# A cultural comparison of treatment need

# Pape Ibrahima Ngom\*, Rebecca Brown\*\*, Falou Diagne\*,

François Normand\*\*\* and Stephen Richmond\*\*

\*Orthodontic Section, Faculty of Dentistry, University Cheikh Anta Diop, Dakar, Senegal, \*\*Department of Dental Health and Biological Sciences, Dental School, Cardiff University, Cardiff, UK, \*\*\*Orthodontic Section, Faculty of Dentistry, University d'Auvergne, Clermont-Ferrand, France

SUMMARY The aims of this study were two-fold. First to compare the perceptions of African dental aesthetics as determined by a panel of black African Senegalese and French Caucasian judges, and second to compare the sensitivity and specificity of both components of the Index of Orthodontic Treatment Need (IOTN) and the Index of Complexity, Outcome and Need (ICON) in relation to the opinions of African and Caucasian judges. Ninety-eight colour digital dental images of black adolescents and adults were scored for attractiveness on a 100 mm visual analogue scale (VAS) by 45 Caucasian and 41 black African judges. In addition the judges were asked to classify the level of treatment need. Both components of the IOTN and ICON were recorded for the 98 cases.

The results indicated that Caucasian judges perceived the majority of images to be less attractive than African judges. African and Caucasian judges showed similar levels in the estimation of treatment need. The aesthetic component (AC) of the IOTN and ICON showed similar levels of sensitivity. Taking all factors into account, it would appear that the ICON is marginally better at identifying those individuals who are perceived to need orthodontic treatment.

### Introduction

Aesthetics is an important factor for patients seeking orthodontic treatment (Gochman, 1975; Jenny, 1975; Albino *et al.*, 1981; Jacobson, 1984; Tulloch *et al.*, 1984; Tung and Kiyak, 1998; Bos *et al.*, 2003). The importance of aesthetics is highlighted by the prominence of aesthetic features in occlusal indices: Social Acceptability Scale of Occlusal Conditions (SASOC) (Jenny *et al.*, 1980), Dentalfacial Attractiveness Scale (DFA) (Tedesco *et al.*, 1983), the aesthetic component (AC) of the Index of Orthodontic Treatment Need (IOTN) (Evans and Shaw, 1987) and the Index of Complexity, Outcome and Need (ICON) (Daniels and Richmond, 2000).

There is conflicting evidence to suggest that dental aesthetics may be judged differently by different ethnic groups. Cons and Jenny (1994) found that perceptions of dental aesthetics from 11 ethnic groups were similar to opinions in the USA. This is supported by other studies (Tulloch *et al.*, 1984; Otuyemi *et al.*, 1998; Mandall *et al.*, 1999). However, it has been reported that Pacific Asians are more lenient towards tooth spacing than Caucasians (Kiyak, 1981). Opinions of black and white ethnic groups indicated that white judges were more critical of dental attractiveness than black judges (Tedesco *et al.*, 1983).

The aim of this study was to compare the perception of African dental aesthetics as determined by a panel of Caucasian (French) and African (Senegalese) lay judges. A further objective was to compare the sensitivity and specificity of the IOTN and ICON in relation to Caucasian and African subjective opinions.

## Subjects and methods

Ninety-eight colour digital images of the anterior dentition were taken of black adolescents and adults, all with the permanent dentition fully erupted. The subjects consisted of volunteer students, teachers and patients attending the University Dental School in Senegal. A range of malocclusions present in the Senegalese population was represented. Forty-five Caucasian and 41 African judges, approximately equally divided by gender and with average ages of 30 and 33 years, respectively, took part. The Caucasian judges were based in Clermont-Ferrand, France and the African judges in Dakar, Senegal. Each of the 98 dental digital images was projected on to a screen for 20 seconds. The judges were asked to mark on a 100 mm visual analogue scale (VAS) the level of attractiveness of the dentition ranging from 0 (least attractive) to 100 (most attractive). In addition, the judges were asked to classify the orthodontic treatment need into three categories 'no or slight need', 'moderate need' and 'definite need'.

One of the authors (PIN), a calibrated examiner, recorded the IOTN and ICON scores for each of the subjects. Treatment need was defined according to the following categories of scores:

	No or	Moderate	Definite	
	slight need	need	need	
AC	1–4	5-7	8+	
Dental health	1–2	3	4–5	
component (DHC)				
ICON	<43		43+	

#### Statistical analyses

The agreement between Caucasian and African attractiveness scores was assessed graphically using a Bland–Altman plot (Bland and Altman, 1986). For this analysis the VAS scores of attractiveness for each of the 98 photographs were averaged over the raters.

The agreement between the lay judges and the calibrated examiner for treatment need was assessed by a comparison of their concurrence for the three treatment need categories for each image. Disagreements were classified as either over- or underestimates of treatment need by the lay judges compared with the examiner. Kappa scores were calculated for each image judged using these classifications and summarized. Sensitivity and specificity were calculated by converting treatment need into binary scores for no or slight need, and moderate need versus definite need.

#### Results

The mean scores for the VAS were 35.5 and 42.8 mm for the Caucasian and African judges, respectively. The Caucasian



Figure 1 Bland–Altman plot of agreement between Caucasian and African raters for visual analogue score of dental attractiveness.

judges perceived the majority of images to be less attractive than the African judges (Figure 1).

In terms of allocating treatment according to the components of the IOTN and ICON, the agreement between the judges and calibrated examiner is reported in Table 1. It can be seen that both French and Senegalese judges showed similar levels in estimating treatment need in comparison with the indices. However, there was a greater underestimation of treatment need by the judges in comparison with the DHC (23–27 per cent). The AC exhibited the least amount of underestimation (5–7 per cent) and the greatest proportion of overestimation (42–45 per cent). It would seem that the ICON is marginally better, providing a more balanced result in terms of agreement, for treatment need compared with the AC and DHC of the IOTN.

Sensitivity and specificity for the AC, DHC and ICON are shown in Figure 2. Similar levels of sensitivity and specificity were found for both the French and Senegalese judges. Both the AC and ICON showed similar high levels of sensitivity (90 per cent), but specificity was relatively low (44 per cent). With regard to the DHC, sensitivity was lower by 10 per cent, with a corresponding 10 per cent improvement in specificity as compared with the AC and ICON. It would appear that the AC of the IOTN and ICON are marginally better than the DHC in relation to the subjective opinions of the lay judges.

The level of agreement between the judges and the indices is shown in Table 2. The mean kappa scores were similar for the French and Senegalese judges, with the level of agreement being marginally better for the ICON. However, the levels of agreement were relatively low.

#### Discussion

The perception of aesthetics of 98 photographs of African dentitions was rated by Caucasian (French) and African (Senegalese) lay judges. Eighty-nine colour photographs of the dentition out of 98 (91 per cent) were perceived as less attractive by the Caucasian than by the African judges. The mean scores for the VAS were 35.5 and 42.8 mm for the Caucasian and African judges, respectively. Similar

**Table 1** Judges' allocation of treatment need versus the aesthetic component (AC) and dental health component (DHC) of the Index of Orthodontic Treatment Need (IOTN) and the Index of Complexity, Outcome and Need (ICON) categories [n (%)].

		Underestimate	Agreement	Overestimate
AC of the IOTN	French Caucasian	223 (5.1)	2163 (49.6)	1681 (45.3)
	Black African	285 (7.2)	2007 (50.5)	1979 (42.3)
DHC of the IOTN	French Caucasian	1020 (23.4)	2334 (53.5)	1011 (23.2)
	Black African	1071 (27.0)	2083 (52.4)	819 (20.6)
ICON	French Caucasian	528 (12.1)	2425 (55.6)	1412 (32.3)
	Black African	665 (16.7)	2016 (50.7)	1292 (32.5)

AC: 1-4, no need; 5-7, moderate need; 8+, definite need.

DHC: 1–2, no need; 3, moderate need; 4+, definite need.

ICON: <43, no need; 43+, definite need.



**Figure 2** Sensitivity and specificity for the aesthetic component (AC) and dental health component (DHC) of the Index of Orthodontic Treatment Need (IOTN) and the Index of Complexity, Outcome and Need (ICON).

perceptions have been reported elsewhere (Kiyak, 1981; Tedesco *et al.*, 1983; Tung and Kiyak, 1998). In contrast, one study found that perceptions of dental aesthetics of students from 11 ethnic groups (Australian, Chinese, German, Japanese, Korean, Latvian, native American, Singaporean Chinese, Singaporean Indian, Singaporean Malay, and Thai) were similar to those of students in the USA (Cons and Jenny, 1994). Similar perceptions of different ethnic groups have been reported by Nigerian and American students (Otuyemi *et al.*, 1998) and British and American communities (Tulloch *et al.*, 1984). However, no influence of ethnicity on self-perception of aesthetics in a sample of Asian and Caucasian children from Manchester was found (Mandall *et al.*, 1999).

The conflicting results may arise from differences in the selection of the study population, the measurement method, the stimuli and methods of analysis. For instance, in the studies of Cons and Jenny (1994) and Otuyemi *et al.* (1998), only 25 stimuli were used.

It is clear from the present study that the Caucasian judges rated the dental aesthetics of the sample significantly lower than the Senegalese judges. The reason for this is not clear. One can only speculate that the judges were influenced by the gingival tooth contrast or the shape and racial characteristics of the gingiva and teeth. Further work will be required to determine which factors contributed to the attractiveness scores.

In this study, the level of agreement between lay and professional assessment of orthodontic treatment need is comparable with that of Mandall et al. (1999), who reported the results of a study involving 334 children; 54 per cent agreement with professionals in their determination of the AC of the IOTN score. However, the present findings demonstrate higher agreement than that reported by Abdullah and Rock (2001) in an assessment of orthodontic treatment need of 5112 Malaysian children. In that study, only 25.36 per cent of children and 22.01 per cent of parents agreed with the AC of the IOTN in allocating definite need for treatment. These figures declined to 12.04 and 10.44 per cent when the lay assessment was compared with the DHC of the IOTN. In another study, So and Tang (1993) found that only 37 per cent of subjects correlated well with treatment need assessed using the IOTN.

#### Conclusions

African (Senegalese) and Caucasian (French) lay judges differed in their perceptions of dental aesthetics. The Caucasian judges rated the dental aesthetics of African subjects lower than the African judges.

The AC of the IOTN and the ICON exhibit similar levels of sensitivity. Taking all factors into account, it would appear that the ICON is marginally better at identifying those individuals who are perceived to need orthodontic treatment.

		п	Minimum	Maximum	Mean	Standard deviation
AC (kappa)	France	45	0.06	0.62	0.27	0.13
	Senegal	41	0.02	0.58	0.28	0.14
DHC (kappa)	France	45	0.09	0.44	0.29	0.08
	Senegal	41	0.17	0.41	0.29	0.06
ICON (kappa)	France	45	0.03	0.66	0.31	0.17
	Senegal	41	0.04	0.68	0.34	0.15

**Table 2** Level of agreement between the judges' perceptions of treatment need and the aesthetic component (AC) and dental health component (DHC) of the Index of Orthodontic Treatment Need and the Index of Complexity, Outcome and Need (ICON).

#### Address for correspondence

Pape Ibrahima Ngom Orthodontic Section PO Box 45282 University Cheikh Anta Diop Dakar Fann Senegal E-mail: ibrahim@refer.sn

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