/0021-843X.105.3.464.

Muris, P., Huijding, J., Mayer, B., Langkamp, M., Reyhan, E., & Olatunji, B. (2012). Assessment of disgust sensitivity in children with an age-downward version of the Disgust Emotion Scale. *Behavior Therapy*, *43*(4), 876–886. doi:10.1016/j.beth.2012.03.002

Muthén, L. K., & Muthén, B. O. (1998-2012). *Mplus User's Guide. Seventh Edition*. Los Angeles, CA: Muthén & Muthén.

Muthén, L. K., & Muthén, B. O. (2002). How to use a Monte Carlo study to decide on sample size and determine power. *Structural Equation Modeling, 4,* 599-620. doi:10.1207/S15328007SEM0904_8.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.

Oaten, M., Stevenson, R.J., & Case, T.I. (2009). Disgust as a disease-avoidance mechanism. *Psychological Bulletin, 135*, 303-321. doi:10.1037/a0014823.

Olatunji, B. O. (2010). Changes in disgust correspond with changes in symptoms of contamination-based OCD: a prospective examination of specificity. *Journal of Anxiety Disorder, 24*, 313–317. doi:10.1016/j.janxdis.2010.01.003.

Olatunji, B. O., & Sawchuk, C. N. (2005). Disgust: Characteristic Features, Social Manifestations, and Clinical Implications. *Journal of Social and Clinical Psychology*, *24*(7), 932–962. Retrieved from http://dx.doi.org/10.1521/jscp.2005.24.7.932

Olatunji, B. O., Adams, T., Ciesielski, B., David, B., Sarawgi, S., & Broman-Fulks, J. (2012). The Three Domains of Disgust Scale: Factor structure, psychometric properties, and conceptual limitations. *Assessment*, *19*(2), 205–225. doi:10.1177/1073191111432881

Olatunji, B. O., Cisler, J., Deacon, B. J., Connolly, K., & Lohr, J. (2007). The Disgust Propensity and Sensitivity Scale-Revised: Psychometric properties and specificity in relation to anxiety disorder symptoms. *Journal of Anxiety Disorders, 21*, 918–930. doi:10.1016/j.janxdis.2006.12.005.

Olatunji, B. O., Ebesutani, C., & Kim, E. H. (2015). Examination of a bifactor model of the Three Domains of Disgust Scale: specificity in relation to obsessive-compulsive symptoms. *Psychological Assessment*, *27*(1), 102–13. http://doi.org/10.1037/pas0000039

Olatunji, B. O., Ebesutani, C., & Reise, S. P. (2015). A bifactor model of disgust proneness: Examination of the Disgust Emotion Scale. *Assessment*, *22*(2), 248–262. http://doi.org/10.1177/1073191114541673

Olatunji, B. O., Ebesutani, C., Haidt, J., & Sawchuk, C. N. (2014). Specificity of disgust domains in the prediction of contamination anxiety and avoidance: A multimodal examination. *Behavior Therapy, 45*, 469-481. doi:10.1016/j.beth.2014.02.006.

Olatunji, B. O., Lohr, J. M., Sawchuk, C. N., & Tolin, D. F. (2007). Multimodal assessment of disgust in contamination-related obsessive-compulsive disorder. *Behaviour Research and Therapy, 45*, 263-276. doi:10.1016/j.brat.2006.03.004.

Olatunji, B. O., Sawchuk, C. N., de Jong, P. J., & Lohr, J. M. (2007). Disgust sensitivity in anxiety disorder symptoms: Factor structure and psychometric properties of the Disgust Emotions Scale. *Journal of Psychopathology and Behavioral Assessment, 29*, 115–124. doi:10.1007/s10862-006-9027-8.

Olatunji, B. O., Sawchuk, C. N., Lohr, J. M., & de Jong, P. J. (2004). Disgust domains in the prediction of contamination fear. *Behaviour Research and Therapy, 42*, 93-104. doi:10.1016/S0005-7967(03)00102-5.

Olatunji, B. O., Williams, N. L., Lohr, J. M., & Sawchuk, C. N. (2005). The structure of disgust: Domain specificity in relation to contamination ideation and excessive washing. *Behaviour Research and Therapy, 43*, 1069–1086. doi:10.1016/j.brat.2004.08.002.

Olatunji, B. O., Williams, N. L., Tolin, D. F., Abramowitz, J. S., Sawchuk, C. N., Lohr, J. M., et al. (2007). The Disgust Scale: Item analysis, factor structure, and suggestions for refinement. *Psychological Assessment, 19*, 281–297. doi:10.1037/1040-3590.19.3.281.

Olatunji, B. O., Williams, N., Lohr, J. M., Connolly, K., Cisler, J., & Meunier, S. (2007). Structural differentiation of disgust from trait anxiety in the prediction of specific anxiety disorder symptoms. *Behaviour Research and Therapy, 45*, 3002–3017. doi:10.1016/j.brat.2007.08.011.

Phillips, M. L., Senior, C., Fahy, T., & David, A. S. (1998). Disgust - The forgotten emotion of psychiatry. *British Journal of Psychiatry, 173*, 373-375. doi:10.1192/bjp.172.5.373.

R Core Team (2014). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org.

Revelle, W. (2015). *Psych: Procedures for Personality and Psychological Research*. Northwestern University, Evanston, Illinois, USA, http://CRAN.R-project.org/package=psych Version = 1.5.4.

Rozin, P., & Fallon, A. E. (1987). A perspective on disgust. *Psychological Review, 94*, 23-41. doi:10.1037/0033-295X.94.1.23.

Rozin, P., Fallon, A., & Mandell, R. (1984). Family resemblance in attitudes to foods. *Developmental Psychology, 20,* 309-314. doi:10.1037/0012-1649.20.2.309.

Rozin, P., Haidt, J., & McCauley, C. R. (2000). Disgust. In M. Lewis & J. M. Haviland-Jones (Eds.), *Handbook of emotions* (2nd ed., pp. 637–653). New York: Guilford Press.

Rozin, P., Haidt, J., & McCauley, C. R. (2008). *Disgust*. In M. Lewis, J. M. Haviland-Jones & L. F. Barrett (Eds.), *Handbook of emotions, 3rd ed*. (pp. 757-776). New York: Guilford Press.

Rozin, P., Lowery, L., & Ebert, R. (1994). Varieties of disgust faces and the structure of disgust. *Journal of Personality and Social Psychology, 76,* 574-586. doi:10.1037/0022-3514.66.5.870.

Sawchuk, C. N., Lohr, J. M., Tolin, D. F., Lee, T. C., & Kleinknecht, R. A. (2000). Disgust sensitivity and contamination fear in spider and blood-injection-injury phobias. *Behaviour Research and Therapy, 38,* 753-762. doi:10.1016/S0005-7967(99)00093-5.

Schienle, A., Stark, R., Walter, B., & Vaitl, D. (2003). The connection between disgust sensitivity and blood related fears, faintness symptoms, and obsessive-compulsiveness in a non-clinical sample. *Anxiety, Stress, and Coping, 16*, 185-193. doi:10.1080/10615806.2003.10382972.

Sica, C., & Ghisi, M. (2007). The Italian versions of the Beck Anxiety Inventory and the Beck Depression Inventory-II: Psychometric properties and discriminant power. In M. A. Lange (Ed.), *Leading-Edge Psychological Tests and Testing Research* (pp. 27–50). Hauppauge, New York: NOVA Publishers.

Sica, C., Coradeschi, D., Ghisi, M., & Sanavio, E. (2006). *Beck Anxiety Inventory – BAI. Manuale*. Firenze: O.S. Organizzazioni Speciali.

Sica, C., Ghisi, M., Altoè, G., Chiri, L. R., Franceschini, S., Coradeschi, D., & Melli, G. (2008). The Italian version of the Obsessive Compulsive Inventory: Its psychometric properties on community and clinical samples. *Journal of Anxiety Disorders*, *23*, 204-211. doi:10.1016/j.janxdis.2008.07.001.

Skolnick, A. J., & Dzokoto, V. A. (2013). Disgust and contamination: A cross-national comparison of Ghana and the United States. *Frontiers in Psychology*, *4*, 91. doi:10.3389/fpsyg.2013.00091

Speltini, G., & Passini, S. (2014). Cleanliness/dirtiness, purity/impurity as social and psychological issues. *Culture & Psychology*, *20*(2), 203–219. http://doi.org/10.1177/1354067x14526895

Speltini, G., Passini, S., & Morselli, D. (2010). Questioni di pulizia: Rappresentazioni e valori [Cleanliness issues; Representations and values]. *Giornale Italiano Di Psicologia*, *37*(3), 623–644. http://doi.org/10.1421/32904

Storch, E. A., Rasmussen, S. A., Price, L. H., Larson, M. J., Murphy, T. K., & Goodman, W. K. (2010). Development and psychometric evaluation of the Yale-Brown Obsessive-Compulsive Scale – Second Edition. *Psychological Assessment*,*22*, 223-232. doi:10.1037/a0018492.

Thordarson, D. S., Radomsky, A. S., Rachman, S., Shafran, R., Sawchuk, C. N., & Hakstian, A. R. (2004). The Vancouver Obsessional Compulsive Inventory (VOCI). *Behaviour Research and Therapy*, *42*, 1289-1314. doi:10.1016/j.brat.2003.08.007.

Troop, N. A., Murphy, F., Bramon, E., & Treasure J. L. (2000). Disgust sensitivity in eating disorders: a preliminary investigation. *International Journal of Eating Disorders*, *27*, 446–451. doi:10.1002/(SICI)1098-108X(200005)27.

Tybur, J. M., Bryan, A. D., Lieberman, D., Caldwell Hooper, A. E., & Merriman, L. A. (2011). Sex differences and sex similarities in disgust sensitivity. *Personality and Individual Differences*, *51*(3), 343–348. doi:10.1016/j.paid.2011.04.003

Tybur, J. M., Lieberman, D., & Griskevicius, V. (2009). Microbes, mating, and morality: Individual differences in three functional domains of disgust. *Journal of Personality and Social Psychology*, *97*(1), 103–122. doi:10.1037/a0015474.

van Overveld, M., de Jong, P. J., Peters, M. L., Cavanagh, K., & Davey, G. C. L. (2006). Disgust propensity and disgust sensitivity: Separate constructs that are differentially related to specific fears. *Personality and Individual Differences, 41*, 1241–1252. doi:10.1016/j.paid.2006.04.021.

Velicer, W. (1976) Determining the number of components from the matrix of partial correlations. *Psychometrika, 41*, 321-327. doi:10.1007/BF02293557.

Walls, M. M. & Kleinknect, R. A. (1996). Disgust factors as predictors of blood-injury fear and fainting. *Paper presented to the Annual Meeting of the Western Psychological Association, San Jose, CA.*

Westen, D., & Rosenthal, R. (2003). Quantifying construct validity: Two simple measures. *Journal of Personality and Social Psychology, 84*, 608-618. doi:10.1037/0022-3514.84.3.608.

Woody, S. R., & Tolin, D. F. (2002). The relationship between disgust sensitivity and avoidant behaviour: Studies of clinical and non-clinical samples. *Journal of Anxiety Disorder, 16*, 543-559. doi:10.1016/S0887-6185(02)00173-1.

Table 1
Socio-demographic characteristics and Disgust Propensity Questionnaire scores in all the samples used.

Variable	Category	Study 1	Study 2				
		NCP (*n* = 784)	NCP (*n* = 315)	OCD total sample (*n* = 208)	OCD-NC (*n* = 155)	OCD-C (*n* = 53)	OAD (*n* = 31)
Gender (proportion)	Females	.50	.58	.64	.68	.51	.58
Age (M±SD, range)		39.68±15.81 (18-87)	38.70±14.51 (18-81)	32.64±10.00 (18-63)	31.75±9.53 (18-63)	35.23±10.96 (18-57)	34.48±12.65 (18-63)
Years of education (M±SD, range)		13.33±3.89 (5-22)	14.46±3.76 (5-22)	14.08±3.29 (8-22)	13.97±3.13 (8-22)	14.40±3.73 (8-22)	14.48±3.53 (8-22)
Marital Status (proportion)	Single	.43	.45	.67	.69	.60	.58
	Married	.50	.46	.28	.26	.36	.39
	Divorced	.05	.07	.03	.03	.04	.03
	Other	.03	.03	.01	.02	.00	.00
Occupation (proportion)	Housemaker	.03	.04	.05	.05	.04	.03
	Clerk	.36	.29	.26	.26	.26	.55
	Professional	.15	.18	.18	.18	.17	.07
	Unoccupied	.08	.02	.08	.08	.06	.10
	Retired	.11	.05	.01	.01	.00	.03
	Student	.18	.21	.26	.28	.21	.13
	Other	.09	.21	.17	.14	.26	.10
DPQ score (*M*±*SD*, range)		19.55±6.98 (0-36)	16.48±8.06 (0-35)	16.17±8.73 (1-36)	13.76±7.44 (1-36)	23.21±6.47 (1-36)	15.26±6.71 (3-30)
DPQ α		.85	.89	.91	.88	.90	.85
M_{rii} (range)		.39 (.19-.52)	.49 (.35-.61)	.52 (.36-.68)	.45 (.21-.59)	.50 (.20-.74)	.37 (-.20-.66)
M_{rii} (range)		.57 (.42-.63)	.66 (.59-.71)	.68 (.54-.75)	.62 (.52-.70)	.67 (.49-.78)	.60 (.47-.71)
M_{SMC} (range)		.36 (.21-.43)	.47 (.36-.55)	.53 (.35-.60)	.46 (.37-.56)	.57 (.32-.68)	.53 (.46-.60)
Max α w/o		.85	.89	.91	.87	.90	.85

Note: NCP = Non Clinical Participants; OAD = Other Anxiety Disorders; OCD-NC = Non contamination related Obsessive-Compulsive Disorder; OCD-C = Contamination related OCD; OAD = Other Anxiety Disorders; DPQ = Disgust Propensity Questionnaire; *M* = Mean; *SD* = Standard Deviation; α = Cronbach's alpha.

Table 2
Item descriptive statistics, item analyses and standardized factor loadings from the confirmatory factor analysis of the Disgust Propensity Questionnaire in Study 1 (n = 784, Cronbach's alpha = .85, left subcolumn), and in the non-clinical sample (n = 315, Cronbach's alpha = .89, central subcolumn) and OCD participants (n = 208, Cronbach's alpha = .91, right subcolumn) in Study 2.

Item	M	SD	Range	SK	KU	r_{it}	SMC	α w/o	FL
1. To step on a poop	2.55 2.38 2.26	1.11 1.17 1.24	0-4 0-4 0-4	-0.21 -0.19 -0.12	-1.01 -0.97 -0.99	.63 .59 .71	.42 .36 .58	.83 .89 .89	.82 .77 .77
2. To touch a garbage bin with your hands	1.75 1.40 1.67	1.17 1.22 1.38	0-4 0-4 0-4	0.30 0.47 0.49	-0.75 -0.84 -1.03	.60 .70 .71	.38 .55 .59	.83 .88 .89	.81 .89 .78
3. To see a drop of saliva from another person that reaches you during a conversation	2.20 1.69 1.72	1.15 1.13 1.22	0-4 0-4 0-4	0.09 0.36 0.38	-0.92 -0.70 -0.78	.62 .71 .71	.41 .55 .58	.83 .88 .89	.81 .90 .71
4. To hug a sweaty person	2.31 1.72 1.68	1.09 1.15 1.14	0-4 0-4 0-4	0.01 0.23 0.36	-0.89 -0.82 -0.59	.62 .66 .66	.40 .49 .48	.83 .88 .90	.72 .84 .68
5. To find bird poop on your clothes	2.47 2.24 2.06	1.06 1.20 1.22	0-4 0-4 0-4	-0.20 -0.16 0.04	-0.67 -0.92 -0.98	.47 .60 .70	.25 .42 .52	.85 .89 .90	.57 .76 .74
6. To hear someone coughing and excreting some snot	2.22 2.24 1.72	1.18 1.31 1.30	0-4 0-4 0-4	-0.07 -0.17 0.25	-0.90 -1.14 -1.01	.62 .66 .61	.43 .48 .45	.83 .88 .90	.80 .94 .61
7. To sit on a bench where you know a bum had slept previously	1.80 1.44 1.62	1.20 1.27 1.42	0-4 0-4 0-4	0.22 0.44 0.40	-0.82 -0.98 -1.14	.42 .60 .75	.21 .41 .60	.85 .89 .89	.61 .82 .80
8. To accidentally get your hands dirty with your own poop	2.31 1.77 1.61	1.22 1.28 1.28	0-4 0-4 0-4	-0.18 0.13 0.48	-0.93 -1.10 -0.78	.62 .67 .54	.40 .47 .35	.83 .88 .91	.83 .91 .57
9. To retrieve something from the garbage pail with your own hands	1.93 1.59 1.84	1.11 1.21 1.32	0-4 0-4 0-4	0.14 0.38 0.23	-0.68 -0.74 -1.03	.56 .71 .75	.34 .53 .60	.84 .88 .89	.64 .91 .80

Note: M = Mean; SD = Standard Deviation; SK = Skewness; KU = Kurtosis; r_{it} = corrected item-total correlation; SMC = squared multiple correlation; α w/o = Cronbach's alpha-if-item-deleted; FL: standardized loading from the confirmatory factor analysis (note that coefficients in left subcolum are those of the random subsample on which confirmatory factor analysis was actually performed in Study 1).

Table 3
Construct validity of the Disgust Propensity Questionnaire: Correlation matrix of the measures of Study 1 (n = 141).

	DPQ	DS-R	VOCI-C	BDI	BAI
DPQ	*.88*				
DS-R	.69***	*.89*			
VOCI-C	.42***	.41***	*.96*		
BDI	.01	-.01	.20***	*.94*	
BAI	.15***	.21***	.33***	.65***	*.93*
M	17.59	48.68	10.21	5.84	7.74
SD	6.57	16.93	11.99	8.44	9.72

Note: * = $p < .05$; ** = $p < .01$; *** $p < .001$; italicized values on the main diagonal are Cronbach's alphas. DPQ=Disgust Propensity Questionnaire; DS-R=Disgust Scale-Revised; VOCI-C=Vancouver Obsessional Compulsive Inventory-Contamination; BDI=Beck Depression Inventory; BAI=Beck Anxiety Inventory; M = Mean; SD = Standard Deviation.

Table 4
Correlation matrix of the measures of Study 2 for non clinical participants (n = 315).

	DPQ	OCI-R-WAS	OCI-R-OBS	OCI-R-HOA	OCI-R-ORD	OCI-R-CHE	OCI-R-NEU
DPQ	*.89*						
OCI-R-WAS	.41***	*.76*					
OCI-R-OBS	.14*	.43***	*.86*				
OCI-R-HOA	.14*	.24***	.43***	*.83*			
OCI-R-ORD	.26***	.39***	.41***	.56***	*.87*		
OCI-R-CHE	.26***	.38***	.36***	.47***	.67***	*.80*	
OCI-R-NEU	.13*	.49***	.41***	.34***	.45***	.37***	*.71*
M	16.48	0.91	1.28	2.33	2.40	1.82	0.46
SD	8.06	1.70	2.08	2.47	2.50	2.26	1.16

Note: * = p < .05; ** = p < .01; *** p < .001; Italicized values on the main diagonal are Cronbach's alphas. DPQ=Disgust Propensity Questionnaire; OCI-R-WAS=Obsessive Compulsive Inventory-Revised Washing; OCI-R-OBS=OCI-R-Obsessing; OCI-R-HOA=OCI-R-Hoarding; OCI-R-ORD=OCI-R-Ordering; OCI-CHE=OCI-R-Checking; OCI-R-NEU=OCI-R-Neutralizing; M=Mean; SD= Standard Deviation.

Table 5
Correlation matrix of the measures of Study 2 for clinical participants (n = 208).

	1	2	3	4	5	6	7	8	9	10	11	12
1. DPQ	*.91*											
2. DOCS-CNT	.52***	*.96*										
3. DOCS-RSP	.05	.05	*.94*									
4. DOCS-UNT	-.02	-.12	.20**	*.94*								
5. DOCS-SYM	.26***	.08	.33***	.25***	*.93*							
6. OCI-R-WAS	.58***	.77***	.08	.01	.22**	*.77*						
7. OCI-R-OBS	.06	-.04	.20**	.58***	.21**	.15*	*.88*					
8. OCI-R-HOA	.11	.16*	.14*	.15*	.11	.24***	.18**	*.85*				
9. OCI-R-ORD	.35***	.28***	.14*	.06	.50***	.53***	.14	.35***	*.89*			
10. OCI-R-CHE	.31***	.20**	.44***	.15*	.37***	.36***	.24**	.26***	.50***	*.87*		
11. OCI-R-NEU	.22**	.11	.24**	.22**	.38***	.33***	.27***	.25***	.48***	.32***	*.86*	
12. BDI-II	.18**	.11	.24**	.34***	.30***	.15*	.37***	.24**	.25***	.22**	.13	*.91*
13. BAI	.19**	.16*	.35***	.37***	.25***	.17*	.47***	.14*	.21**	.27***	.13	.61**
M	16.17	6.63	8.48	9.16	5.31	3.14	7.46	2.21	3.48	4.61	2.71	21.0
SD	8.73	6.32	6.29	6.12	5.26	3.43	3.66	2.88	3.46	3.82	3.70	11.4

Note: * = p < .05; ** = p < .01; *** p < .001; Italicized values on the main diagonal are Cronbach's alphas; DPQ=Disgust Propensity Questionnaire; DOCS-CNT: Dimensional Obsessive-Compulsive Scale-Contamination; DOCS-RSP: DOCS-Responsibility for Harm; DOCS-UNT: DOCS-Unacceptable Thoughts; DOCS-SYM: DOCS-Symmetry; OCI-R-WAS=Obsessive Compulsive Inventory-Revised Washing; OCI-R-OBS=OCI-R-Obsessing; OCI-R-NET=OCI-R-Neutralizing; OCI-R-ORD=OCI-R-Ordering; OCI-CHE=OCI-R-Checking; OCI-R-HOA=OCI-R-Hoarding; BDI-II: Beck Depression Inventory-II; BAI: Beck Anxiety Inventory; M=Mean; SD= Standard Deviation.