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โครงการวิจัย

ผลของตำแหน่งและแนวแกนของฟันหน้า ต่อความสวยงามของการยิ้ม ในมุมมองด้านข้าง

Effect of incisor position and inclination on smiling profile attractiveness

โดย

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ชื่อเรื่อง : ผลของตำแหน่งและแนวแกนของฟันหน้า ต่อความสวยงามของการยิ้ม ในมุมมองค้านข้าง ผู้วิจัย : อ.ทญ. หทัยชนก เจริญพงศ์ สถาบัน : มหาวิทยาลัยรังสิต ปีที่พิมพ์ : 2558 สถานที่พิมพ์ : มหาวิทยาลัยรังสิต แหล่งเก็บงานวิจัยฉบับสมบูรณ์ มหาวิทยาลัยรังสิต จำนวนงานวิจัย 44 หน้า คำสำคัญ : แนวแกนฟันหน้าบน ตำแหน่งฟันหน้าบน ความสวยงามของใบหน้า มุมมองการยิ้มค้านข้าง

บทคัดย่อ

ความเป็นมา : ตำแหน่งและมุนของฟันหน้าที่เปลี่ยนไปมีผลต่อความหน้าคึงดูดของใบหน้า และยังเป็นสิ่ง สำคัญในการวางแผนการรักษาทางทันตกรรมจัดฟันด้วย ในปัจงุบันยังไม่พบการศึกษาผลของการปรับ ตำแหน่งและมุนของฟันต่อความสวยงามของใบหน้าด้านข้างขณะยิ้มในคนเอเชีย วิธีการ : ภาพถ่ายใบหน้าด้านข้างขณะยิ้มของ thai model (ชาย 1, หญิง 1) ถูกนำมาปรับเพิ่ม 8 ภาพ ผ่าน photoshop โดยการปรับ จะปรับตำแหน่งเป็น +3,-3 ส่วนมุมจะเป็น +6,-6 รวมแล้วจะมี 9 ภาพต่อ model 1 คน ภาพทั้งหมดจะนำไปให้กนจำนวน 402 กน (ชาย 198 กน หญิง 204 กน โดยมีช่วงอายุที่ 18-24 ปี) ถูกสุ่มมาจากภาคต่างๆ ในประเทศไทยประเมินความสวยงามผ่าน VAS และนำผลที่ได้มาวิเคราะห์เทียบก่า mean ใน ANOVA

ผลการศึกษาและสรุปผล : ตำแหน่งฟันปกติคือตำแหน่งที่คนมองว่าสวยในชาย ส่วนหญิงจะเป็นทั้งตำแหน่ง ปกติและ retrusiveส่วนมุมพบว่า retrocline ได้รับคะแนนมากสุดในชาย ส่วนในหญิงจะเป็นมุมปกติ และ proclineและเมื่อนำมาพิจารณารวมทั้งตำแหน่งและมุมพบว่า การ procline ในชาย และ retrocline ในหญิง ได้รับความนิยมน้อยสุดทั้งในตำแหน่ง protrude และ retrudeและถ้าแยกกิดตามภากพบว่ามีความชอบที่ แตกต่างกันในแต่ละภากของประเทศไทย แต่ปัจจัยอื่นๆ ไม่ได้มีความเห็นที่แตกต่างกันอย่างเห็นได้ชัด

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Abstract

Background: Changing position and inclination of incisors can affect facial attractiveness and it is one of the most important factors to be considered in orthodontic treatment planning since it can dramatically affect the treatment plan. However, there is no study to estimate the effects of changing incisor position and inclination in smiling profile view in an Asian population

Material and method: The photographs in smiling profile view of 2 chosen Thai models (1 male and 1 female) were modified using Photoshop to obtain 8 additional photos with 2 different positions (-3, +3) and 2 different inclinations (-6, +6). Therefore, the total of 9 images of each model were created. The 402 subjects (198 males and 204 females, age 18-34) randomly selected from each sector of Thailand were asked to evaluate attractiveness of each image using visual analog scale. ANOVA was used to compare the mean scores of each image.

Result and conclusion: The most attractiveness incisor position in male was normal position, while in female was normal or -3 mm retrusion. Six degree retroclination of incisors from original picture received highest score in male while normal inclination or +6 degree proclination was rated as the most attractive in female. When considering position together with inclination, it was found that in proclination in male and retroclination in female was the least attractive either in protrusive or retrusive position. Different sectors tended to have different preference in incisor position while other factors did not show obvious difference in the preference.

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การวิจัยนี้สำเร็จลุล่วงได้ ด้วยการทำงานหนักของผู้ร่วมวิจัยทุกคน ได้แก่ นางสาวอักษร กิตติสถากุล นายกุลพัชร์ อิงคธนาชัย นายชัชวุทธิ์ ปฏิมาอารักษ์ นายกฤษณ์ ชาญชัยชูจิต นางสาวจีรณา โชติสมิทธิ์กุล นายวีระวัฒน์ สุนทรกิจจารักษ์ นางสาวพฤศจิ บุญหลี และนางสาวพิมนภัทร์ อัครอิทธิพงศ์ ผู้วิจัยขอขอบคุณ อาจารย์วัชรินทร์ จงกลสถิต ซึ่งเป็นผู้ให้คำปรึกษาทางด้านสถิติแก่งานวิจัยชิ้นนี้มา ณ โอกาสนี้ด้วย และขอขอบคุณมหาวิทยาลัยรังสิต ผู้ให้ทุนสนับสนุนการวิจัยในครั้งนี้



Contents

Chapter1	Introduction	Page
	1.1 Background	1
	1.2Study purposes	2
	1.3 Research question	2
Chapter2	Review literature	Page
	2.1 Cephalometric evaluation of normal incisal position	3
	2.2 Extraction guideline	3
	2.3 Factor involving in esthetic evaluation of smiling profile view	4
	2.4 The related studies	5
	2.5 Conceptual framework	
Chapter3	Materials and methods	Page
	3.1 Model	6
	3.2 Image taking	8
	3.3 Image alteration	8

	3.4 Study population	10
	3.5 Subject	10
	3.6 Sampling method	10
	3.7 Inclusion criteria	10
	3.8 Exclusion criteria	10
	3.9 Interviewing	11
	3.10 Validity and reliability	12
	3.11 Ethic consideration	12
	3.12 Benefit	12
	3.13 Data analysis	12
Chapter4	Result	Page
Chapter4	Result 4.1 Reliability and validity	Page 13
Chapter4	Result 4.1 Reliability and validity 4.2 General information	Page 13 14
Chapter4	Result 4.1 Reliability and validity 4.2 General information 4.3The effect of changing position on attractiveness of smiling profile	Page 13 14 16
Chapter4	Result 4.1 Reliability and validity 4.2 General information 4.3The effect of changing position on attractiveness of smiling profile view	Page 13 14 16
Chapter4	Result 4.1 Reliability and validity 4.2 General information 4.3 The effect of changing position on attractiveness of smiling profile view 4.4 The effect of changing inclination on attractiveness of smiling	Page 13 14 16
Chapter4	Result 4.1 Reliability and validity 4.2 General information 4.3 The effect of changing position on attractiveness of smiling profile view 4.4 The effect of changing inclination on attractiveness of smiling profile view	Page 13 14 16
Chapter4	 Result 4.1 Reliability and validity 4.2 General information 4.3 The effect of changing position on attractiveness of smiling profile view 4.4 The effect of changing inclination on attractiveness of smiling profile view 4.5 The effect of changing inclination on attractiveness of different 	Page 13 14 16 16
Chapter4	 Result 4.1 Reliability and validity 4.2 General information 4.3 The effect of changing position on attractiveness of smiling profile view 4.4 The effect of changing inclination on attractiveness of smiling profile view 4.5 The effect of changing inclination on attractiveness of different position in smiling profile view 	Page 13 14 16 16
Chapter4	 Result 4.1 Reliability and validity 4.2 General information 4.3 The effect of changing position on attractiveness of smiling profile view 4.4 The effect of changing inclination on attractiveness of smiling profile view 4.5 The effect of changing inclination on attractiveness of different position in smiling profile view 4.6 Result of attractive position and inclination in population separate 	Page 13 14 16 16 17 21

	4.7 Result of attractive position and inclination in population separate	24
	by occupation	
	4.8 Result of attractive position and inclination in population separate	27
	by age group	
	4.9 Result of attractive position and inclination in population separate	28
	by income	
	C Q	
Chapter5	Discussion and conclusion	Page
	5.1 Discussion	31
	5.2 Conclusion	35
Reference		36-38
Appendix		39-42
	S 20	

Table

Table	Page
1 Cephalometric value of two models compared with	1 Thai norms 7
2 Position and inclination obtained from image altera	ation 9
3 The number of people live in each sector of Thailar subjects calculated from these ratio	nd and the number of 11
4 IOC of each pictures evaluated by 5 specialists	13
5 The result from reliability test using SPSS	
2 ane	

Figure

รูปที่		Page
1	a Cephalometric radiograph of female model of male model	8
1	b Cephalometric radiograph of female model of female model	8
2	a Image alteration of male model	9
2	b Image alteration of male model	9
3	a Distribution of subjects' gender	15
3	b Distribution of subjects' age	15
3	d Distribution of subjects' educational background	15
3	e Distribution of subjects' occupation	15
3	f Distribution of subjects' residing area	15
4	a Comparison of attractiveness score of different incisor positions in male	17
	model	
4	b Comparison of attractiveness score of different incisor positions in	17
	female model	
5	b Comparison of attractiveness score of different incisor inclination in	17
	male model	
6	a Comparisons of attractiveness score of different incisor position and	18
	inclination in male model	
6	b Attractiveness score from figure 6a in descending order	19
6	c Pictures of male model with different incisor position and inclination	19
	arranged according to the attractiveness score received	
7	a Comparisons of attractiveness score of different incisor position and	20
	inclination in female model	20
7	Attractiveness score from figure 7a in descending order.	

7c	Pictures of female model with different incisor position and inclination arranged	21
	according to the attractiveness score received	
8	Result of attractive position and inclination in population separate by sector	22-24
	8a North sector population scored the male image	22
	8b North sector population scored the female image	22
	8c South sector population scored the male image	22
	8d South sector population scored the female image	22
	8e East sector population scored the male image	23
	8f East sector population scored the female image	23
	8g West sector population scored the male image	23
	8h West sector population scored the female image	23
	8i Center sector population scored the male image	23
	8j Center sector population scored the female image	23
	8k Bangkok population scored the male image	24
	81 Bangkok population scored the female image	24
	8mNortheast sector population scored the male image	24
	8n Northeast sector population scored the female image	24
9	Result of attractive position and inclination in population separate by occupation	25-26
	9a Employee population scored the male image	25
	9b Employee population scored the female image	25
	9c Government employee population scored the male image	25
	9d Government employee population scored the female image	25
	9e Personal business population scored the male image	26
	9f Personal business population scored the female image	26
	9g Student population scored the male image	26
	9h Student population scored the female image	26
	9i Other occupation population scored the male image	26
	9j Other occupation population scored the female image	26

10	Result of attractive position and inclination in population separate by age group	27-28
	10a Age between 18-22 population scored male image	27
	10b Age between 18-22 population scored the female image	27
	10c Age between 23-26 population scored the male image	27
	10d Age between 23-26 population scored the female image	27
	10e Age between 27-30 population scored the male image	28
	10f Age between 27-30 population scored the female image	28
	10g Age between 31-35 population scored the male image	28
	10h Age between 31-35 population scored the female image	28
11	Result of attractive position and inclination in population separate by income	29-30
	11a Income less than 5000 Bath scored the male image	29
	11b Income less than 5000 Bath scored the female image	29
	11c Income 5000-10000 Bath scored the male image	29
	11d Income 5000-10000 Bath scored the female image	29
	11e Income 10000-20000 Bath scored the male image	30
	11f Income 10000-20000 Bath scored the female image	30
	11g Income 20000 Bath up scored the male image	30
	11h Income 20000 Bath up scored the female image	30
	2 M ROMEST	

Chapter 1

Introduction

Background

Position of the incisor teeth is one of the most important factors to be considered in orthodontic treatment planning since it can dramatically affect the treatment plan. For example if the patient have mild to moderate crowding with normal incisor position, placing incisors in more forward position can correct crowding without the need of tooth extraction. However, the more proclined teeth may or may not be esthetically compromising. The other option is to extract premolars and correct crowding without flaring the incisors. The position of incisors, as in this example, can determine whether the patient needs extraction. Moreover, in patient with skeletal discrepancy, to procline or retrocline incisors could make the treatment plan change from orthodontic treatment only to camouflage the skeletal discrepancy to combined orthodontic and orthognathic surgery.

There are many cephalometric analyses proposed to standardize incisor teeth positions. Some focus on the position of lower rather than upper incisor (1), others have the standard for both upper and lower incisors (2-4). However, upper incisors are more closely related to facial esthetic, which is the major concern of patients seeking orthodontic treatment (5).

Although there are some standard values available for upper incisor position, usually these are obtained from lateral cephlometric radiograph routinely used in orthodontics, which are taken with lips in the resting position. Smiling profile view, in which the upper incisors are fully displayed usually is less in attention. In contemporary orthodontic diagnosis, maxillary incisors' display is usually assessed and recorded by photographs only in frontal perspective, not the profile view. In profile view, the maxillary incisors are mostly assessed only indirectly by assessing the soft tissue covering the teeth for example the assessment of Nasolabial angle, Holdaway angle and lower lip to E-line (6, 7).

There are only few of studies regarding the relationship between esthetics and the position of incisors in profile view of smile (8, 9). These studies, however, were performed in other ethnicities rather than Asian. The difference in skeletal and facial form makes the norm available for each ethnicity (10, 11). The proper position for incisors for each ethnic group could be different due to the differences in facial form, for example, more prominent nose in Caucasians tends to allow more proclined teeth to be

esthetically acceptable. Moreover many studies have showed that racial difference can affect perception and preference of facial esthetic (12-15).

Overall, changing the position of the incisors can affect facial esthetic and may require tooth extract. However, the position of incisors in facial profile smiling view, in which the incisors is fully displayed is less in attention. Furthermore, there is no study conducted to estimate the esthetic effects of changing incisor position in Asian population. Therefore this study assessed the esthetics or the attractiveness when the position of incisor teeth is changed in Thai people in smiling profile view.

Study purposes

This study aimed to evaluate the attractiveness of smiling profile view when changing incisor position and inclination in Thais.

Research question

- 1. Does changing in incisor position affect facial attractiveness in smile profile view?
- 2. Does changing in incisor inclination affect facial attractiveness in smile profile view?
- 3. Does different in incisor inclination in changed position affect facial attractiveness?
- 4. Do age, occupation, living area and income have the effect on the preference of incisal position and inclination?

Chapter 2

Review literature

Cephalometric evaluation of normal incisal position

Down's analysis is the first analysis that tried to use cephalometric values to configure incisor teeth position. Down's parameters used for evaluation of dental configuration included interincisal angle, lower incisor to occlusal plane, lower incisor to mandibular plane, upper incisor to A-Pg (distance measurement in mm) (16).

Tweed suggests the position of incisors should be based on the position of lower incisors in Tweed triangle (17, 18). Tweed and Down analysis of dental configuration was mainly based on the position of lower incisors.

Steiner used S-N plane as reference line instead of frankfort horizontal plane in Down's analysis to measure the angle to analyze the facial structure and jaw and also to measure the position and inclination of both upper and lower incisor. This analysis is widely used in orthodontics treatment nowadays. Analysis of dental configuration in Steiner's analysis includes Upper 1 to NA, Upper 1 to NA (mm. distance), Upper 1 to NB, Upper 1 to NA (mm. distance), interincisal angle (3, 4).

Extraction guideline

From the contemporary extraction guideline (19), if the arch length discrepancy (ALD) is less than -4 mm, the orthodontics treatment usually could be done without tooth extraction. The ALD of -10 mm or more, extraction is indicated. However, if the ALD is in the range of -5 to -9 mm, the decision must be made between non-extraction and extraction treatment plan. If the plan is extraction, the incisors are usually moved backward or left in the original position rather than moving forward. On the other hand, in non-extraction case, the space must be provided by other means e.g. protrusion of the incisors.

Factors involving esthetic evaluation of the smiling profile view

Race

Both race of the model to be evaluated and race of the judges can affect the esthetic preference. For judges from different countries within the same continent, the profile preferences may not be different (20). However in larger scale racial difference such as Caucasian and Maxicans, this difference could be significant (13).

The race of the model can also affect the esthetic preference. Wuerpel 1937 (21) suggested that profile types are perceived differently among different races. Studies of esthetic preferences in different races showed different results (12, 14, 15, 22).

Judges dental background

Social background of the judges may have an impact on esthetic evaluation. Previous studies have found the difference of preferences among different groups of judges such as general dentists, orthodontists and lay people (23-25).

Facial appearances

Facial features can affect esthetic. Cunningham, Barbee et al. 1990 (26) and Meerdink, Garbin et al. 1990 (27) found that nose size and cheek width are important factors for perception of facial attractiveness. Difference in facial form for example more prominent nose and chin allow more forward position of teeth as suggested by Holdaways (7).

Dental appearance

Dental parameter can influence facial attractiveness. Beside from the position and the inclination that was evaluated in this study, the alignment of the teeth can affect esthetic. It was found that malalignment of anterior teeth with severe crowding and a median diastema decrease the attractiveness (28, 29). Good alignment of incisors was found to be crucial to enhance attractiveness (28-31).

Gender

Gender of the model can affect preference. In other words, people may like males to look different from female. It was found that some features such as prominent cheekbones, square jaws, or a large chin are correlated with increase in attractiveness in males (26). In contrast, some features were found to be linked with more attractiveness in females for example small chin and wide smile (26).

The related studies

Schlosser et al, 2005 (9) studied the effects of changing the incisor position in antero-posterior direction in smile profile view in Caucasian. The results indicated that 4-mm retrusion was the least attractive. The overall trend was that people preferred normal or protrusive position rather than retrusive position.

Ghaleb et al (8) studied the effect of incisor inclination in profile view of a smile and found that excessive inclination in both labial and lingual direction was significantly less attractive. The most preferred smile was when the maxillary incisors inclined 93 degrees to the horizontal line and +7 degree to the lower facial third.



Chapter 3

Materials and methods

Models

Two models (1 male and 1 female) were chosen from 80 Thai undergraduate dental students in the faculty of Dental Medicine, Rangsit University. The following criteria were applied in order the choose the models

(1) Having skeletal, dental and soft tissue configuration measured from cephalometric radiographs within Thai norms (32, 33). The cephalometric value of the models and their norms are shown in table 1. Cephalometric radiograph of models are illustrated in Figure 1a and 1b

(2) Good alignment of upper anterior teeth (Arch length discrepancy (ALD) = 0 in upper arch),

- (3) Normal overjet and overbite
- (4) Normal gingival display on smiling

Cephalometric parameters	Male Norm	Male model	Female Norm	Female model
SNA	83±4	85	83±4	80
SNB	79±3	81	79±3	77
ANB	4±2	4	4±2	3
SN-GoGn	34±6	26	34±6	35.5
FMA	25±4	21	25±4	28
Li-APog (mm)	5 <u>+</u> 2	P1 G	5 <u>+</u> 2	4
LI-NB	32±6	35	32±6	23
LI-NB (mm)	6±2	8	6±2	6
UI-NA	28±4	32	28±4	26
UI-NA (mm)	6±2	6	6±2	6
ADH (mm)	31 <u>+</u> 3	30	29 ± 3	28
PDH (mm)	20 <u>+</u> 2	17	19 <u>+</u> 2	19
NLA (nasolabial angle)	90±9	96	89±11	93
FCA (facial contour angle)	9±4	15	9±4	11
UFH (upper face hight)	51±3	53	48±3	41
LFH (lower face hight)	75±5	72	69±3	64
ULL (upper lip length)	25±2	22	23±2	23.5
LLL (lower lip length)	49±3	50	46±3	40.5
	\mathcal{F}_{-}			

 Table 1Cephalometric values of two models compared with Thai norms.



Figure1a Cephalometric radiograph of female model.



Figure 1b Cephalometric radiograph of male model.

Image taking:

Photographs were taken from the models in lateral profile view with broad smile using Canon EOS 550D with Canon 100-mm macro lens and Canon Macro Ring Lite. The camera was set at aperture of f8, ISO 200 and the speed shutter of 1/200. Head position was oriented in natural position.

Image alteration:

Original images were altered using Photoshop program to obtain 8 additional photos with 2 different positions and 2 different inclinations. Therefore a total of 9 images were created as listed in Figure 2a, 2b and Table 2 (0 is the original position and inclination).



Figure 2aImage alteration of male model

Figure 2b Image alteration of female model

Table 2 Position	and inclination	obtained	from imag	e alteration

Inclination	
-6 Position -3 / inclination -6 Position 0/ inclination -6 Position +3/ inclination	1 -6
0 Position -3/ inclination 0 Position 0/ inclination 0 Position +3/ inclination	1 O
+6 Position -3/ inclination +6 Position 0/ inclination +6 Position +3/ inclination	1+6

To change the position of the teeth, the initial position was measured relative to reference vertical line. The teeth were then cut and move forward or backward at the distance indicated.

To change the inclination of the teeth, the initial inclination was measured relative to reference vertical line. The teeth were then cut and rotated until obtaining the indicated inclination with the incisal edge fixed in point (so that the position is maintained)

Study population

The population of this study was consisted of Thai people aged between 18-35 years. The amount of this population is 19,532,960 according to The National Statistical Office Kingdom of Thailand, Ministry of Information and Communication Technology.

Subjects:

A total of 402 Thais (198 males and 204 females) were included in the study. The number of subjects has been calculated according to Krejcie and Morgan method (34).

Sampling method

Subjects were randomly selected by multi-stage sampling method. Firstly, the number of subjects from each sector of Thailand was allocated by quota sampling. The ratio of subjects (male and female separately) living in each sector of Thailand was obtained from the data of General Register Office, Department of Provincial Administration of Thailand. This ratio was then applied to sample size of 400 subjects. From the total number of 402 subjects, the subjects from north sector were 19 males and 21 females, north-east sector 66 males and 66 females, central sector 42 males and 44 females, east sector 16 males and 15 females, west sector 10 males and 10 females, south sector 28 males and 30 females, and Bangkok 17 males and 19 females (Table 3).

Secondly, one province in each sector was selected for the data collection by simple random. The final step of sampling was simple random of people in those provinces who match the inclusion and exclusion criteria.

Inclusion criteria

Subjects aged between 18-35 years who live in each sector of Thailand.

Exclusion criteria

Dental professional or subjects, who have been involved in dental practice.

Subjects with severe vision compromised.

Table 3 The number of people live in each sector of Thailand and the number of subjects calculated from

 these ratio (data from General register office, Department of provincial administration)

	Number of people		Number of subject (Out of402)	
Region	Male	Female	Male	Female
North	3,021,071	3,123,528	18.76(19)	19.41(20)
North-East sector	10,567,634	10,624,783	65.63(66)	65.98(66)
Central sector	6,646,548	6,986,099	41.28(42)	43.39(44)
East sector	2,202,463	2,262,814	15.58(16)	14.05(14)
West sector	1,584,045	1,612,824	9.84(10)	10.02(10)
South sector	4,470,660	4,918,935	27.76(28)	30.55(31)
Bangkok	2,690,754	2,982,806	16.71(17)	18.52(19)
Total	SY.		198	204

Interviewing

First, the subjects were asked about their general information (sex, age, education, occupation, province, and income) then the subjects were asked to assess the attractiveness of smile in each image and give the score for each image by mark the vertical line on 200 mm of visual analog scale. At 5 points of the scale, there were the descriptors "very unattractive", 'unattractive', 'average', 'attractive', and 'very attractive". Subjects were presented with all of the images to be scored once before scoring. When starting scoring, the subjects were presented with the pictures in random order and they were asked not to return to the previously scored pictures.

Validity and reliability

The validity of all the images was evaluated by five specialists using Item Objective Conguence Index (IOC).The reliability was evaluated from a pilot study, which was conducted in 40 subjects randomly chosen. Cronbach's alpha coefficient was performed to test the reliability of the questions.

Ethic consideration

Permission and consent were obtained from subjects and models. Model were explained how images were used and published. Subjects were given the full explanation of the aim of study, the method and the expected benefits of the study. Models and subjects have the right to decline being involved in the study at anytime during the study period. This study was approved by Rangsit University Ethic committeewith approval number RSEC 12/2556.

Benefits of the study

This research gives the useful information of how the position of the incisor teeth in smiling profile affects facial attractiveness in Thai people. The information obtained from this study should be useful for orthodontic treatment planning in Thai as well as other Asian population.

Data analysis

The visual analogue scale (VAS) score of maximum 100 was calculated of each picture from the line marked on 200-mm line. One way ANOVA was used to compare the mean score different position and/or inclination. The *P*-value of < 0.05 was considered statistically significant. A multiple comparison was performed using Turkey and Dunnett T3 test if there was the homogeneity and non-homogeneity of the variance respectively.

Chapter 4

<u>Result</u>

Reliability and Validity

Item Objective Conguence Index (IOC) of each pictures was 1 (Table 4). Cronbach's alpha coefficient was 0.829.(analysed by SPSS)(Table 5).

Table 4 IOC of each pictures evaluated by 5 specialists



Table 5 The result from reliability test using SPSS

Reliability Statistics

Cronbach's Alpha	N of Items
.829	18

General information of subjects

From the 402 subjects that were randomly selected by multi-stage sampling method, the distributions of gender, age, educational background, occupation, income and residing area (sector in Thailand) are shown in Figure 3a to 3f.

The subjects comprised of 198 males (49%) and 204 females (51%) (Figure 3a). The average age of the subjects was 22.9 years. The distribution of age of the subjects is shown in Figure 3b. There were 230 subjects (57%) in 18-22 years age group, 73 persons (18%) in 23-26 years age group, 54 persons (14%) in 27-30 years age group and there are 45 persons (11%) in 31-35 years age group.

With regard to the educational background; most of the subjects had bachelor's degree (220 subjects or 54%), while164 persons had less than bachelor's degree (41%) (**Figure 3c**). There were 15 subjects (4%) with master degree and 3 subjects (1%) with doctoral degree. The majority of the subjects were students (233 persons or 58%), followed by employee (99 persons or 25%), government officer (30 persons or 7%) and other occupations such as artist, scientist, chef, researcher, seller, agriculturist, tutor, doctor and veterinarian (30 persons or 7%). The last occupation group was personal business, which consisted of 12 subjects (3%) (**Figure 3d**). Twenty-nine percent of subjects (119 subjects) had an income of 5000 Bath or less, 37% (149 subjects) had 5000-10000 Bath, 21% (83 subjects) had 10000-20000 Bath and 13% (51 subjects) had an income more than 20000 Bath (**Figure 3e**).

The number of subjects from each sector was distributed corresponding to the ratio of Thai population in each of those **(table 3)**. There are 132 persons (33%) from northeast sector, 86 persons

(21%) from center sector, 59 persons (15%) from south sector, 39 persons (10%) from north sector, 36 persons (9%) from Bangkok province, 30 persons (7%) from east sector and 20 persons (5%) from west sector (**Figure 3f**).



Figure 3 Distribution of a.)gender b.) age c.) educational background d.) occupation. e) income and f.) residing area (sector in Thailand) of subjects.

The effect of changing position on attractiveness of smiling profile view

To determine the effects of changing position on the attractiveness, the sum of the scores from pictures with the same position (regardless of inclination) were used (eg. Score of position "0" was from the sum score of picture 0/-6, 0/0 and 0/+6)

Figure 4a and 4b show the attractiveness of the pictures with different positions in male and female respectively. It was found that in both male and female, the normal position was the position that is the most attractive (Figure4a and 4b). Changing position from normal either in protrusive or retrusive directions resulted in significant reduction in attractiveness score in the male model with protrusive position has the least attractive score compared normal or retrusive position (Figure4a).

For the female model, changing position into more retrusive position resulted in reduction in attractiveness score although there is no significant different. Protrusion causes a significant reduction of attractiveness score when compared to normal position although there was no significant difference when comparing protrusive and retrusive positions (Figure4b).

The effects of changing inclination on attractiveness of smiling profile view

To determine the effects of changing the inclination on the attractiveness, the sum of the scores from pictures with the same inclination (regardless of position) were used (eg. Score of inclination "0" was from the sum score of picture -3/0, 0/0 and +3/0)

For the inclination, in male pictures, the 6 degree retroclination from original inclination was the most attractive picture, followed by original inclination and proclination. These differences were all significant. (figure 5a)

For the female model, it was found that normal inclination was the most attractive inclination. Changing position and inclination into more proclined inclination caused significant reduction in the attractiveness score. Changing position into more retroclined inclination caused further significant reduction in facial attractiveness. (Figure5b)



of different incisor positions in male model of different incisor positions in female model



Figure 5aComparison of attractiveness scoreFigure 5b Comparison of attractiveness scoreof different incisor inclination in male modelof different incisor inclination in female model

The effects of changing inclination on attractiveness of different position in smiling profile view

For the male model, when moving incisors either forward into more protrusive position or backward into more retrusive position, if the inclination was kept as on original inclination of this model or more retroclining, the scores were not significantly different. However, in both protrusive or retrusive position, proclination of incisors results in significantly less attractive. (Figure6b)

Retrusion position in the female model had less attractiveness when compared to the original position but the difference was not statistically significant as described in earlier part. (Figure4b) When considering the inclination together with position, there was also no statistically significant when comparing between retrusion with proclination or retrusion with retroclination although retrusion with normal position tend to have significantly higher attractiveness score comparing to retrusion with retroclination. (Figure7b)

Protrusion in the female model however resulted in significantly lower attractiveness when compared to normal position. Considering the position together with inclination, it was found that protrusion with the inclination kept normal, has significantly better attractiveness than protrusion with proclination and retroclination. Protrusion with proclination had better attractiveness score than retroclination but no statistical difference was found. (Figure7b)



Figure 6a Comparisons of attractiveness score of different incisor position and inclination in male model. The (x,y) in the graph label indicate the position (x) and inclination (y).



Figure 6b Attractiveness score from figure 6a in descending order. The line indicating the closet score that was statistically different (P < 0.05). The (x,y) in the graph label indicate the position (x) and inclination (y).



Figure 6c Pictures of male model with different incisor position and inclination arranged according to the attractiveness score received.



Figure 7a Comparisons of attractiveness score of different incisor position and inclination in female



model. The (x,y) in the graph label indicate the position (x) and inclination (y).

Figure 7bAttractiveness score from figure 7a in descending order. The line indicating the closet score that was statistically different (P<0.05). The (x,y) in the graph label indicate the position (x) and inclination (y).



Figure 7c Pictures of female model with different incisor position and inclination arranged according to the attractiveness score received.

Results of attractive position and inclination in populationsfromdifferentsectors

The results showed that subjects from north, south, east, central, Bangkok and north-east regions tend to like male in normal position with retroclined incisal teeth (Figure8a,8c,8e,8i,8k,8m) but the subjects from west Thailand tend to like male in normal inclination with retruded incisal teeth (Figure 8g).

For the subjects from north, east, west, central and north-east regions protruded with proclination of incisal had the lowest score for the male model (Figure8a,8e,8g,8i,8m). Whereas the male model in retruded position with proclined incisal received the lowest scores from south and Bangkok population (Figure8c, 8k). For the female model, north, south, west, Bangkok and north-east population tend to like normal position with proclination (Figure8b, 8d, 8h, 8l, 8n) but the east and central population tend to like female with protruded incisors with normal inclination (Figure8f, 8j).

The lowest score in the female model varied considerably for each sector. In central and Bangkok population, retruded with retroclination of incisal got the lowest score (Figure8j, 8l) whereas protruded with retroclination got the lowest score by north, east and north-east population (Figure8b, 8f, 8n). For south and west population, retruded with proclination and protruded with proclination obtained the lowest



Figure 8c South sector population scored the

Figure 8d South sector population scored the

male image

female image



Figure 8e East sector population scored the





Figure 8i Center sector population scored the



male image

female image







Bangkok

5M0, M0, 61

W1+3-61+301



 Figure 8m Northeast sector population scored
 Figure 8n Northeast sector population scored

 the male image
 the female image

The (x,y) in the graph label indicate the position (x) and inclination (y).

Results of attractive position and inclination in population with different occupation

Every occupational group; employee, government officer, personal business, student and other occupation tend to like normal position with retroclination the most in male model (Figure9a, 9c, 9e, 9g, 9i). The protrusive incisal female model with normal inclination received the highest score from 3 occupational groups; employee, personal business and other occupations (Figure9b, 9f, 9j). Government officers gave the highest score for retrusion with normal inclination (Figure9d), whereas students gave the highest score for normal position with proclination in female (Figure9h).

The employee and other occupations rated male picture in retrusion with proclination of incisors the least attractive (Figure9a, 9i), while government officers, personal business and students rated male pictures in protrusion with proclination of incisors the least attractive (Figure9c, 9e, 9g).

The employee and other occupations rated the female picture in retrusion with retroclination of incisors the least attractive (Figure9b, 9j). Government officers and students rated protrusion with retroclination of incisors in female the least attractive (Figure9d, 9h) while personal business gave normal position with retroclination incisor the lowest attractiveness score (Figure9f).



Figure 9c Government employee population

Figure 9d Government employee population

scored the female image

scored the male image



Figure 9e Personal business population Figure 9f Personal business population



Figure 9iOther occupation population scored Figure 9jOther occupation population scored

the male image

the female image

The (x,y) in the graph label indicate the position (x) and inclination (y).

Results of attractive position and inclination in population in different age group

Every age groups; 18-22 years old, 23-26 years old, 27-30 years old and 31-35 years old, prefer the male picture in normal position with retroclination of incisors the most(Figure10a,10c, 10e, 10g). Every age group except 23-26 years prefer protrusion with proclination the least (Figure10a, 10e, 10g). For 23-26 years old group, retrusion with proclination received the lowest attractiveness score (Figure10c).

For the female model; every age groups except 23-26 years gave normal position with proclination the highest score(Figure10b, 10f,10h,) while 23-26 years group rated protrusion with normal inclination the most attractive(Figure10d). The least attractive picture of the female model was retrusion with retroclination, for the age groups 23-26 years old, 27-30 years old and 31-35 years old (Figure10d, 10f, 10h), while 18-22 years group selected protrusion with retroclination as the least attractive (Figure10b).





 Figure 10a Age between 18-22 population scored
 Figure 10b Age between 18-22 population scored

 the male image
 the female image



Figure 10c Age between 23-26 population scored Figure 10d Age between 23-26 population scored



Figure 10g Age between 31-35 population scored Figure 10h Age between 31-35 population scored

the male image

the female image

The (x,y) in the graph label indicate the position (x) and inclination (y).

Results of attractive position and inclination in population in different income group

All income groups rated normal position with retroclination in male the most attractive (Figure11a, 11c, 11e, 11g). Income group less than 5000 and 5000-10000 prefer protrusion with proclination the least (Figure11a, 11c) while income group 10000-20000 and more than 20000 rated retrusion with proclination the least attractiveness(Figure11e, 11g).

Income group less than 5000 and 5000-10000 gave normal position with proclination in female the highest score and protrusion with retroclination the lowest score (Figure11b, 11d). Income group 10000-20000 and more than 20000 rated protrusion with normal inclination the most attractive in female while rated retrusion with retroclination the least attractive(Figure11f, 11h).





Figure 11c Income 5000-10000 Bath scored







Figure 11g Income 20000 Bath up scored

the male image

Figure 11h Income 20000 Bath up scored

the female image

The (x,y) in the graph label indicate the position (x) and inclination (y).

the male image

Chapter 5

Discussion

To evaluate the attractiveness of the photographs of different positions and inclinations of incisors, the visual analogue scale score was used. This method has been proved to be a valid and reliable method to measure dental and facial attractiveness (35) and has been used by many previous studies (36-38).

The extraction guideline (19) suggest that the space discrepancy of less than 4 mm can be treated without extraction and more 10 mm or more of arch length discrepancy requires treatment with extraction. However, arch length discrepancy of 5 to 9 mm of can be treated with or without extraction. Therefore, 3 mm protruding was chosen because it is the amount of forward movement required for correcting 6 mm arch length discrepancy without extraction. On the other hand, if extraction treatment plan is planned, the incisors may move backward approximately 3 mm with the moderate control of anchorage. The inclination of +6 and -6 degree were chosen corresponding to the amount of +3/-3 changing position, if the teeth are moved by pure tipping.

In this study, it was found that, original position of both male and female model was the most attractive position for smiling profile view. These models have the upper incisor position measured from cephalometric radiograph match exactly with standard value of Thais. Although altering the incisor position for 3 mm is still within the range of normal position, the attractiveness was found significantly compromising (except for 3 mm retrusion in female in which the attractiveness score was reduced insignificantly). These results suggested that if there is the 6 mm or more of space deficiency, extraction would be better choice to keep the incisors closet to the standard value rather than moving teeth forward to correct space deficiency without extraction.

In extraction case, for the moderate crowding such as 6 mm arch length discrepancy, the incisor position can be more retruded than original position after treatment. In this study, it was found that even 3 mm retrusion of the incisors did not significantly reduce the attractiveness of smiling profile in the female model. Although 3 mm retrusion in the male model had significantly reduction in the attractiveness score,

the score was still significantly higher than protrusion. Therefore, these results also support the extraction treatment in moderate crowding. However, this study only evaluated 3 mm-changing of the incisor position. Alteration of position and inclination of lesser amount should have less effect on facial attractiveness.

The results of this study showed some differences in preference incisal position when compared to study of Schlosser et al. (9) in New York. In the study of Schlosser et al. (9), in which the model was not American, people prefer 1-4 mm protrusive position of the incisors followed by normal position. Retrusion of any amount from 1 mm onward resulted in less facial attractiveness in that study. However, the results in Thais were different. The present study found that protrusion of incisors resulted in significantly less attractiveness in both male and female Thai model. Retrusion, on the hand had better score than protrusion.

For changing in inclination of incisors, the results from this study showed that Thai people liked the female pictures in normal inclination, followed by proclination and liked retroclination the least. However, it should be noted that the female model in this study had initial incisor position of 2 degree less than standard value (table 1). Therefore the results of preference towards proclination should be interpreted with this awareness. In the male pictures, the results showed that Thai people like more retroclined incisors. The male model in this study had "UI-NA" measured from the cephalometric radiograph 32 degree (table 1), which is the high normal value (24-32 degree). Therefore it is not surprising that value that retroclined incisors in this male model had the most attractiveness score.

The results from this study are consistent with the results from the study of Ghaleb et al (8) that was conducted in Lebanon, in which the excessive labial or lingual inclination was not appreciated by lay people. However, 5 degree proclination was the most attractive inclination found in the study of Ghaleb et al (8) which is not in agreement with the results of our study. In our study, the most attractive inclination was normal inclination or retrocline in male. Proclination of 6 degree received significantly less attractiveness score in both male and female in this study.

Furthermore, the study by Soh J et al. (15, 20) conducted in Chinese people, found that normal profile in male and normal profile or bimaxillary retrusion in females are the most attractive profile. Although, these studies were performed with the picture of models in lip at rest, the results were in agreement with our results in both male and female. This study found that normal position of incisors had highest attractiveness score which was significantly higher than the score of other positions. In female, normal and retrusion have significantly higher attractiveness score than protusion.

In some situations, the incisors have to be placed more forward or backward than in standard value, for example, in patients with skeletal discrepancy the situation is treated by camouflaging. Therefore in this study, we also analyzed the effects of changing incisor inclination in different position of the incisors.

In male, either in 3 mm protrusive or 3 mm retrusive position of incisors, proclination of 6 degree from original position of this model resulted in significantly less attractive perception. This may resulted from the original inclination in this male model that was slightly proclined as described earlier, so that changing inclination to +6 resulted in very proclined incisors. However when compared the attractiveness score of the original incisor inclination and retroclination, it was found that the scores were close to each other and had no significant difference either in retrusive or protrusive position. This indicated that slightly proclination of incisors (no more than 6 degree from standard value) in male does not compromise the attractiveness.

When considering the inclination together with position in female, the results suggested that, if the position of incisors has to be changed into more retrusive position, it is better to keep the inclination normal or proclined rather than retroclined because retrusion with retroclination has the lowest attractiveness compared with the other two inclinations and this score was significantly lower compared to retrusion with normal inclination. Retroclination of incisors in female in protrusive position also received the lowest attractiveness score compared to the other two inclinations. Therefore when changing position of incisors in female, either in protrusive or retrusive direction, torqing control should be applied in order to keep the inclination as close to normal position as possible. These results are important, for example, in orthodontic compensation treatment for Class III patient where the upper incisors might have to be protruded and proclined to compensate the skeletal discrepancy.

The results from different sectors, occupations, age groups and income groups were also evaluated in this study. However, the numbers of subjects in some subgroups were few for example subgroup 3 of occupation. Therefore, the results might not well represent the population of those subgroups. When dividing subjects according to their educational background, two subgroups had very few subjects (only 1% and 4% of subjects) so that we did not showed the attractiveness scores according educational background.

People from different sectors tend to have different preference in incisor position and inclination while other factors did not show obvious difference. For the income subgroups, the similarity of the preference could be observed especially between income group less than 5000 bath and 5000-10000 as well as between income group of 10000-20000 and more than 20000.

There are many factors that determine the most attractive incisor position and inclination in each person. In this study, one male and one female who have skeletal features matched the most with standard values of Thai people were selected to be the model. However, each patient has different facial contour that can affect the attractiveness of different incisor position and inclination, for example, the protrusion of nose and chin. Therefore the actual orthodontic treatment planning must be adjusted for individuals with the basic information for average Thai preferences gathered from this study. Furthermore, this study was designed to evaluate the facial attractiveness only in smile profile view. In orthodontic treatment, other factors including esthetics in other views as well as proper function of teeth are also the important factors to be considered.

Further studies that include more models would be beneficial in that they could be better representative for Thais. In addition, increasing the number of the models used can help reducing other factors beside from incisor position and inclination that can affect facial attractiveness.

Conclusion

- Normal position is the most attractive position of incisor in male model with normal skeletal, dental and soft tissue appearance. In female model, normal position and retrusion was considered more attractive than protrusion.
- Retroclination in male (but match the standard value) was found the most attractive. Normal inclination and proclination were more attractive compared to retroclination in female
- In 3 mm protrusive or 3 mm retrusive positions of incisors, in male, either normal inclination or retroclination were considered more attractive than proclination. In female, retroclination was the least attractive in both protrusive and retrusive position,
- People from different sectors tend to have different preference in incisor position and inclination.
 Whereas different age group, occupation and income group seem to have no obvious different in this preference.

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Appendix

Attractiveness scores of different positions in male

Position	Score, SD
-3	Mean score:152.9557
	SD: 65.20999
0	Mean score:177.3566
	SD: 38.13261
+3	Mean score:145.8026
	SD: 44.10120
Attractiveness scores o	f different positions in fem
Position	Score, SD
-3	Mean score:131.0884
	SD: 61.58394
0	Mean score:137.2454
	SD: 41.75042
	105 (04

Attractiveness scores of different positions in female

Position	Score, SD
-3	Mean score:131.0884
	SD: 61.58394
0	Mean score:137.2454
	SD: 41.75042
+3	Mean score:127.684
0	SD: 50.05173

Attractiveness scores of different inclinations in male

inclinations	Score, SD
-6	Mean score:168.9008
	SD: 44.47600
0	Mean score: 160.1792
	SD: 38.05400
+6	Mean score:147.0349
	SD: 42.90249

Attractiveness scores of different inclinations in female

inclinations	Score, SD	
-6	Mean score:123.1739	
	SD: 42.39866	
0	Mean score: 137.9796	
	SD: 38.17241	
+6	Mean score:134.8644	
	SD: 45.09777	

Attractiveness scores of different positions/inclinations in female

			A	
Position Inclination	-3	0	+3	
-6	Position -3 / inclination -6	Position 0/ inclination -6	Position +3/ inclination -6	
	Mean score: 39.7055	Mean score: 44.4839	Mean score: 38.9845	
	SD: 21.62870	SD: 17.82769	SD: 18.68612	
0	Position -3/ inclination 0	Position 0/ inclination 0	Position +3/ inclination 0	
	Mean score: 48.2723	Mean score: 42.5209	Mean score: 47.1863	
	SD: 25.11985	SD: 18.25173	SD: 21.84519	
+6	Position -3/ inclination +6	Position 0/ inclination +6	Position +3/ inclination +6	
	Mean score: 43.1108	Mean score: 50.2406	Mean score: 41.513	
	SD: 23.83474	SD: 18.31121	SD: 21.55891	
Ranco				

Attractiveness scores of different positions/inclinations in male

Position			
	-3	0	+3
Inclination			
-6	Position -3 / inclination -6	Position 0/ inclination -6	Position +3/ inclination -6
	Mean score:55.0072	Mean score:63.0238	Mean score:50.8698
	SD: 25.64477	SD: 18.90210	SD: 20.02821
0	Position -3/ inclination 0	Position 0/ inclination 0	Position +3/ inclination 0
	Mean score:52.017	Mean score:56.1735	Mean score:51.9886
	SD: 24.03134	SD: 15.99822	SD: 18.86679
+6	Position -3/ inclination +6	Position 0/ inclination +6	Position +3/ inclination +6
	Mean score:45.9318	Mean score:58.1592	Méan score:42.9438
	SD: 24.30244	SD: 19.89272	SD: 18.1587

Distribution of attractiveness score





The interview sheet with VAS score



ประวัติผู้วิจัย

ชื่อผู้วิจัย : หทัยชนก นามสกุล : เจริญพงศ์ ชื่อภาษาอังกฤษ : Hataichanok นามสกุลภาษาอังกฤษ : Charoenpong ที่ทำงาน : คณะทันตแพทยศาสตร์ มหาวิทยาลัยรังสิต โทรศัพท์ (ที่ทำงาน) : 02-9972200 ต่อ 4377

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