A self-report assessment of appearance-related safety behaviours: Development and psychometric properties

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Abstract

Background: Individuals with appearance concerns may engage in maladaptive appearance-related safety behaviours aimed at checking, hiding or fixing perceived flaws in their appearance.
Aims: This investigation examined the psychometric properties of a newly developed measure of appearance-related safety behaviours across three different studies.
Method: The first two studies utilized exploratory and confirmatory factor analysis, respectively, to understand the factor structure of the measure. The final version of the Appearance-Related Safety Behavior Scale (ARSB) consisted of 13 items and two subscales related to behavioural avoidance and appearance maintenance.
Results: Number of appearance-related safety behaviours was positively associated with body dysmorphic disorder symptomology and functional impairment, as well as social anxiety and eating disorder symptoms. The measure also demonstrated convergent validity with other appearance-related measures. Scores on the ARSB also predicted performance on an appearance-related behavioural task (time spent fixing appearance prior to having a picture taken). The third study found that scores on the ARSB were higher in a body dysmorphic disorder sample compared with healthy controls. Furthermore, change in scores on the ARSB was correlated with change in body dysmorphic disorder symptoms and impairment in a treatment study for body dysmorphic disorder.
Conclusions: Clinical implications and potential uses of the measure as a clinical and research tool are discussed.

Keywords: appearance; assessment; factor analysis; safety behaviour

Introduction

Body dysmorphic disorder (BDD) is a disorder of body image characterized by excessive, time-consuming and distressing pre-occupation with a slight or imperceptible flaw in one's physical appearance (American Psychiatric Association, 2013). These individuals are most commonly pre-occupied with facial features, skin or hair (Phillips, 2009), and evidence marked psychosocial and occupational impairment (Didie *et al.*, 2008; Phillips *et al.*, 2008) as well as elevated risk for suicide due to their appearance concerns (Phillips *et al.*, 2005; Rief *et al.*, 2006). Individuals with BDD often hold strong beliefs about the importance of appearance, experience ideas of reference (i.e. perceive others to be watching and judging them due to their looks), and anticipate negative consequences associated with not looking attractive (e.g. Anson *et al.*, 2012). Importantly,

appearance concerns can also be observed across different psychiatric disorders including social anxiety disorder, eating disorder, depressive disorders, and obsessive-compulsive disorder (Aderka *et al.*, 2014; Coles *et al.*, 2006; Gitimu *et al.*, 2016; Koskina *et al.*, 2011). Elevated appearance concerns may also cause psychosocial issues in individuals with visible differences in their appearance, leading to social impairment and subjective distress (Rumsey *et al.*, 2004).

To mitigate feared negative consequences related to their appearance, individuals with appearance concerns tend to engage in maladaptive appearance-related behaviours aimed at checking, hiding or fixing perceived flaws. For instance, they may frequently check their appearance in the mirror, spend an inordinate amount of time grooming, strategically select clothing, or ask others for reassurance. Additionally, they may engage in avoidance behaviours such as avoiding photographs, video messages, mirrors, or social situations when they are dissatisfied with their appearance or fear they will be too exposed. These 'safety-seeking behaviours' (SBs) may offer temporary relief from anxiety or distress but serve to maintain appearance concerns in the long-term (Legenbauer *et al.*, 2017). Furthermore, these SBs may lead individuals to misattribute their safety to engagement in the behaviour (e.g. 'I wasn't rejected by my coworkers because I spent hours perfecting my appearance before leaving the house'; Moscovitch *et al.*, 2013; Summers and Cougle, 2018). Disorder-relevant SBs are commonly observed across anxiety and compulsive disorders and are thought to preclude disconfirmation of erroneous threat beliefs by undermining the individual's ability to spontaneously cope and learn that the outcome of most feared situations is tolerable, or even positive, without the use of safety aids (Powers *et al.*, 2004; Salkovskis, 1991; Sloan and Telch, 2002).

Recent experimental research has demonstrated that, even in individuals without elevated appearance concerns, increased engagement in appearance SBs worsens BDD symptoms, social anxiety, body dissatisfaction, depression, anxiety, and maladaptive cognitions (i.e. beliefs about the importance of appearance, negative interpretations of ambiguous information; Summers and Cougle, 2018). Furthermore, in a sample of individuals with elevated appearance concerns, instructions to reduce or eliminate appearance SBs subsequently yielded reductions in social anxiety, BDD symptoms, body dissatisfaction, and maladaptive cognitions compared with a no instructions control (Wilver *et al.*, 2020).

Collectively, clinical observations alongside recent experimental work suggests that appearance SBs play an important maintaining role in disorder-relevant sequalae. However, there is a relative dearth of assessment tools designed to identify the type and frequency of engagement in specific SBs related to appearance concerns. Although there are established tools that have been developed to assess BDD symptom severity (Mancuso *et al.*, 2010; Phillips *et al.*, 1997; Veale *et al.*, 2014; Wilhelm *et al.*, 2016), these measures either do not focus on SBs and potential factors associated with these behaviours, or they require more time and are unfeasible to administer in a quick and repeated fashion. Furthermore, some of these measures may not offer as much specificity with regard to the role these SBs play in the course of the illness. For example, the Body Dysmorphic Disorder Symptom Scale (BDD-SS) is a 54-item measure that captures rituals, cognitions and avoidance behaviours seen in the population over the past week, but these items are grouped into 7-item clusters and the individual rates the severity of the cluster instead of each individual item (Wilhelm *et al.*, 2016). Conversely, the Yale-Brown Obsessive-Compulsive Scale Modified for BDD (BDD-YBOCS) does measure SBs related to appearance in addition to other BDD symptoms, but it does not assess specific SBs directly (Phillips *et al.*, 1997). Similarly, the Body Image Coping Strategies Inventory includes items related to fixing appearance but does not include avoidance-related SBs (Cash *et al.*, 2005), and the Derriford Appearance Scale includes items relevant to SBs but focuses on individuals with visible differences in appearance (Carr *et al.*, 2005). Additionally, all of these tools are limited in that they are focused on individuals with BDD but not any other appearance pathology. A more specific tool that clarifies the relative role of specific appearance-related SBs transdiagnostically may better inform clinicians and researchers alike.

A quick and reliable appearance-specific SB measure could offer clinicians and researchers meaningful information about nuanced maintaining factors contributing to patients' disorder

experience. Additionally, a quick and reliable measure of these behaviours could better facilitate treatment outcomes and oversight (Scott and Lewis, 2015). Such an assessment could further be used to identify patient-specific treatment targets and monitor change over the course of treatment.

Research objective

The current investigation sought to create a novel measure of appearance SBs (i.e. the Appearance-Related Safety Behavior scale [ARSB]) that can be easily administered and more directly measure these behaviours across psychiatric disorders. We sought to validate this measure and examine its psychometrics across three studies. The goal of the first study was to conduct an exploratory factor analysis of the factor structure of the ARSB in a general sample. In the second study, confirmatory factor analysis (CFA) was conducted to evaluate the psychometric properties and the latent structure of the ARSB. Additionally, the measure was behaviourally validated using a portion of the sample that completed a behavioural task. In the final study, an analysis of 50 participants with BDD were compared with 51 non-psychiatric (healthy) control participants to measure differences in scores on the measure. Furthermore, Study 3 also sought to examine correlations between changes in ARSB scores and changes in BDD symptom severity over the course of treatment (i.e. using data from a RCT; Wilver and Cougle 2019). Correlational analyses were also conducted to measure convergent validity with measures assessing BDD symptoms across these studies.

Study 1

In Study 1, we sought to develop a questionnaire assessing appearance-related SBs in a college sample. Sixteen items were subjected to a principal axis factoring analysis to determine multicollinearity and reduce unnecessary or redundant items.

Method

Initial item construction

The original ARSB[1] lists 16 appearance-related SBs commonly observed in individuals with BDD (see Appendix A of the Supplementary material for final version of the ARSB) and instructions indicate that these are behaviours people may perform in response to anxiety about appearance. The initial pool of 16 items were created by three research clinicians (one PhD, and two senior graduate students) with extensive experience in assessing and treating BDD. In creating these items, the clinicians considered individuals with BDD that they have worked with and the subtle and explicit methods with which they tried to reduce their appearance-related distress. Additionally, the items were reviewed and revised through consulting with two other expert doctoral level researchers in the field of BDD. Importantly, four of these individuals were White (one identified as Asian), and four were women. Issues of bias related to cultural sensitivity were attempted to be addressed through considering experience working with clients from diverse backgrounds and how appearance pathology presented differently in these cultures. Individuals with lived experiences of appearance concerns were not directly involved in the selection of measure items. The ARSB was also compared with related measures such as the Subtle Avoidance Frequency Examination (SAFE; Cuming *et al.*, 2009), a measure of SBs relevant to social anxiety. In comparing this measure with the initial pool, items were more explicitly stated to emphasize the behaviour's relationship with appearance and increase coherence. Participants are asked to indicate how often they performed each behaviour over

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[1]One item was dropped from the original ARSB due to high collinearity with another item (see results of Study 1).

the course of the past month due to appearance concerns on a 5-point Likert scale from 0 (*Never*) to 4 (*Always*). Items are summed to create a total score with higher scores indicating greater engagement in appearance SBs over the month.

Participants and procedures

Participants were recruited from a pool of undergraduate psychology students at a large southeastern university in the United States. The study was described as examining participants' mood, thoughts and behaviours. Eligible participants included students between the ages of 18 to 65 who fluently spoke English. The present sample consisted of 187 participants with 67.4% of the sample identifying as women with age ranging from 18 to 30 years ($M = 19.59, SD = 1.75$). A total of 59.9% of the sample identified as White, 11.8% as Black, 20.9% as Hispanic, 4.8% as Asian or Pacific Islander, and 2.74% as other.

All study procedures were approved by the university institutional review board (reference no. 2016.19854). Informed consent was obtained prior to initiating study procedures by a trained research assistant. Participants were asked to complete a battery of questionnaires on a laboratory computer. Anonymity was maintained by storing identifying information of each participant in separate files from all study data, and participants were not asked to reveal identifying information within study questionnaires. Participants were debriefed after study completion and were compensated for study participation with course credit.

Self-report Measures

Appearance-Related Safety Behavior Scale (author constructed)

Participants completed the original 16-item version of the ARSB.

Yale-Brown Obsessive-Compulsive Scale Modified for BDD-Self Report (BDD-YBOCS-SR; adapted from Phillips et al., 1997)

The BDD-YBOCS is a 10-item measure of past-week BDD symptom severity. Items are rated from 0 (no symptomatology) to 4 (extreme symptomatology), and in the current study, participants were administered a self-report format of the BDD-YBOCS. Previous research has shown good support for the psychometric properties of the BDD-YBOCS (Phillips *et al*., 1997; Phillips *et al*., 2014). Internal consistency of the self-report version of the BDD-YBOCS for the present study was good ($\omega = 0.84$).

Results

Exploratory factor analysis

Exploratory factor analysis was conducted using principal axis factoring with promax rotation using *R* statistical software version 4.1.1. This method was determined after a series of checks on the data. The data were initially checked for missing data and were found to not have any missing data points for the ARSB. Afterwards, the 16 items were entered into a principal axis factoring analysis without rotating factors. The Kaiser-Meyer-Olkin measure of sampling adequacy was .885, indicating the sample was adequate for these analyses. The initial analyses yielded three factors of Eigenvalues greater than 1, but a parallel analysis was conducted to verify this factor structure (Ruscio and Roche, 2012). Parallel analysis revealed only two factors should be kept. The factor analysis was reconducted with two specified fixed factors. These analyses revealed that the factors were correlated, and a promax rotation was applied.

The initial correlation matrix yielded inter-item correlations ranging from .013 to .519 except for one item. Item 6 (e.g. 'Avoid extended face-to-face interactions due to your appearance

Table 1. Study 1 – rotated factor matrix of the revised version of the ARSB

	Factor 1	Factor 2
1. Check reflective surfaces (e.g. mirrors, windows	−0.31	**0.91**
2. Check body parts (e.g. touching, measuring)	−0.03	**0.67**
3. Camouflage body parts so they are less noticeable (e.g. with clothes, make-up, or accessories)	0.25	**0.49**
4. Seek reassurance from others about your appearance	0.09	**0.52**
5. Avoid eye contact with others due to your appearance concerns	**0.66**	0.12
6. Avoid reflective surfaces (e.g. mirrors, windows)	**0.69**	−0.13
7. Avoid having my picture taken by others	**0.67**	0.02
8. Change clothes repeatedly to find the right outfit	0.23	**0.50**
9. Position yourself so as not to be noticed (e.g. in the back of the room)	**0.67**	0.06
10. Position yourself in a specific manner to hide appearance (e.g. angling yourself in certain lighting, using face or body positioning)	**0.61**	0.13
11. Avoid places where your body might be exposed (e.g. pools, beaches, gym)	**0.48**	0.21
12. Avoid going out in the daytime due to your appearance concerns	**0.60**	−0.12
13. Use substances (e.g. alcohol, drugs, tobacco) due to your appearance concerns	**0.49**	−0.11
% of Variance explained	39.20	11.40

Factor 1 represents behavioural avoidance and factor 2 represents compulsions. One item was removed from the original measure due to high collinearity with another item, and two others were dropped due to not loading onto either factor.

concerns') was removed due to having high collinearity ($r = .87$) with item 5 (e.g. 'Avoid eye contact with others due to your appearance concerns'), and the principal axis factoring analysis was reconducted. Item 5 was chosen over item 6 due to its greater face validity and inclusion of assessing eye contact avoidance, a common safety behaviour in social anxiety (Cuming *et al.*, 2009). All 15 items displayed distinctive factor loadings above .40 except for two. Item 10 [e.g. Position yourself in a specific manner to hide appearance (e.g. angling yourself in certain lighting, using face or body positioning)] and item 15 [e.g. Conduct body related research online (e.g. ways to manage, conceal or alter your appearance)] did not load onto either factor, and they were subsequently removed after testing other rotation methods. See Table 1 for the final rotated factor matrix and factor loadings for the remaining 13 items on the ARSB (see Appendix A of the Supplementary material for final version of the ARSB).

Two factors were identified and explained 50.6% of the total variance (39.2 and 11.4%, respectively). Factor 1 (items 5, 6, 7, 9, 10, 11, 12, 13) seemed to relate to behavioural avoidance (e.g. Avoid eye contact with others due to your appearance concerns), while Factor 2 (items 1, 2, 3, 4, 8) seemed to relate to compulsive behaviour related to fixing or adjusting appearance [e.g. Camouflage body parts so they are less noticeable (e.g. with clothes, make-up or accessories)]. Bartlett's test of sphericity was significant, $\chi^2(78) = 820.186$, $p < .001$.

Internal consistency

Internal consistency of the revised ARSB for the present study was good (McDonald's $\omega = .89$). Additionally, internal consistency for both factors were good (factor 1 McDonald's $\omega = .84$; factor 2 McDonald's $\omega = .82$).

Convergent validity with similar measures

The revised ARSB was positively correlated with BDD symptom severity ($r = .70$, $p < .001$) in the present sample. Both factor subscales were also correlated with the BDD symptom severity (factor 1: $r = .65$, $p < .001$; factor 2: $r = .58$, $p < .001$).

Study 2

In Study 2, we sought to cross validate the two-factor structure of the ARSB using CFA in a separate sample much larger than the first. To further validate the two-factor structure of the ARSB, we also tested a one-factor model of the ARSB hypothesizing that the two-factor model would be a better fit than the one-factor model. We also sought to investigate the convergent and divergent validity of the ARSB with other clinical measures. Additionally, we sought to behaviourally validate the ARSB by determining if it would be correlated with time spent grooming one's appearance in the context of a behavioural task.

Method

Participants and procedures

Participants ($n = 840$) in the present study were recruited for a larger study investigating appearance-related concerns in a sample of undergraduate students. Participants were a new sample recruited from the same subject pool described in Study 1. The mean age of the sample was 19.44 years ($SD = 2.2$). A total of 670 participants (79.8%) identified as women. The racial/ethnic make-up of the sample was as follows: 207 (24.6%) identified as Hispanic, 115 (13.7%) identified as Black, 693 (82.5%) identified as White, 56 (6.7%) identified as Asian, six (0.7%) identified as Hawaiian or Pacific Islander, nine (1.1%) identified as Native American or Alaskan Native, and 27 (3.2%) identified as other.

Study procedures were similar to those described in Study 1, with some participants ($n = 115$) additionally completing a behavioural task as well as a subsequent EEG portion (see Jordan *et al.*, 2021). Study procedures were amended following the start of the 2019 novel coronavirus (COVID-19) pandemic to have participants remotely complete the battery of questionnaires without the behavioural or EEG tasks ($n = 725$). All procedures were approved by the university IRB (reference no. HSC2019.26737), and informed consent was obtained for each participant before study participation.

Self-report measures

Similar to Study 1, both the original ARSB and the BDD-YBOCS-SR were administered in the present study. The internal consistency of the BDD-YBOCS-SR was good ($\omega = 0.87$).

Appearance Anxiety Inventory (AAI; Veale et al., 2014)

The AAI is a self-report measure of BDD consisting of 10 questions rated on a 5-point Likert scale. Items are summed to create a total score ranging 0–40. Scores of 20 and higher are suggestive of clinically significant appearance concerns, while scores of 13 are average and are indicative of general appearance concerns observed in the general population (Mastro *et al.*, 2016). The AAI has demonstrated good internal consistency ($\alpha = 0.86$; Veale *et al.*, 2014) and was excellent ($\omega = 0.92$) in the present sample.

Beliefs About Appearance Scale (BAAS; Spangler and Stice, 2001)

The BAAS is a 20-item self-report measure designed to assess maladaptive attitudes about the importance of one's appearance. Items are rated on a scale of 0–4 with higher endorsement indicative of greater agreement with each statement. The BAAS has demonstrated good internal consistency in past samples ($\alpha = 0.83$–0.84; Spangler and Stice, 2001). The internal consistency of the BAAS in the present sample was excellent ($\omega = 0.96$).

Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977)

The CES-D is a 20-item measure of depression and its associated symptoms in the past week. Responses range from 0 to 3, assessing frequency of symptoms. Scores can range from 0 to 60, with higher scores indicative of greater depressive symptom severity. The CES-D has demonstrated high internal consistency in the past (α = 0.85–0.90; Radloff, 1977). The internal consistency of the CES-D in the present sample was good (ω = 0.80).

The State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA; Ree et al., 2000)

The STICSA is a 21-item self-report measure of state and trait anxiety. Respondents rate items on a scale of 1–4, identifying to what degree they feel the item describes them. There are two subscales in the measure. One is focused on cognitive symptoms of anxiety while the other focuses on somatic symptoms of anxiety. The overall internal consistency of the STICSA in the present sample was excellent (ω = 0.94).

The Social Phobia Inventory (SPIN; Connor et al., 2000)

The SPIN is a 17-item self-report questionnaire of social anxiety disorder symptoms. Respondents rate on a scale of 0–5 how much a specific symptom applies to them. The SPIN has demonstrated good test–retest reliability, internal consistency, and convergent and divergent validity in the past (Connor *et al.*, 2000). The internal consistency of the SPIN in the present sample was excellent (ω = 0.93).

The Eating Disorder Inventory (EDI; Garner et al., 1983)

The EDI is a 64-item self-report questionnaire of eating disorder pathology. Respondents are asked to rate a series of items on a 6-point scale ('*Never*' to '*Always*') to determine the frequency of each symptom. The EDI consists of eight subscales that measure different aspects of eating pathology (i.e. drive for thinness, bulimia, perfectionism, etc.). The EDI has been extensively studied and validated (Clausen *et al.*, 2011). The internal consistency of the EDI total score in the present study was good (ω = 0.86).
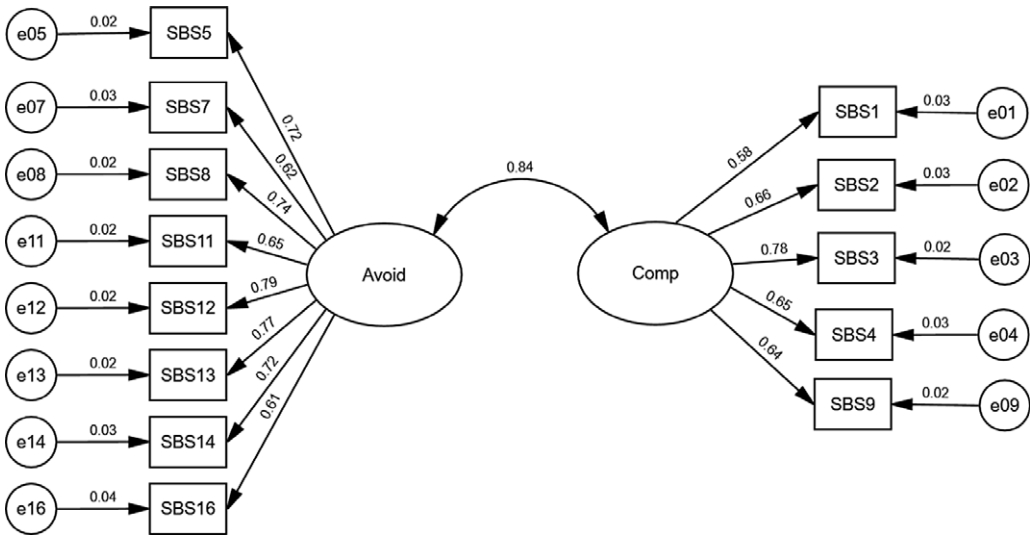
Behavioural task

In this task, participants were informed that they would have their picture taken for the purpose of others later rating their attractiveness. Participants were then left alone and were told to prepare themselves for their picture being taken and were given up to two minutes to adjust their appearance while the time was recorded in seconds (the key variable for analyses). When they felt ready, the picture was taken. During debriefing, participants were informed that the pictures would not actually be rated and were made aware of the true purpose of the task. More information about this task can be found elsewhere (Jordan *et al.*, 2021).

Results

Confirmatory factor analysis

CFA of the ARSB was conducted using Mplus, version 8 (Muthén and Muthén, 2017) with maximum likelihood estimation. Missing data were addressed using full information maximum likelihood. Several fit indices were examined including comparative fit index (CFI; Bentler, 1990), the Tucker-Lewis index (TLI; Tucker and Lewis, 1973), standardized root mean square residual (SRMR; Hu and Bentler, 1999), and root mean square error of approximation (RMSEA; Browne and Cudeck, 1992). Additionally, the chi square test for the model was conducted, but it is important to note that this test is heavily biased by large samples.

   Based on the results of Study 1, two latent factors were identified: safety behaviours related to behavioural avoidance, and safety behaviours related to compulsions. The two latent factors were allowed to co-vary. Results indicated a reasonable approximate model fit, $\chi^2(64) = 449.02$, $p < .001$,

Figure 1. Standardized path coefficients for the two-factor model of the 15-item version of the ARSB. Latent constructs are in ellipses and observed variables are in rectangles. Avoid, appearance-related behavioural avoidance; Comp, compulsive behaviour related to appearance. SBS1–5, ARSB items 1–5; SBS7–9, ARSB items 6–8; SBS11–14, ARSB items 9–12; SBS16, ARSB item 13.

CFI = .94, TLI = .92, SRMR = .05, RMSEA = .060, 95% CI [0.049, 0.071]. For factor structure and loadings of this model, see Fig. 1. The two-factor model did fit the data better than the one-factor model, $\chi^2(65) = 565.88$, $p < .001$, CFI = .87, TLI = .83, SRMR = .06, RMSEA = .10, 95% CI [0.089, 0.104].

Internal consistency

The internal consistency for the total revised ARSB in the present study was excellent ($\omega = 0.91$) and was good for both the behavioural avoidance subscale ($\omega = 0.88$) and compulsions subscales ($\omega = 0.84$).

Convergent validity with similar measures

Zero-order correlation analyses were conducted to observe the convergent validity of the ARSB with other clinically relevant measures (see Table 2). Means and standard deviations for each measure can be found in Table 3. The ARSB was positively correlated with BDD symptom severity ($r = .72$, $p < .001$), appearance anxiety ($r = .86$, $p < .001$), beliefs about appearance ($r = .76$, $p < .001$), depression severity ($r = .60$, $p < .001$), trait anxiety ($r = .64$, $p < .001$), social anxiety ($r = .61$, $p < .001$), and eating disorder symptom severity ($r = .77$, $p < .001$). Furthermore, partial correlation analyses, co-varying for depression and trait anxiety, showed the ARSB was still strongly related to BDD symptom severity, $pr = .50$, appearance anxiety, $pr = .75$, social anxiety symptom severity, $pr = .28$, eating disorder severity, $pr = .54$, and beliefs about appearance, $pr = .58$, $p < .001$. Zero-order correlation analyses were also conducted to observe convergent validity of the individual subscales of the ARSB with the same clinical measures (see Table 2).

Table 2. Study 2 – zero order correlations (*n* = 840)

Variables	1	2	3	4	5	6	7	8	9
1. ARSB	––								
2. ARSB Behavioral Avoidance 3 Subscale	.94*	––							
3. ARSB Compulsion Subscale	.93*	.68*	––						
4. BDD-YBOCS	.72*	.66*	.65*	––					
5. BAAS	.75*	.69*	.69*	.66*	––				
6. AAI	.86*	.79*	.82*	.75*	.76*	––			
7. CES-D	.60*	.61*	.46*	.60*	.57*	.59*	––		
8. STICSA	.64*	.65*	.51*	.63*	.58*	.65*	.74*	––	
9. SPIN	.61*	.62*	.48*	.54*	.51*	.60*	.58*	.73*	––
10. EDI	.77*	.75*	.64*	.69*	.73*	.74*	.74*	.71*	.60*

*$p<.001$; ARSB, Appearance Related Safety Behavior Scale; BDD-YBOCS, Yale-Brown Obsessive Compulsive Scale modified for Body Dysmorphic Disorder; BAAS, Beliefs about Appearance Scale; AAI, Appearance Anxiety Inventory; CES-D, Center of Epidemiologic Studies Depression Scale; STICSA, State-Trait Inventory for Cognitive and Somatic Anxiety; SPIN, Social Phobia Inventory; EDI, Eating Disorder Inventory.

Table 3. Studies 2 and 3 – means and standard deviations of self-report measures

	Study 2 (*n* = 840)		Study 3 healthy sample (*n* = 51)		Study 3 clinical sample (*n* = 50)	
	Mean	SD	Mean	SD	Mean	SD
ARSB	16.44	10.48	8.76	7.59	40.84	10.18
BDD-YBOCS	12.59	6.50	6.61	4.86	29.36	4.41
BAAS	29.25	18.58				
AAI	15.67	9.35				
CES-D	17.23	11.51				
STICSA	38.75	13.37				
SPIN	22.35	14.56				
EDI	188.96	47.47				
PANAS-NA			12.36	2.63	24.66	7.91
SDS					16.86	6.86
Post-treatment						
ARSB					29.57	13.74
BDD-YBOCS					18.61	8.40
SDS					9.33	7.71

ARSB, Appearance Related Safety Behavior Scale; BDD-YBOCS, Yale-Brown Obsessive Compulsive Scale modified for Body Dysmorphic Disorder; BAAS, Beliefs about Appearance Scale; AAI, Appearance Anxiety Inventory; CES-D, Center of Epidemiologic Studies Depression Scale; STICSA, State-Trait Inventory for Cognitive and Somatic Anxiety; SPIN, Social Phobia Inventory; EDI, Eating Disorder Inventory; PANAS-NA, Positive Affect and Negative Affect Schedule–Negative Affect Subscale; SDS, Sheehan Disability Scale.

Correlation with behavioural task

Analyses were conducted to behaviourally validate the ARSB by correlating scores with time spent on modifying appearance. The mean time spent on modifying appearance was 23.01 s (*SD* = 30.64; range 0.0–120.0 s). Scores on the ARSB were indeed positively correlated with time spent on modifying appearance (*r* = .33, *p* < .001), and both the behavioural avoidance subscale (*r* = .30, *p* < .001) and the compulsion subscale (*r* = .29, *p* < .001) were positively correlated with time modifying appearance.

Incremental validity

Hierarchical regression analyses were conducted to examine the incremental validity of the ARSB above and beyond the BDD-YBOCS (the most frequently used measure of appearance concerns)

in predicting time modifying appearance. The BDD-YBOCS was entered into the first step of the model and accounted for 9.6% of the variance and significantly predicted time modifying appearance, $\beta = 0.31$, $p < .001$. The ARSB was entered in step 2 of the model. The unique variance attributed to the ARSB was non-significant ($\Delta R^2 = .023$), $F_{1,111} = 2.94$, $p = .17$, and neither the BDD-YBOCS, $\beta = 0.18$, $p = .16$, nor the ARSB, $\beta = 0.18$, $p = .17$, predicted time modifying appearance when controlling for each other. An additional model predicting depression was conducted with the BDD-YBOCS entered at step 1 and the ARSB entered at step 2. The unique variance contributed by the ARSB was significant ($\Delta R^2 = .07$), $F_{1,107} = 15.16$, $p < .001$. The BDD-YBOCS accounted for 44.7% of the variance, and the ARSB accounted for an additional 7.0% of the variance. Both the BDD-YBOCS, $\beta = .40$, $p < .001$, and ARSB, $\beta = 0.38$, $p < .001$, were significant unique predictors of depression in step 2.

Study 3

In Study 3, we sought to compare the scores on the ARSB in two separate samples with one sample consisting of individuals with BDD and the other a healthy control group. Additionally, we sought to use clinical data of individuals with BDD undergoing internet-based treatment to evaluate whether changes in the ARSB were associated with symptom change at post-treatment and follow-up.

Method

Participants and procedures

The first sample came from a treatment trial for BDD and consisted of 50 individuals diagnosed with BDD with participants either randomized to an 8-session online interpretation bias modification (IBM) condition or an 8-session progressive muscle relaxation (PMR) condition (see Wilver and Cougle 2019 for a more thorough overview of study procedures). Individuals in the IBM condition were presented with both a sentence completion comprehension task as well as a word-sentence relatedness task that took approximately 15 minutes to complete per session, and individuals in the PMR condition were presented recordings of a PMR exercise, completed in approximately 15 minutes per session. These interventions were one month long and data from pre- and post-treatment were examined. Like Studies 1 and 2, some participants were recruited from an undergraduate research pool. Additionally, participants were recruited from the community through flyers and Craigslist postings. To be eligible for the larger study, participants needed to be between the ages of 18 and 65, proficient in English, and meet criteria for BDD[2] as measured by the Structured Clinical Interview for DSM-5 (SCID-5; First *et al.*, 2015). Participants were excluded if they had a lifetime history of psychotic symptoms, current or lifetime diagnostic history of bipolar or borderline personality disorder, current alcohol or substance use disorder, unstable psychotropic medication status, concurrent psychotherapy for BDD, and clinically significant suicidality. All procedures were approved by the institution IRB (reference no. 2017.20244). Most of the sample identified as women ($n = 42$; 84.0%), and one individual (2.0%) identified as transgender. Participants' ages ranged from 18 to 53 ($M = 28.52$, $SD = 9.32$). A total of 58.0% of the sample identified as White/Caucasian, 12.0% as Hispanic, 14.0% as Black, 10.0% as Asian or Pacific Islander, and 6.0% identified as other.

    The second sample came from a larger study investigating correlates and maintenance factors of general mood and anxiety symptoms at the same southeastern university described in both Studies 1 and 2. Participants were considered 'healthy' ($N = 51$) if they did not endorse any psychiatric symptoms during a brief clinical interview composed of the BDD module of the SCID-5 (First *et al.*, 2015) and the screener items of the Mini-International Neuropsychiatric Interview (M.I.N.I.; Sheehan *et al.*, 2006) which assesses for common psychiatric conditions in the *DSM-5*. All study

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[2]Because a BDD diagnosis requires that the appearance concerns not be more than slightly visible to others, individuals with appearance concerns regarding a true visible difference were not included in the study.

procedures were reviewed and approved by the university's IRB (reference no. 2018.24975), and all participants provided informed consent before completing clinical interviews and questionnaires. Three-quarters of the sample identified as female (70.6%), and ages ranged from 18 to 30 years ($M = 19.75$, $SD = 2.00$). The racial and ethnic make-up of the sample was 60.8% Caucasian, 19.6% Hispanic, 7.8% Black, 9.8% Asian or Pacific Islander, and 2.0% identified as other.

Clinical interviews

The BDD-YBOCS is a clinician-administered semi-structured interview (Phillips *et al.*, 1997) that was utilized to measure BDD symptom severity in the clinical sample. All interviewers were advanced graduate students at the previously described southeastern university. The BDD-YBOCS consists of 12 semi-structured interview questions that inquire about BDD symptomology in the past week. The internal consistency of the interview was adequate ($\omega = .71$). The rater-administered BDD-YBOCS was not administered to the healthy sample. Rather, they were administered the self-report version of the BDD-YBOCS.

Self-report measures

Similar to Study 1 and Study 2, all participants completed the ARSB (clinical BDD $\omega = 0.84$; healthy controls $\omega = 0.87$). Internal consistency was adequate for both the behavioural avoidance (clinical BDD $\omega = 0.83$; healthy controls $\omega = 0.84$) and compulsions (clinical BDD $\omega = 0.76$; healthy controls $\omega = 0.80$) subscales for the clinical and healthy sample. In addition to being administered at baseline the measure was completed at post-treatment (clinical BDD $\omega = 0.91$; behavioural avoidance $\omega = 0.90$; compulsions $\omega = 0.82$) for the clinical sample.

Sheehan Disability Scale (SDS; Sheehan et al., 1996)

The SDS is a measure of functional impairment that asks respondents to rate the extent to which their present issue impacted home management, their ability to work or complete schoolwork, and their social life on a scale of 1–10. The SDS was only administered in the clinical sample. Internal consistency was adequate in the present sample ($\omega = 0.78$).

Positive Affect and Negative Affect Schedule (PANAS; Watson et al., 1998)

The PANAS is a 20-item questionnaire measuring global emotional state at the time of completion. There are two subscales, one that measures positive affect and another that measures negative affect. The present study utilized the negative subscale, which assessed how respondents felt each emotion in general. The measure was administered to both groups. The internal consistency of the subscale was good in the present sample ($\omega = 0.88$).

Results

Mean and standard deviations for all measures are presented in Table 3. Scores on the ARSB were found to be significantly higher in the BDD group ($M = 32.84$, $SD = 8.32$) compared with the healthy control group ($M = 7.96$, $SD = 6.77$) ($F_{1,99} = 272.26$, $p < .001$, $\eta^2 = .74$). Once controlling for negative affect via the PANAS negative affect subscale, scores on the ARSB were again found to be significantly higher in the BDD group compared with the healthy control group ($F_{1,89} = 68.19$, $p < .001$, $\eta^2 = .45$).

   Power analysis indicated that to detect the expected medium to large effect ($r = .40$) for the planned correlational analyses, 37 participants would be sufficient with $\alpha = .05$ and power $= .80$. In the clinical BDD sample, baseline scores on the ARSB were positively correlated with rater-administered BDD symptom severity scores at baseline ($r = .48$, $p < .001$), number of

co-morbid diagnoses as measured by the MINI ($r = .40$, $p = .005$), functional impairment ($r = .65$, $p < .001$), and negative affect ($r = .41$, $p = .004$).

Repeated measure ANOVAs were conducted to determine if there were significant change in ARSB, BDD symptoms severity scores, and functional impairment score from baseline to post-treatment for the clinical sample. The mean scores of ARSB ($F_{1,48} = 34.88$, $p < .001$, $\eta_p^2 = .42$), BDD symptoms severity ($F_{1,48} = 92.28$, $p < .001$, $\eta_p^2 = .66$), and functional impairment ($F_{1,48} = 55.57$, $p < .001$, $\eta_p^2 = .54$) were statistically significantly different from baseline to post-treatment. Correlational analyses were also conducted to test whether change in ARSB scores from pre- to post-treatment were associated with symptom change. Change in scores was found to be positively correlated with changes in the BDD symptoms severity ($r = .45$, $p = .001$), as well as changes in functional impairment ($r = .35$, $p = .01$).

General discussion

The findings from the present study suggest that the ARSB is a sound measure of appearance-related SBs with evidence of good reliability and validity. In Study 1, the 13 items of the ARSB fit into two distinct factors. One factor appears to assess appearance-related behavioural avoidance, and the second factor appears to assess compulsive appearance-related rituals. This two-factor model was confirmed in a second sample, suggesting that the ARSB does indeed account for these two factors measuring SBs. In addition, the measure accounted for a similar amount of variance (50.6%) in relevant clinical symptoms compared with other measures of SBs (SAFE = 42.4%). While there are valid and reliable measures of BDD symptoms, the ARSB demonstrates a novel and easily administrable measure of appearance-related safety behaviours that captures a specific aspect of appearance concerns that could be present across various disorders. Additionally, the ARSB and its two subscales were positively correlated with BDD symptoms and appearance anxiety across these studies, and they were also correlated with measures of negative affect, appearance concerns and cognitions, and functional impairment. Furthermore, the ARSB was positively correlated with social anxiety and eating disorder symptoms, supporting the role of these behaviours across diagnoses.

In Study 2, we also examined the ARSB as a correlate of *in vivo* safety behaviours via a behavioural task in which a subset of participants was told that their picture would be taken and evaluated by others. ASRB total score and subscale scores were positively correlated with time spent adjusting/grooming prior to having their picture taken. While prior studies have utilized similar behavioural paradigms to observe appearance concerns, the outcome measure was participants' self-rated stress and fear in anticipation of having their photo taken without any additional stressor (i.e. were not told that their photo would be seen or rated by others; Summers and Cougle, 2018; Wilver *et al.*, 2020). The behavioural task in the present study was able to induce this same fear and record the time spent on modifying appearance, and the subsequent findings provide unique behavioural evidence supporting the validity of the ARSB as a measure of appearance-related safety behaviour.

We conducted additional analyses to examine the incremental validity of the ARSB over an established measure of appearance concerns, the BDD-YBOCS. When controlling for BDD-YBOCS scores, the ARSB was associated with greater time spent modifying appearance, although this relationship was small and at a non-significant trend; these analyses may have been underpowered to detect significance. The BDD-YBOCS consists of some items assessing general SB use, so these findings are not surprising. Further analyses of incremental validity found that, when co-varying for BDD-YBOCS scores, the ARSB predicted unique variance in depression, which is unique evidence for its distinctness and clinical value. Future research should seek to examine the ARSB's incremental validity compared with other measures of appearance concerns in more experimental designs to demonstrate its utility in detecting safety behaviours above and beyond these measures.

In Study 3, additional analyses in a clinical sample revealed that individuals with BDD evidenced significantly higher scores on the ARSB when compared with healthy controls (independent of co-occurring negative affect). Among individuals with BDD, the ARSB was also positively correlated with number of co-morbid disorders and BDD-related impairment. These findings align with the literature suggesting that SBs are related to greater clinical impairment and distress (Legenbauer *et al.*, 2017; Moscovitch *et al.*, 2013).

Crucially, in the context of a clinical trial in Study 3, we also found that the ARSB was sensitive to the effects of treatment, and changes in the ARSB were correlated with changes in both BDD symptoms and related impairment. These findings speak to the clinical importance of these behaviours in BDD and the potential utility of this measure in assessing them. Although the present clinical trial did not directly target SBs, the findings of this study further support that reduction in SBs related to appearance are related to reductions in BDD symptoms (Summer and Cougle, 2018; Wilver *et al.*, 2020). Future studies should seek to build on the present and past findings to observe the effect reductions in SBs as measured by the ARSB have on related pathology (e.g. BDD, social anxiety, body dissatisfaction, and maladaptive cognitions). Additionally, future studies should build on our findings to further examine the measure's sensitivity to change over time providing valuable information to clinicians and treatment trials.

Limitations

It is important to consider the findings of the study in the context of limitations. First, the initial exploratory factor analysis in Study 1 was conducted in a non-clinical sample. Although the sample was unselected, the factor structure may have presented differently in a clinical sample. Secondly, all three study samples primarily consisted of younger women; thus, our findings may not generalize to men or older adults. Third, the present study was unable to determine discriminant validity of the ARSB. Future studies should seek to replicate the convergent validity demonstrated in this study and observe the discriminant validity of the measure in both unselected and clinical samples. Fourth, while the ARSB was positively correlated with similar measures, indicating convergent validity, we were not able to establish the incremental value of the ARSB as an assessment of appearance safety behaviours over other measures of appearance concerns. Notably, some of these measures such as the BDD-YBOCS incorporate some items that assess appearance-related SBs, although they are more general in nature and lack detail on the frequency of individual SBs. Future research should examine these measures in the context of ARSB manipulations (e.g. Summers and Cougle, 2018; Wilver *et al.*, 2020) to evaluate their relative sensitivity to detect SB-related effects. Additionally, the present study was unable to determine the stability of the measure over time. Although we had a longitudinal dataset, analysing test–retest reliability in the context of an intervention would not have yielded the necessary information to determine the temporal stability of the measure. Finally, much of the inferences that can be made from the present study are correlational.

Future studies should seek to study the ARSB in the context of experimental safety behaviour fading studies (e.g. Wilver *et al.*, 2020) or multi-wave longitudinal designs. These studies may also consider employing a past week version of the ARSB to better measure change in these behaviours. Additionally, they should seek to further validate the measure in different samples (i.e. individuals with social appearance anxiety, eating disorders, actual visible differences) to understand the variability of these behaviours trans-diagnostically and the flexibility of the ARSB. Additionally, future research may consider building on the measure by assessing appearance-related SBs that are covert mental acts (e.g. comparing one's appearance with others') rather than overt behaviour to further understand and address these behaviours.

Conclusion

Taken together, the findings of the present study suggest that the ARSB validly and reliably measures appearance-related safety behaviours through two distinct but related subscales.

The ARSB has several potential uses as a tool for researchers and clinicians working with individuals with appearance-related concerns (e.g. BDD, social anxiety, eating disorders). Safety behaviours have been proposed to be a key maintenance factor of appearance concerns in individuals with BDD (Summers and Cougle, 2018; Veale, 2004). The cognitive model of BDD suggests that individuals may utilize SBs to regulate negative emotions and cognitions related to appearance; thus, the ARSB could be a valuable tool in assessing for these behaviours and their role in treatment and potential contribution to appearance-related psychopathology (Clerkin and Teachman, 2008; Didie *et al.*, 2008; Phillips *et al.*, 2005; Phillips *et al.*, 2008; Veale, 2004). Future research can further explore the role SBs play in individuals with appearance-related concerns while also creating tailored treatments to address these concerns. Clinically, the ARSB could be a vital tool in assessing for specific SBs, allowing for a better understanding of how these behaviours affect individuals in addition to enhancing the client's understanding of these behaviours and their impact. Altogether, the ARSB appears to be a novel measure of appearance related SBs and may be crucial in further understanding these transdiagnostic phenomena.

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