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

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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

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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

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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.

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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,

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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

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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 Kasier-

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.

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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).

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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

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

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

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	

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

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

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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.

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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,

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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.

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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.

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177 Table 2 GSC: Those concerned vs those not concerned about specific body parts
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	Df	*F*	η^2	*P*
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

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

	Df	F	η^2	p
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

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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).

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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

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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.

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