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1 Identification of the underlying factor structure of the Derriford Appearance Scale 24

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29

30 **Abstract**

31 Background. The Derriford Appearance Scale24 (DAS24) is a widely used measure of

32 distress and dysfunction in relation to self-consciousness of appearance. It has been used in

33 clinical and research settings, and translated into numerous European and Asian languages.

34 Hitherto, no study has conducted an analysis to determine the underlying factor structure of the
35 scale.

36 Methods. A large (n=1265) sample of community and hospital patients with a visible
37 difference were recruited face to face or by post, and completed the DAS24.

38 Results. A two factor solution was found to be the best fit to the data. A main factor,
39 general self consciousness (GSC), was represented by 18 items. Six items comprised a second
40 factor, sexual and body self-consciousness (SBSC). The SBSC scale demonstrated greater
41 sensitivity and specificity in identifying distress for sexually significant areas of the body.

42 Discussion. The factor structure of the DAS24 facilitates a more nuanced interpretation of
43 scores using this scale. Two conceptually and statistically coherent sub-scales were identified.
44 The SBSC subscale offers a means of identifying distress and dysfunction around sexually
45 significant areas of the body not previously possible with this scale.

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Introduction

50

51 The psychological distress and dysfunction associated with visible differences associated
52 with disease, traumatic injury and congenital and developmental abnormality has been
53 increasingly documented over recent years (Bessell, Dures, Semple, & Jackson, 2012).
54 Difficulties reported include social avoidance, fear of negative evaluation, shame, and anxiety
55 (Rosser, Moss, & Rumsey, 2010). Applied psychologists, including health, clinical, and
56 counseling psychologists have been at the forefront of developing interventions to support people
57 with psychological needs arising from visible differences (Bessell et al., 2012), and in
58 developing a clearer understanding of the differentiating factors and processes between those
59 who adjust well, and those who struggle to cope and manage with differing appearances.

60 In order to make a meaningful assessment of interventions, and also to be able to have a
61 relevant, specific and well defined outcome variable in theoretical explorations, a team of plastic
62 surgeons and psychologists created the Derriford Appearance Scale 59 (Carr, Harris, & James,
63 2000). This psychometrically sound measure derived from patient reports in plastic surgery, has
64 shown to be valid and reliable in clinical and general population samples. It has been translated
65 into multiple languages, for example, Japanese and Nepalese (Carr, Moss, & Harris, 2005; Keiko
66 et al., 2008; Singh, Singh, Moss, Roy, & Baral, 2013). In 2005, Moss, Carr and Harris published
67 a shorter form of the scale, the Derriford Appearance Scale 24 (DAS24), which retained the
68 psychometric properties of the DAS59 but was quicker for participants to complete and had
69 greater face validity (Carr et al., 2005). Originally envisaged as unifactorial, the subsequent
70 widespread use of DAS24 in medical, and psychological practice, as well as in psychological

71 research has led to a reconsideration of the constructs DAS24 identifies, specifically if it is a
72 multifactorial measure. Therefore the purpose of the current study was to investigate the factor
73 structure of DAS24 for people who have visibly different appearance.

74

75 **Method**

76 *Ethics*

77 The research was approved by National Research Ethics Service UK Research Ethics
78 Committee (Central and South Bristol - 05/Q2006/19), and is consistent with the Declaration of
79 Helsinki ethical principles. Participants were recruited in accordance with ethical guidance for
80 obtaining informed consent, which included a two-week period to consider opting into the study.

81 *Participants*

82 Sample size was based on recommendations by Comrey and Lee on minimum sample
83 size in factor analysis (Comrey & Lee, 1992). They indicate that more than 500 is very good,
84 whilst 1000 or more observations is excellent. For the current study, increasing sample
85 sizes beyond 1000 served to enhance power and provided the opportunity to obtain a wide
86 sample over multiple clinical groupings.

87 Participants aged over 18 years old who self-identified as being visibly different and with
88 fluency in written and spoken English were recruited from community and clinical settings. Six
89 hundred and fourteen community participants were recruited through advertisements and general
90 practice doctors' surgeries, whilst 651 clinical participants were recruited via outpatient clinics
91 (prosthetics, dermatology, ophthalmology and general plastics (plastics & burns), ear, nose and
92 throat clinics (including cleft lip and palate) cancer clinics (head and neck, skin) and laser
93 treatment. Participants were recruited from locations across the United Kingdom (Bristol,

94 London, Bradford, Sheffield and Warwick). In total, 1265 participants were recruited. 867 of the
95 whole sample were female (68.5%), 354 male (28.0%). 474 of those in the community sample
96 were female (77.2%), 120 were male (19.5%). Similarly, 393 of those in the clinic sample were
97 female (60.4%), 234 were male (35.9%). The mean age of the whole sample was 47.3 years
98 (range 18-91, SD 16.7 years) with the mean age in the community sample 44.9 years (range 18 –
99 91; SD 16.2 years), marginally lower than in the clinic mean age 49.7 years (range 18 – 89; SD
100 16.9 years). 783 (61.9%) of the whole sample reported being married or living with partner, 183
101 (14.6%) living with friends or relatives and 287 (22.9%) living alone. 81% of the whole sample
102 were white, with the other 12% either Pakistani, Indian, Black Caribbean, Black African or
103 other, 7% did not state their ethnicity. The percentages are similar in both the clinic and
104 community sample.

105 DAS 24 was included as part of a wider Appearance Research Collaboration study that
106 was assessing adjustment to visible difference (Clarke, Thompson, Jenkinson, Rumsey and
107 Newell, 2013). Those who agreed to participate were given a questionnaire booklet to complete
108 at their next outpatient appointment or mailed the booklet by post. Participants self-reported
109 demographic information, and the aspect of their physical appearance they were most sensitive
110 about.

111

112 *Materials*

113 DAS24 is a 24 item self report scale measuring social anxiety and avoidance in relation
114 to self-consciousness of appearance. Total scores range from 11-96 with lower
115 scores representing lower levels of social anxiety and social avoidance. The authors report high
116 internal consistency, with Cronbach's alpha coefficients $\alpha = .92$ and six-month test-retest

117 reliability of $r=.68$. It has also shown good convergent and discriminant construct validity with
118 measures of social anxiety, shame, and depression, and divergent construct validity with hysteria.
119 For a detailed description of the psychometric validation of DAS24 please refer to the original
120 article (Carr, Moss and Harris, 2005).

121 *Data analytic strategy*

122 A bootstrapped Kaiser-Guttman with a hypothesised to two factor solution, and a principle
123 component analysis with varimax rotation were implemented. The more frequently used Kaiser-
124 Guttman method was rejected as it can be over inclusive and generate useless factors. Analyses
125 of variance (ANOVAs) were then conducted on the resultant factors to identify variability by
126 gender, recruitment method and location of participants' areas of visible difference sensitivity.

127
128 **Results and Discussion**

129 *Results*

130 Firstly, data were checked for influential observations; we measured changes in the
131 ellipsoid volume of the dataset if an observation was deleted (Chatterjee, 1991). As there were
132 only a small number of influential observations this was acceptable. The data was also assessed
133 to establish if the correlation between variables was high enough for meaningful extraction,
134 which was found to be the case with Kaiser-Meyer-Olkin measure $=0.952$ ($KMO >.09$ is
135 generally confirmed as "marvelous" (Kaiser & Rice, 1974).

136
137 *Factor structure*

138 A principal component analysis was conducted with varimax rotation. Identical analysis was
139 conducted with separate community and clinical subsamples, and with the total sample. There

140 was no significant difference between subsamples; with both analyses resulting in a similar
 141 solution therefore results from the total sample are reported.

142 All items loaded on to their respective factors at $\geq .5$. Two components with eigen values
 143 >1 were observed. A scree plot of eigen values also showed a clear “elbow” at this point,
 144 therefore a two component solution was accepted as the best fit for the data. Component one
 145 was defined as “general self-consciousness of appearance” (GSC) and contained 18 items. Factor
 146 two contained six items and was defined as “sexual and bodily self-consciousness of
 147 appearance” (SBSC). Item loadings are shown in Table 1.
 148
 149

Item summary	F1 GSC loading	F2 SBSC loading
Feel Rejected	.734	
Close into shell	.730	
Feel hurt	.723	
Avoid leaving house	.708	
Feel confident	.680	
Feel Irritable	.673	
Self conscious & irritable at home	.668	
Feel normal	.666	
Distressed at reflection	.640	
Distressed at social events	.637	
Avoid pubs/restaurants	.635	

DAS24 Factor Structure

Feel self conscious of feature	.583
Feel Misjudged	.579
Adopt concealing gestures	.561
Distressed supermarkets/dept stores	.551
Distressed at others' remarks	.539
Self conscious adverse work impact	.524
Feel masculine/feminine	.516
Distressed at beach	.760
Distressed at clothing limitations	.711
Avoid communal changing	.698
Avoid undressing with partner	.656
Distressed at sports/games	.616
Adverse effect on sex life	.587

150

151

Table 1: Component loading (loadings shown above 0.5 for clarity)

152

153 The two factors accounted for 70-95% of the proportion of the variance. Cronbach's alpha for
 154 this sample was $\alpha = .93$ for the whole DAS24, $\alpha = .0.93$ for the GSC factor, and $\alpha = .0.80$ for the
 155 SBSC factor.

156

157

158 *Variability in factor response by gender and recruitment method*

159 As would be expected, men scored lower than women on both factors (i.e., were less distressed).

160 For GSC, men's mean = 29.6, sd = 11.5, whereas for women mean = 35.0, sd = 11.9. For SBSC,

161 men's mean = 6.9, sd = 4.7, whereas women's mean = 10.5, sd = 5.6. This was significant in
 162 both cases. For GSC, $F(1,1000) = 43.389, p < .0001, \eta^2 = .042$, and for SBSC, $F(1,1161) =$
 163 $101.576, p < .0001, \eta^2 = .080$. In addition, the effect sizes indicate that this variation was small for
 164 GSC but medium to large for SBSC. There were also significant difference between community
 165 and clinical samples, with higher scores noted for the clinical samples; for GSC this was
 166 $F(1,1035) = 9.812, p < .002, \eta^2 = .009$ whilst for SBSC $F(1,1203) = 16.357, p < .0001, \eta^2 = .013$,
 167 however the effect sizes were very small.

168
 169 *Variability in factor response by area of sensitivity*

170 For areas of the body where participants identified their main area of sensitivity in a less
 171 sexually significant location (nose or hands) GSC was significantly greater compared to those
 172 not self conscious of these body areas. This was not the case for SBSC. Furthermore, scores for
 173 participants who identified their main area of sensitivity about their appearance as a more
 174 sexually significant or concealed location of their body were significant on both GSC and SBSC,
 175 with larger effect for SBSC sizes, as indicated in Tables 2 and 3.

176
 177 Table 2 GSC: Those concerned vs those not concerned about specific body parts
 178

	<i>Df</i>	<i>F</i>	η^2	<i>P</i>
Nose	1,1035	26.835	.025	<.0001
Hands	1,1035	11.238	.011	<.0001
Breasts	1,1035	78.251	.071	<.0001
Mouth	1,1035	18.805,	.018	<.0001
Abdomen	1,1035	57.290,	.0052	<.0001

179

180

181

182 Table 3 SBSC: Those concerned vs those not concerned about specific body parts

	<i>Df</i>	<i>F</i>	η^2	<i>p</i>
Nose	1,1203	.788	.001	.181
Hands	1,1203	.356	.000	.551
Breasts	1,1203	154.488,	.114	<.0001
Mouth	1,1203	6.956	.006	<.0001
Abdomen	1,1203	124.212	.094	<.0001

183

184 As shown in Table 2, GSC was significant, regardless of location of appearance sensitivity, with
 185 small to medium effect sizes. For SBSC there were large effects if the area of sensitivity was the
 186 breasts or abdomen. However, if the area of sensitivity was the mouth, the results were
 187 significant but with a much smaller effect size that GSC. There was no significant difference in
 188 SBSC between those concerned about their nose (compared to those not concerned about their
 189 nose) or hands (compared to those not concerned about their hands).

190

191 *Discussion*

192 Principal component analysis of DAS24 generated two factors, General Self-Consciousness of
 193 appearance (GSC) and Sexual and Bodily Self-Consciousnesses of appearance (SBSC). Further
 194 analysis of the factor scores indicated that this two factor solution correlated with dominant area
 195 of appearance self-consciousness. There was a greater likelihood of significance and large effect
 196 sizes for SBSC for people identified their main area of sensitivity in a region of their body that
 197 was sexually significant or concealable by clothing. Issues concerning appearance and sexual

198 difference for people with a visibly different appearance are recognised as neglected areas such
199 as in burns rehabilitation (Ahmad, Masoodi, Akhter, & Khurram, 2013). The lack of
200 understanding of sexual functioning in relation to body image, and any accompanying lack of
201 measurement tools have been cited as a major barrier to developing effective interventions
202 (Corry, Pruzinsky, & Rumsey, 2009; Taylor, Harley, Ziegler, Brown, & Velikova, 2011).
203 Increased understanding of the factor analytic structure of DAS24 and the identification of a
204 brief, six item subscale to measure SBSC adds to the tools available for research and
205 intervention. The specificity of the SBSC factor was demonstrated by the differentiation of the
206 sample according to sexually significant areas, while no difference was observed in SBSC in
207 those concerned/unconcerned about non-sexually significant areas.

208 A major strength of this study was its robustness, in terms of good data, a well-powered
209 sample and close consideration of the most appropriate method of factor analysis. This permitted
210 clear factor structure to emerge. Further validation of factor stability in other large samples
211 would be useful.

212 **Conclusion**

213 This brief paper adds further utility to well established measure, offering the possibility
214 of using the complete scale, or one of the two subscales as required. It demonstrates the existence
215 of a factor structure beyond the simple total score of the DAS24. The SBSC factor demonstrated
216 greater sensitivity and specificity to distress which is based on a concern arising from sexually
217 significant body areas.

218

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