

Factors Influencing Subjective Orthodontic Treatment Need and Culture-related Differences among Chinese Natives and Foreign Inhabitants

Xiao-ting Li¹, Yin Tang², Xue-lian Huang², Hua Wan³, Yang-xi Chen^{1*}

¹Department of Orthodontics, West China College of Stomatology, Sichuan University, Chengdu, China

²Department of Operative Dentistry and Endodontics, West China College of Stomatology, Sichuan University, Chengdu, China

³Department of Health Statistics, West China College of Public Health, Sichuan University, Chengdu, China

Abstract

Aim The aim of this survey was to compare Chinese natives and foreign inhabitants in Chengdu, China, with respect to: (1) attitudes towards dental appearance, (2) subjective orthodontic treatment need, and (3) the main factors influencing orthodontic treatment need.

Methodology A total of 522 subjects, including 227 foreign inhabitants and 295 Chinese natives in Chengdu participated in the survey. A simple random sampling method was adopted and a face-to-face interview was conducted at some public sites using a questionnaire. Data was entered by two persons synchronously using Epidata 3.0, and SPSS 13.0 was used to analyze these data.

Results 89.0% of foreign inhabitants were satisfied with their teeth compared to only 46.8% of Chinese natives. Females were more dissatisfied with their teeth than males. Chinese natives put improving appearance as the top priority (55.9%) for seeking orthodontic treatment; however, in foreign inhabitants, the main reason for seeking treatment was to improve masticatory function

(44.1%), followed by “to be pretty” (35.2%). The importance of well-aligned teeth and self-perception of psychosocial impact of malocclusion were the same two main factors influencing subjective orthodontic treatment need ($P<0.05$) in foreign inhabitants and Chinese natives. Subjective orthodontic treatment need between the two target groups was significantly different ($P<0.05$).

Conclusion (1) It was very common that Chinese natives were dissatisfied with their dental appearance, and their subjective orthodontic treatment needs were high. (2) There were some differences in orthodontic treatment motives between the two target groups. (3) There were differences in subjective orthodontic treatment needs between foreign inhabitants and Chinese natives. However, the prominent influential factors were almost the same. There may be benefit to understanding subjective orthodontic needs of different races.

Keywords orthodontic treatment, motives, subjective needs, comparative study

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Introduction

With the rapid development of the society and economy of China, Chinese people have gradually paid more attention to quality of life, especially associated with the impact of dental conditions (Wang *et al.*, 1998). Desire for orthodontic treat-

ment is increasing and the reason for this should not be underestimated. Evidence suggests that people who express dissatisfaction with their teeth may have some psychological problems which may impact their social behavior (Cash and Fleming, 2002). Those who are satisfied with their teeth seem to be more self-confident and have

higher self-esteem. Therefore, seeking orthodontic treatment is considered a way to improve dento-facial appearance and gain self-confidence.

The city of Chengdu is one of the most vigorous cities in China. Because of its unique geographic location and abundant tourism resources, plenty of foreigners flock to Chengdu every year. They mainly engage in business or education, and many of them choose to work for a long time or settle down here because Chengdu is a suitable and ideal city in which to live. This large proportion of foreign inhabitants will inevitably suffer some dental problems. However, there are currently few surveys studying foreign inhabitants' expectation of dental needs in China, especially orthodontic treatment needs.

Self-perception and satisfaction with one's teeth had been studied by Elham (Elham *et al.*, 2005). It was found that females and older school children considered their teeth as more attractive than males and younger children. The demand for orthodontic treatment was found to be affected by gender.

In previous studies, the motives of seeking orthodontic treatment have also been analyzed. Phillips found a strong social motivation occurred among males more than among females, while a higher proportion of females focused on improving appearance (Phillips *et al.*, 1997). Similar results were presented by Birkeland who found that aesthetic motives were the most frequently reported subjective reason for orthodontic care (Birkeland *et al.*, 1999). In a study comparing adolescents and teens in the United States, with those in Japan and China, appearance was also the primary characteristic noticed by American students, whereas Japanese and Chinese students were more focused on specific behaviors in others (Crystal *et al.*, 1998).

Subjective orthodontic treatment need was affected by many individual factors. Cultural, educational, gender differences, or access to orthodontic treatment all influenced patients' subjective needs. Josefsson investigated subjective orthodontic treatment needs in adolescents of Swedish and immigrant backgrounds, and found that the needs were significantly higher in the Swedish than immigrant groups (Josefsson *et al.*, 2005; 2009). In Christopherson's research on children from minority

backgrounds in the United States who had limited or no access to orthodontic treatment, black children were less happy with their smile than White children, and wanted braces more than White children (Christopherson *et al.*, 2009). In the study by Burden concerning the factors which influenced the uptake of orthodontic treatment, the results indicated that self-perception of dental appearance, desire to look attractive, self-esteem, gender, and age were factors influencing the uptake of orthodontic treatment (Burden, 1995). Another study by Annemieke had found significant correlations between satisfaction with dental appearance and patients' expectations (Annemieke *et al.*, 2003). No significant correlations were found among gender and expectations of orthodontic treatment. Another study also showed no gender difference in the population seeking orthodontic treatment (Burden *et al.*, 1994). A meta-analysis found that a positive relationship existed between facial attractiveness and interpersonal popularity, as well as others' favourable evaluation of one's personality, social behaviour, and intellectual expression (Hosoda *et al.*, 2003). Thus, psychosocial impact of malocclusion may also be a factor that affected subjective orthodontic treatment needs (Langlois *et al.*, 2000).

In Chengdu City, Chinese natives and foreign inhabitants may have different orthodontic treatment expectations because of their different cultural and educational backgrounds. Comparing their different subjective orthodontic treatment need and studying influential factors will provide a guide for China's orthodontic education, but may also be helpful in addressing foreign inhabitants with their orthodontic problems. The aim of this survey was to compare Chinese natives and foreign inhabitants in Chengdu, China, with respect to: (1) attitudes towards dental appearance, (2) subjective orthodontic treatment need, and (3) the main factors influencing orthodontic treatment need.

Materials and Methods

Subjects and sampling method

The survey was divided into two periods. The first period was carried out from May to July in

2008 and the target population was foreign inhabitants in the city of Chengdu. The urban areas of Chengdu have nine subordinate districts. From the Bureau of Public Security, we determined that foreign inhabitants were distributed throughout five subordinate districts. Our research team investigated some public sites, such as restaurants, international schools, communities, and some famous tourist resorts in these five districts. Questionnaires written in English were randomly sent out and a face-to-face interview was conducted between the investigator and the participants. In every subordinate district, 50 foreign inhabitants were selected to complete the questionnaires.

The second survey was carried out from August to October, 2008 and the target population was the natives in Chengdu. We first acquired lists of all nine subordinate districts and all the community neighborhoods of Chengdu. Two neighborhoods were randomly selected in each subordinate district, resulting in a total of 18 neighborhoods being selected. From every selected neighborhood, 20 natives were selected with face-to-face interviews.

Inclusion criteria included a willingness to provide informed consent and complete the survey, and age from 18 to 64 years.

Questionnaire

The questionnaire included the following items:

1. Demographic data (gender, age, profession, educational background, self-satisfaction with the teeth, the importance of well-aligned teeth, awareness of others' teeth, motives of seeking orthodontic treatment, and self-perception of psychosocial impact of malocclusion)
2. Self-satisfaction with their teeth
3. Importance of well-aligned teeth
4. Awareness of others' teeth
5. Subjective orthodontic treatment need
6. Motivation of seeking orthodontic treatment (to improve masticatory function and to be healthy/to be pretty/to be acceptable to the society)
7. Self-perception of psychosocial impact of malocclusion

Reliability test

35 university students were selected at random

and were presented with the same questionnaire after an interval of four weeks, under the same circumstances. For the analysis of reliability, the Kappa value was used. Their initial answers were included in the study.

The demographic data was the same between the two tests. In the remaining items, a Kappa value of 0.873 in one item represented that near perfect agreement was achieved. Substantial agreement was attained in other six items with Kappa value between 0.63–0.72 during the two tests. This indicates that the consistency and reliability of this survey was very high (Landis and Koch, 1977).

Statistical methods

The data was entered by two persons synchronously using Epidata 3.0, and SPSS 13.0 was used to analyze the data.

One dependent and nine independent variables were selected from the questionnaire. Chi-square test was used to examine the correlation between nine independent variables and the dependent one. Forward stepwise logistic analysis was subsequently used to select the statistically significant variables and to determine the main factors influencing subjective orthodontic treatment need. Significance was set at $P < 0.05$.

Results

A total of 522 participants including 227 foreign inhabitants and 295 natives in Chengdu completed the questionnaire. The study foreign inhabitants came from more than 30 countries (see Figure 1).

The distribution of participants by demographic characteristics and their attitudes towards dental appearance are shown in Table 1.

Among 227 foreign inhabitants, the "18–24", "25–34" age strata were the largest proportions. "18–24" was 24.7%, and "25–34" was 27.8%. 39.2% of them came from North America, 36.1% came from Europe, while 24.7% came from other countries and districts. Among 295 Chinese natives, "18–24" accounted for 36.6% proportion and "25–34" were 37.6% of the sample, which conformed to population composition of China.

Regarding self-satisfaction with the teeth, 89.0%

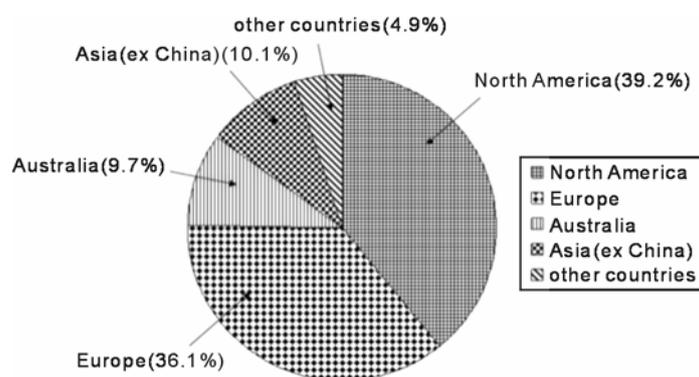


Figure 1 Distribution of the countries of foreign inhabitants

Table 1 Demographic characteristics and attitudes towards dental appearance

| | foreign inhabitants (n=227) | natives (n=295) |
|---|--------------------------------|--------------------|
| Gender | | |
| Male | 144 (63.4%) | 154 (52.2%) |
| Female | 83 (36.6%) | 141 (47.8%) |
| Age | | |
| 55–64 | 9 (4.0%) | 3 (1.0%) |
| 45–54 | 46 (20.3%) | 12 (4.1%) |
| 35–44 | 53 (23.3%) | 61 (20.7%) |
| 25–34 | 63 (27.8%) | 111 (37.6%) |
| 18–24 | 56 (24.7%) | 108 (36.6%) |
| Profession | | |
| Governor | 68 (30.0%) | 42 (14.2%) |
| Student | 55 (24.2%) | 113 (38.3%) |
| Company staff | 35 (15.4%) | 64 (21.7%) |
| Technician | 42 (18.5%) | 38 (12.9%) |
| Others | 27 (11.9%) | 38 (12.9%) |
| Education backgrounds | | |
| Lower education | 32 (14.1%) | 63 (21.3%) |
| Middle education | 77 (33.9%) | 84 (28.5%) |
| Higher education | 118 (52.0%) | 148 (50.2%) |
| Self-satisfaction with the teeth | | |
| Yes | 202 (89.0%) | 138 (46.8%) |
| No | 25 (11.0%) | 157 (53.2%) |
| Importance of well-aligned teeth | | |
| Yes | 205 (90.3%) | 278 (94.2%) |
| No | 22 (9.7%) | 17 (5.8%) |

of foreign inhabitants were satisfied with their teeth, and 11.0% were dissatisfied. However, only 46.8% of Chinese natives were satisfied while 53.2% were dissatisfied. Of the two target groups, more than 90% considered that well-aligned teeth were very important. The age distribution of self-satisfaction with the teeth is shown in Figure 2 and Figure 3.

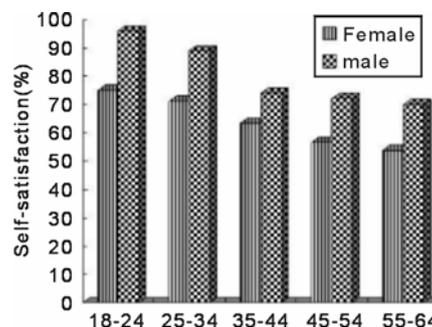


Figure 2 Age distribution of self-satisfaction with the teeth in foreign inhabitants

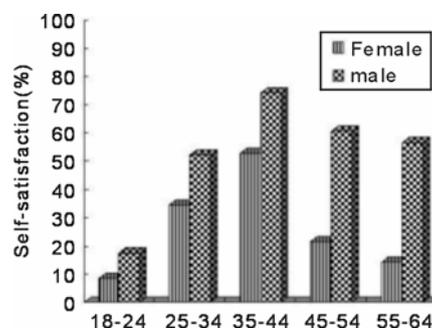


Figure 3 Age distribution of self-satisfaction with the teeth in Chinese natives

As is seen from Figure 2 and Figure 3, men were more often satisfied than women among all age groups. Of all foreign inhabitants, there was a decreased satisfaction with teeth with increasing age. However, dissatisfaction was more common among Chinese natives. Especially in the “18–24” age stratum, only 17.6% of males and 8.5% of females were satisfied with their teeth.

The desire for seeking orthodontic treatment showed some differences between foreign inhabitants and Chinese natives. A total of 44.1% of foreign inhabitants regarded improving masticatory function as the first consideration, and also 35.2% considered improving appearance. Nevertheless, more than half of Chinese natives (55.9%) reckoned improving appearance as the most important reason for orthodontic treatment (Figure 4).

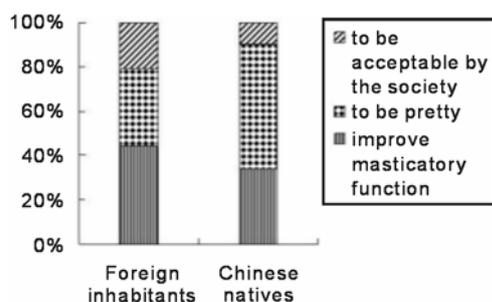


Figure 4 Different motives of orthodontic treatment of subjects

Referring to self-perception of malocclusion impact, both foreign inhabitants and Chinese natives held the standpoint that a good look of oral and facial appearance had a positive impact on their social behavior and communication. The percentage was 80.6% and 86.8%, separately. In total, 59.9% of foreign inhabitants agreed that malocclusion had a negative effect on psychology. Relatively more Chinese natives (73.9%) supported this view.

Factors influencing subjective orthodontic treatment

One dependent variable, subjective orthodontic treatment need, was selected from the questionnaire. And nine other independent variables also derived from it included gender, age, profession, educational background, self-satisfaction with the teeth, the importance of well-aligned teeth, aware-

ness of others’ teeth, motives of seeking orthodontic treatment, and self-perception of psychosocial impact of malocclusion.

All the nine independent variables were separately brought into the chi-square test to determine crude associations with the dependent variable. The results are shown in Table 2.

Table 2 Chi-square test of independent variables and subjective orthodontic treatment need

| Variables | P value | |
|--|-----------------------------|-----------------|
| | Foreign inhabitants (n=227) | Natives (n=295) |
| Importance of well-aligned teeth | 0.000 | 0.000 |
| Awareness of others' teeth | 0.045 | 0.001 |
| Self-perception of psychosocial impact of malocclusion | 0.008 | 0.000 |

Chi-square test with exit criteria of $P=0.05$.

All the nine independent variables brought into chi-square test at the beginning.

Importance of well-aligned teeth, awareness of others' teeth, self-perception of psychosocial impact of malocclusion were significant ($P<0.05$) and the others were not significant ($P>0.05$).

Of two target groups, the same three independent variables had statistical significance. They were importance of well-aligned teeth, awareness of others’ teeth, and self-perception of psychosocial impact of malocclusion. Other variables such as gender, age, profession, educational background, self-satisfaction with the teeth, and motivation of seeking orthodontic treatment were not found to be associated with subjective orthodontic treatment.

Forward stepwise logistic analysis was subsequently used to select the main influential factors among these three statistically significant variables. This analysis was also made separately in two target groups. The results are shown in Table 3 and Table 4.

The results of forward stepwise logistic analysis showed that the importance of well-aligned teeth and self-perception of psychosocial impact of malocclusion were the two main factors influencing subjective orthodontic treatment need ($P<0.05$) in foreign inhabitants and Chinese natives in Chengdu.

Table 3 Forward stepwise logistic analysis of statistically significant variables and self-perceived orthodontic treatment need of foreign inhabitants ($n=227$)

| | | B | S.E. | Wald | df | P | RR |
|-----------|--|--------|-------|--------|----|-------|-------|
| Step 1(a) | Socio-behavioural impact | 1.716 | 0.380 | 20.405 | 1 | 0.000 | 5.562 |
| | Constant | -3.706 | 0.547 | 45.896 | 1 | 0.000 | 0.025 |
| Step 2(b) | Importance of well-aligned teeth | 1.625 | 0.505 | 10.344 | 1 | 0.001 | 5.077 |
| | Self-perception of psychosocial impact of malocclusion | 1.470 | 0.400 | 13.476 | 1 | 0.000 | 4.349 |
| | Constant | -5.246 | 0.773 | 46.070 | 1 | 0.000 | 0.005 |

Forward stepwise logistic analysis with exit criteria of $P=0.05$. a: Variable(s) entered on step 1: b9. b: Variable(s) entered on step 2: b2. All the three statistically significant variables brought into forward stepwise logistic analysis at the beginning. Importance of well-aligned teeth, self-perception of psychosocial impact of malocclusion were significant ($P<0.05$) and the others were not significant ($P>0.05$).

Table 4 Forward stepwise logistic analysis of statistically significant variables and self-perceived orthodontic treatment need of Chinese natives ($n=295$)

| | | B | S.E. | Wald | df | P | RR |
|-----------|--|--------|-------|--------|----|-------|--------|
| Step 1(a) | Importance of well-aligned teeth | 2.788 | 0.544 | 26.305 | 1 | 0.000 | 16.250 |
| | Constant | -5.458 | 0.688 | 62.894 | 1 | 0.000 | 0.004 |
| Step 2(b) | Importance of well-aligned teeth | 2.039 | 0.609 | 11.233 | 1 | 0.001 | 7.687 |
| | Self-perception of psychosocial impact of malocclusion | 1.599 | 0.495 | 10.456 | 1 | 0.001 | 4.950 |
| | Constant | -6.601 | 0.844 | 61.126 | 1 | 0.000 | 0.001 |

Forward stepwise logistic analysis with exit criteria of $P=0.05$. a: Variable(s) entered on step 1: b2. b: Variable(s) entered on step 2: b9. All the three statistically significant variables brought into forward stepwise logistic analysis at the beginning. Importance of well-aligned teeth, self-perception of psychosocial impact of malocclusion were significant ($P<0.05$) and the others were not significant ($P>0.05$).

The difference of subjective orthodontic treatment need between groups

Of the 227 foreign participants, 81.9% wanted to receive orthodontic treatment, while of the 295 Chinese native subjects, 90.8% had the same desire. Chi-square test between the two target groups showed that this difference had statistical significance ($P<0.05$). The Chinese natives had a little higher expectation to receive orthodontic treatment than foreign inhabitants.

Combining the data of two target groups, the subjects were then divided into two subdivisions: developed countries and developing countries. Of these, 94.4% of participants from developed countries had the expectation to receive orthodontic treatment, while 89.8% of participants from developing countries did. Chi-square test showed no statistical significance ($P>0.05$).

Discussion

The majority of Chinese people are dissatisfied with their teeth, and only 46.8% of them satisfy. The reason for this is likely that more and more Chinese people are aware of their dental health associated with their quality of life. However, a dental health prevention system may not be maintained. Many Chinese have certain dental problems including malocclusion, so they are dissatisfied with their teeth. In this survey, most foreign inhabitants came from North America and Europe. These countries have had a long tradition of paying attention to citizens' dental health. Therefore, their self-perception of dental appearance was higher than that of Chinese natives.

Tuominen *et al.* found among young Finnish adults, men were more often satisfied with their

dentition than women (Tuominen *et al.*, 1994). In earlier years, Shaw studied children regarding their feelings about dental appearance, finding that dissatisfaction with dental appearance was more common among females than males (Shaw, 1981). And this dissatisfaction was associated with increasing age. Our research found similar results. Both in foreign inhabitants and Chinese natives, it is common that men are more satisfied with their teeth than women. In foreign inhabitants, with age increasing, their satisfaction with teeth decreases, especially in females. This finding is consistent with Shaw's study (Shaw, 1981). In Chinese natives, the population most dissatisfied with their dental appearance is young people. This indicates that among Chinese young people, there is a tendency that aesthetics of dental appearance are receiving more and more attention, and their higher dental demands and needs should not be neglected.

In this survey, Chinese natives put improving appearance the top priority (55.9%) for seeking orthodontic treatment; however, in foreign inhabitants, the main reason was to improve masticatory function (44.1%), followed by "to be pretty" (35.2%). Several previous studies have also found that the commonest reason for orthodontic treatment was to improve appearance (Shaw, 1991; Tuominen *et al.*, 1994; Riedmann *et al.*, 1999). In Germany, Riedmann *et al.* found that the orthodontic treatment demand was mainly influenced by the desire for improvement in appearance rather than for an improvement in chewing function. (Riedmann *et al.*, 1999). The same results were found in CHU's research of Chinese young adults in Hong Kong (Chu *et al.*, 2009). Their commonly-held reasons for orthodontic treatment were to improve appearance (78%), self-image (36%), self-confidence (34%), as well as to follow parental advice (24%). Other studies in North China also found that good appearance was the most common reason for orthodontic treatment (Huang *et al.*, 2002; Chen *et al.*, 2003).

This is the first study to compare the subjective orthodontic influential factors between foreign inhabitants and Chinese natives in China. The results show that the two groups have the same main factors influencing seeking orthodontic treatment, these being well-aligned teeth and self-perception of psychosocial impact of malocclusion.

Age, gender, and educational background do not affect subjective orthodontic treatment need.

For many years, the determining factors that influence subjective orthodontic treatment need are controversial. Burden (1995) found that self-perception of dental appearance, desire to look attractive, self-esteem, gender and age were the factors influencing the uptake of orthodontic treatment. It is also supported by Hagg's study (Hagg *et al.*, 2001), which suggested that females have a higher demand and need for subjective orthodontic treatment. In China, Du *et al.* (2008) investigated the knowledge concerning orthodontic treatment in the Beijing area. They also found a gender difference in teeth concerns with the percentage of women being higher than men. Wang *et al.* (1998) investigated the influential factors for orthodontic treatment of adolescents in the city of Xi'an, and showed that gender and psychosocial factors played an important role.

Although in our study gender is not the prominent factor influencing subjective orthodontic treatment need, as many researchers have suggested, orthodontists should keep gender differences in mind when communicating with their patients. Annemieke *et al.* (2003) also pointed out that if samples of the survey had been larger, there might have been statistically significant correlations, as expected.

Overall, 59.9% of foreign inhabitants and 73.9% of Chinese natives in this survey considered that malocclusion will affect psychological development. Recently, there has been growing acceptance of aesthetics and its psychosocial impact as an important orthodontic treatment benefit (Cunningham and Hunt, 2001; Hunt *et al.*, 2001). Malocclusions may result in impaired craniomandibular function and have an unfavourable influence on facial and dental attractiveness, which may in turn have psychological and socio-behavioural implications (Linder-Aronson *et al.*, 2002).

This study is the first to compare subjective orthodontic treatment needs between Chinese and other races. The results show Chinese natives in Chengdu have a little higher expectation to receive orthodontic treatment than foreign inhabitants. One reason for this may be that there is a culturally-related difference in the two target groups. Their different economic development, social-cultural

environment, and educational backgrounds may cause their different oral health and dental appearance attitudes and beliefs. Lew (1993), from Singapore, pointed out that several cross-cultural differences existed in the attitudes of Chinese compared to those reported in Caucasians. Mandall *et al.* (2000) reported that Asians do not seem disadvantaged compared with Caucasians with respect to the use of orthodontic services. Asians and females had higher orthodontic treatment needs than Caucasians and males. The other reason is that dental service system in China may not be suitable for foreign inhabitants. Thus, some of them do not want to seek dental services in China. The current circumstances may be ameliorated as China is changing to a multi-cultural society and sanitation is improving constantly.

Our study provides a rough description about subjective orthodontic treatment needs among foreign inhabitants and Chinese natives in Chengdu, China. This study indicates that the governors and orthodontists should take more effective measures to meet people's increasing orthodontic needs, including foreign inhabitants. However, the study has some limitations in sample selection. The sample should be larger, and a multicenter study is needed to explore other factors influencing subjective orthodontic treatment needs. Also, the objective orthodontic treatment needs of foreign inhabitants and Chinese natives should receive more attention. Objective and subjective assessment together will fully reveal orthodontic treatment needs of foreign inhabitants and Chinese natives, and give better guidance to orthodontists.

Conclusions

It was very common that Chinese natives were dissatisfied with dental appearance. More Chinese natives chose orthodontic treatment for aesthetic reasons, which indicates that the subjective orthodontic treatment needs of Chinese natives are increasing.

Foreign inhabitants were more satisfied with dental appearance. And there were some differences in orthodontic treatment motives between the two target groups, which indicates that different cultural and educational backgrounds might cause different

orthodontic beliefs and attitudes.

There were differences in subjective orthodontic treatment needs between foreign inhabitants and Chinese natives. However, the prominent influential factors were almost the same.

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*Corresponding author: Yang-xi Chen

Address: Department of Orthodontics, West China College of Stomatology, Sichuan University, 14 Ren Ming South Road, Chengdu, Sichuan, 610041, China

Tel: 86 28 85503081 E-mail: cyxlfx@tom.com
