THAI DENTISTS' PREFERRED MAXILLARY ANTERIOR TOOTH WIDTH AND WIDTH/HEIGHT PROPORTIONS

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A Thesis Submitted in Partial Fulfillment of the Requirements

for the Degree of Master of Science Program in Esthetic Restorative and Implant Dentistry

Faculty of Dentistry

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Academic Year 2011

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ความชอบของทันตแพทย์ไทยต่ออัตราส่วนความกว้างและ
ความกว้าง/ความสูงของฟันหน้าบน

นายชยพร ศุภชาติวงศ์

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By   Mr. Chayaporn Supachartwong
Field of Study   Esthetic Restorative and Implant Dentistry
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ชยพร ศุภชาติวงศ์ : ความชอบของทันตแพทย์ไทยต่ออัตราส่วนความกว้างและความกว้าง/ ความสูงของฟันหน้าบน. (Thai dentists' preferred maxillary anterior tooth width and width/height proportions) อ. ที่ปรึกษาวิทยานิพนธ์หลัก : รศ. ทพ. เฉลิมพล ลี้ไวโรจน์ , 40 หน้า.

วัตถุประสงค์ เพื่อจัดหาข้อมูลเกี่ยวกับมาตรฐานที่เป็นที่ยอมรับสำหรับการออกแบบรอย ยิ้มโดยอาศัยอัตราส่วนของฟันสำหรับทันตแพทย์ไทย **วิธีการทดลอง** ถ่ายรูปรอยยิ้มของคนไทยแล้ว นำมาตกแต่งด้วยโปรแกรมตกแต่งภาพ(Adobe Photoshop CS5) เพื่อให้ได้รอยยิ้มที่สมมาตร นำ ภาพที่ได้มาปรับอัตราส่วนความกว้าง/ความสูงเป็น 3 แบบ (ปกติ, ยาว และสั้น)และในแต่ละแบบ ปรับความกว้างของฟันส่วนความกว้างจะถูกปรับเป็นสามแบบ (Golden, 70RED และ Preston) ภาพ ที่ได้ทั้งหมด 9 ภาพจะถูกนำมาจัดเป็น 18 คู่เพื่อทำแบบสำรวจ ทันตแพทย์ไทยจำนวน 242 คนจะ เลือกรูปที่ชอบมากกว่าในแต่ละคู่ ผลการสำรวจที่ได้นำมาวิเคราะห์ด้วยการทดสอบทวินาม (Binomial test) และการทดสอบของฟิชเชอร์ (Fisher's Exact Test) ที่ระดับนัยสำคัญ 0.05 **ผล การทดลอง** จากการสำรวจพบว่า ความชอบในอัตราส่วนความกว้างไม่มีความแตกต่างกันอย่างมี นัยสำคัญในฟันที่อัตราส่วนความกว้าง/ความสูงปกติและอัตราส่วนความกว้าง/ความสูงยาว แต่ใน กลุ่มฟันที่อัตราส่วนความกว้าง/ความสูงสั้น พบว่า อัตราส่วน golden เป็นอัตราส่วนที่ได้รับความ ชอบน้อยที่สุด ส่วนการเปรียบเทียบในกลุ่มอัตราส่วนความกว้างเดียวกันพบว่า ฟันที่มีอัตราส่วน ความกว้าง/ความสูงปกติ (78%) ได้รับความชอบสูงที่สุด และเมื่อนำปัจจัยอื่นมาวิเคราะห์ด้วย พบ ว่า สาขาวิชาที่ศึกษาต่อมีผลต่อการเลือก 7 คู่จากทั้งหมด 18 คู่ เพศมีผลต่อการเลือก 2 คู่จาก 18 คู่ และ อายุการทำงานมีผลต่อการเลือก 1 คู่ จาก 18 คู่ **สรุป** อัตราส่วนความกว้าง/ความสูงมีผลต่อ ความชอบของทันตแพทย์ไทยมากกว่าอัตราส่วนความกว้าง ในขณะที่สาขาวิชาที่ศึกษาต่อ, เพศ และอายุการทำงานก็มีผลต่อความชอบในบางอย่างเช่นกัน

สาขาวิชา ทันตกรรมบูรณะเพื่อความสวยงาม   ลายมือชื่อนิสิต...
         และทันตกรรมรากเทียม   ลายมือชื่ออ.ที่ปรึกษาวิทยานิพนธ์หลัก...................
ปีการศึกษา 2555

CHAYAPORN SUPACHARTWONG : THAI DENTISTS' PREFERRED MAXILLARY ANTERIOR TOOTH WIDTH AND WIDTH/HEIGHT PROPORTIONS ADVISOR: ASSOC. PROF. CHALERMPOL LEEVAILOJ, 40 pp.

Objective The purpose of this survey study is to provide information about the generally accepted standards for designing smiles using tooth proportion relationships for Thai dentists. **Materials and methods** A frontal image of a Thai smile was made and adjusted by a computer image manipulation program (Adobe Photoshop CS5) to produce a symmetric smile. The teeth were adjusted to three ratios (normal, tall and short teeth) and each ratio was made to three proportions (Golden, Preston and 70RED proportion). Eighteen survey sets of two different smiles were constructed. Two hundred forty two Thai dentists were asked to decide which smile in each set is more preferable. The results were analyzed with binomial test and Fisher's Exact Test (α = 0.05) **Result** In normal width/ height ratio teeth, no significant difference was found in the preferred tooth width. For the survey of short teeth, the golden ratio was the least preferable. When compared to the group with the same width proportion, the normal (78% width/height ratio) teeth were the most preferable. The analysis found that the preferences of Thai dentists may be influenced by field of mainly practice (7 out of 18 sets), gender (2 out of 18 sets) and years in practice(1 out of 18 sets). **Conclusion** The width/height proportion has more influence on the preference of Thai dentists than the tooth width proportion. And the field of mainly practice, gender and years in practice may also affect some preferences of Thai dentists.

Field of Study: Esthetic Restorative and   Student's Signature....................................

           Implant Dentistry   Advisor's Signature…………………………..

Academic Year: 2012

ACKNOWLEDGEMENTS

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CHAPTER I

INTRODUCTION

Rationale and Significance of the problem

Nowadays, cosmetic or esthetic dentistry has become a major focus for Thai people. Achieving excellent esthetics when restoring or replacing the maxillary anterior teeth are one of the most challenging tasks in dentistry. Dental aesthetics is an important element of facial appearance that may potentially influence the personality, which in turn may affect self-confidence and sociability(1-3).

Term of esthetic is completely subjective and individual in each person(1, 4), although lay people's self-perception of dental esthetics usually focuses mainly on gross esthetic discrepancies related to debilitating malocclusions(5-7).

Even several studies have suggested guidelines in establishing anterior esthetics that include suggestions for the optimal anterior tooth proportion. However only few studies can tell us what proportion that most of the dentists prefer, especially for Thai dentists. From the past many proportions were presented such as "golden proportion"- one of the most famous proportion, "70 RED proportion"- the new popular proportion, or "Preston proportion"- the proportion that mimic natural teeth.

One factor that can affect the preferred proportion is the tooth length, like short or tall of the teeth(8), but we have little information about how dentists perceive various tooth proportions. For example, in a patient who has tall teeth may be suitable to have teeth with the proportion that has bigger central incisors. This means when dentists choose the proportion, the length of the teeth is one important factor to decide proper proportion.

The purpose of this survey study is to provide information about the generally accepted standards for designing smiles using tooth proportion relationships for Thai dentists and to determine the factors which affect the preference of Thai dentists.

Research Question

What is the proportion which Thai dentists prefer (golden, RED or Preston proportion) ? And what is the most favorable ratio in each proportion ?

Research objectives

The purpose of this survey study is to provide information about the generally accepted standards for designing smiles using tooth proportion relationships for Thai dentists.

Statement of Hypothesis

Null hypothesis :

There is no significant difference in preferred maxillary anterior tooth width proportions among three types of proportion in Thai dentists.

There is no significant difference in preferred maxillary anterior tooth width proportions with the different width/height ratios.

Alternative hypothesis

There is significant difference in preferred maxillary anterior tooth width proportions between three types of proportion in Thai dentists.

There is significant difference in preferred maxillary anterior tooth width proportions with different width/height ratios.

Scope of the Study

This research used computer programming to make the smile photos in 3 proportions and 3 ratios of six maxillary anterior teeth. The survey sets were then constructed to compare proportion in each ratio and compared the ratio in each proportion. Thai dentists were requested to choose the preferred picture in each set.

Basic Assumption

The smile photos in this study were made using a computer program. Thai dentists were instructed to choose the photo which was preferable by looking from the frontal view. The photos were only different in proportion and ratio of six maxillary anterior teeth but no difference in color of the teeth, color of the gingiva, midline, axis of the teeth and occlusion.

Study Limitation

This study investigates only three types of proportions and three ratios of the teeth.

Keywords

Esthetic dentistry/ Golden proportion/ Preston proportion/ RED proportion/ Smile analysis/ Thai proportion/ Upper anterior teeth

The Expected Benefits

1. Information for clinical selection of anterior teeth proportion and ratio
2. Basic knowledge for further study

CHAPTER II
Review of Literatures

In 1973, Lombardi(9) discussed that dental and facial esthetics were optimized if features, such as the central to lateral width and lateral to canine width, were repeated in proportion when the patient was viewed from the front. Several repeated teeth width proportions have been presented, including the Plato beauty proportion (57%), the esthetic norm proportion (71%), the quarter 3:4 proportion (75%), and the human norm 5:6 proportion (80%), but few proportions are currently being applied at the present.

Golden proportion

The golden proportion is based on the theory that a relationship exists between beauty in nature and mathematics. This proportion has been used for a long time by architecture. To be applied to smile design, it states that the width of the maxillary lateral incisor, as viewed from the front, should be in golden proportion to the width of the maxillary central incisor(10). The ratio among central:lateral:canine should be 1.618:1:0.618 and can be calculated that the maxillary lateral incisor should be 62% of the width of the maxillary central incisor, and the width of the maxillary canine should be 62% of the width of the lateral incisor (Figure 1).

Although Lombardi(9) considered the use of the so-called "Golden Proportion", he stated that "it has proven too strong for dental use."

Levin(10) in 1978 introduced special calipers(Figure 2) which follows the golden proportion and has been suggested as useful in designing a well-proportioned prosthesis.

1.618   1.0   0.618
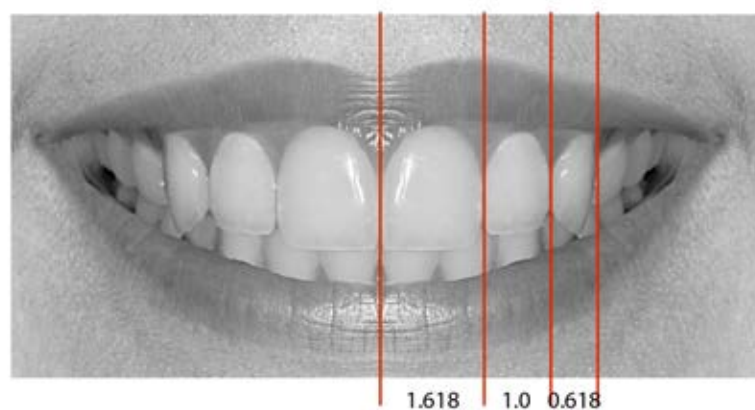
Figure 1. Golden proportion

Preston proportion

In 1993, Preston(11) evaluated 58 orthodontic casts made from dental students to determine the frequency of the golden proportion in the ratio of the maxillary centrals-to-laterals and laterals-to-canines when looked at from the front. He found these natural teeth were rarely in the golden proportion (17% maxillary central-to-lateral and 0% lateral-to-canine). He also reported that for his subjects, the lateral incisor was on average, 66% narrower than the central, and the maxillary canine was 84% narrower than the lateral.

The word "Preston proportion" was named by Ward(8) in 2007 to imply the natural proportion of the teeth that was found in most population when look from frontal view. Many studies(12-15) from around the world support that the ratio of canine:lateral in Preston proportion is larger than the Golden proportion or 70RED proportion, and that the Preston proportion is not the constant ratio.
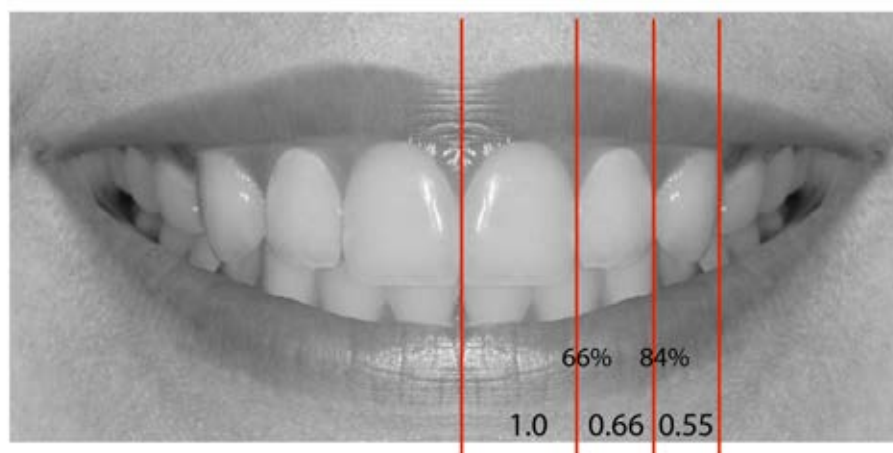
Figure 2. Preston proportion

RED (Recurring Esthetic Dental) proportion

Ward(16, 17) in 2000 proposed Recurring Esthetic Dental (RED) proportion. He based his suggestion on the result of his study in which he described RED proportion as the proportion of the successive width of the teeth remaining constant, when progressing distally from the midline.

The 70% RED proportion has been recommended for normal-length teeth with a 78% width/height ratio of the maxillary central incisors(17). When using the 70% RED proportion, the width of the maxillary lateral incisor is 70% of the frontal view width of the maxillary central incisor, and the maxillary canine is 70% of the width of the resulting lateral incisor.
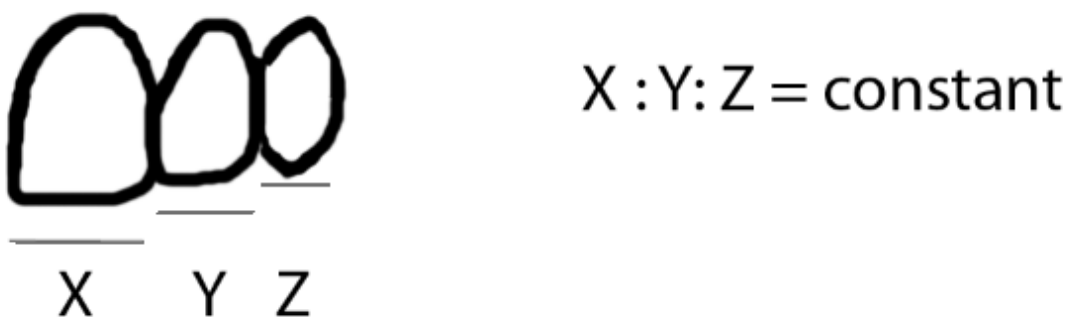
Figure 3. Recurring Esthetic Dental proportion

Width/Height Ratio

Another important factor for esthetic restorations is the width/height ratio of the central incisor. Gillen(18) in 1994 showed width/height ratio of the central incisor varied from 66-80% and the results of other authors: Sterret reported 85 % width/height ratio of the maxillary central incisor(19), Magne 87%(20), while Brisman proposed the optimal ratio of 75 %(21).

Wolfart suggested other proportions according to the attractiveness judged by dental professionals and patients(22). He proposed that central incisor's width/length ratio should be between 75 and 85%. Ward(17) suggested using 78% width/height ratio because it was his personal favorite and supported his opinion by referring to mold guides from a denture manufacturer.

CHAPTER III

MATERIALS AND METHODS

Research Design

Cross-sectional descriptive study

Sample Description

1. The population of this study were Thai dentists.

2. Sample size estimation was calculated from this formula;

$$n_i = \frac{\left[Z\frac{\alpha}{2} + Z_\beta \right]^2 \left(\pi_1(1\text{-}\pi_1) + \pi_2(1\text{-}\pi_2) \right)}{\left(\pi_1\text{-}\pi_2 \right)^2}$$

Where: n_i represent the required sample size

Z represents the Z value ($Z_{\alpha/2}$ = 1.96 for type I error (**α**) equal to 0.05

and Z_β = 0.84 for type II error (**β**) equal to 0.2)

Π_1 represents expected success proportions of sample one

Π_2 represents expected success proportions of sample two

At 95% confidence interval and 80% power of test, the result from sample size estimation was 94.

Method of Survey sets preparation

Frontal images of a smile were made using a 100- mm focal length macro lens (Canon EF 100mm f/2.8 USM Macro Lens) mounted on a 12-megapixel digital SLR (single-lens reflex) camera (Canon EOS 450D) with ring flash (Sigma EM-140 DG)(Figure 4).

Figure 4. Taking a frontal image of a smile

A computer image manipulation program (Adobe Photoshop CS5, Adobe Systems, San José, CA, USA) was applied to produce a symmetric smile with a 78% width/height ratio of the maxillary central incisors (Figure 5). The teeth were adjusted to three ratios (normal, tall and short teeth)(Figure 6), and each ratio was made to three proportions (Golden, Preston and 70RED proportion). The normal ratio was 78% width/height, Tall ratio was increased height for 10% and the short ratio was decreased height 10% from the normal ratio. The images were adjusted at the six maxillary anterior teeth width proportions, the distance from canine to canine was keeping constant. The widths of the posterior teeth and the mandibular teeth were not manipulated.

Figure 5. Adjusting the smile by computer program

Figure 6. Pictures of three ratios of the teeth (A, Normal ratio. B, Tall ratio. C, Short ratio)

Eighteen survey sets of two different smiles were constructed. Each of the three ratios (normal, tall and short ratios) contained three sets of different proportion. And each proportion of three proportions (Golden, Preston and 70 RED proportion) contained three sets of the different ratio.

Table I. Formulas used for tooth width calculations.

Proportion	Central incisor(CI)width	Lateral incisor(LI) width	Canine incisor width
Golden	IC width × 0.25	CI width × 0.62	LI width × 0.62
Preston	Preston CIW*	CI width × 0.66	LI width × 0.84
70 RED	70 RED CIW**	CI width × 0.70	LI width × 0.70
RED = recurring esthetic dental; IC width = intercanine width of six maxillary teeth(as viewed from the front). *Preston CIW = Total intercanine frontal view width/ 2(1 + 0.66 + (0.66 × 0.84)) **70 RED CIW = Total intercanine frontal view width/ 2(1 + 0.7 + 0.7^2)			

The formulas applied to determine the widths of the maxillary teeth in each proportion are displayed in Table 1, and each proportion was created to three ratios include normal(78% Width:Height), tall(increase height 10%) and short(decrease height 10%). The width/height ratios were constant in all proportions except in the golden proportion because it was felt that changing the height of the maxillary central incisor to keep the width/height ratio constant for each view would be distracting. Table 2 shows 18 survey sets that were created to compare proportions or ratios.

Table II. Survey sets

Survey Set	Ratio	Proportion	View A	View B
1	Normal		Golden	Preston
2	Normal		70 RED	Preston
3	Normal		Golden	70 RED
4	Tall		Golden	Preston
5	Tall		70 RED	Preston
6	Tall		Golden	70 RED
7	Short		Golden	Preston
8	Short		70 RED	Preston
9	Short		Golden	70 RED
10		Golden	Normal	Tall
11		Golden	Short	Tall
12		Golden	Normal	Short
13		Preston	Normal	Tall
14		Preston	Short	Tall
15		Preston	Normal	Short
16		70 RED	Normal	Tall
17		70 RED	Short	Tall
18		70 RED	Normal	Short

The paired sets of smiles were inserted into a computer presentation program (Keynote '09 v 5.1.1, Apple Inc.). The images were carefully aligned so that there was no change in position of the lips and only the affected teeth would appear to move in order to make selection more definitive with the minimal distractions.

Method of Data Collection

The presentation shown by the same model of computer(iMac 10,1, Apple Inc.). The participants were placed in front of the computer and received an answer sheet(Figure 7). Each view was shown for 15 seconds and then faded away for 2 seconds, and the next view would be shown in 2 seconds and was then shown for 15 seconds again.

The participants were requested to choose the proportion they preferred on the answer sheet(Figure 8). After eighteen sets were shown, the questionnaires were collected, and the participants were thanked.

The author performed the experiment and collected the data. The data was then analyzed using statistical software (SPSS 20.0, SPSS).

Figure 7. The participant while choosing the proportions

แบบประเมินความพึงพอใจในรูปร่างและอัตราส่วนของฟัน
คณะทันตแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

วัตถุประสงค์ : แบบสอบถามนี้มีวัตถุประสงค์เพื่อสำรวจความพึงพอใจในรูปร่างและอัตราส่วนของฟัน
ของประชากรไทย เพื่อเป็นประโยชน์ในการวางแผนการรักษาทางทันตกรรมต่อไป
หมายเหตุ : ผู้ตอบแบบได้รับทราบถึงขั้นตอนการทำวิจัยนี้แล้ว และยินยอมที่จะร่วมการวิจัยโดยการตอบ
          แบบสอบถามนี้
แบบสอบถามแบ่งเป็น 2 ตอน ได้แก่
ตอนที่ 1 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม
ตอนที่ 2 รูปร่างและอัตราส่วนของฟันที่ผู้ตอบแบบสอบถามพึงพอใจ

ตอนที่ 1 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม
(โปรดทำเครื่องหมายถูก ✔ หน้าคำตอบที่ตรงกับความเป็นจริง หรือกรอกข้อมูลลงในช่องว่าง)
1. เพศ   ☐ หญิง ☐ ชาย

2. อายุ   _____ ปี

3. อาชีพ   ☐ ทันตแพทย์ ☐ ไม่ใช่ทันตแพทย์
   ในกรณีที่เป็นทันตแพทย์ โปรดตอบ 2 คำถามต่อไปนี้

          3.1 จบการศึกษาเป็นเวลา   _____ ปี

          3.2 สาขาที่ศึกษาต่อ _____

ตอนที่ 2 รูปร่างและอัตราส่วนของฟันที่ผู้ตอบแบบสอบถามพึงพอใจ
          ในส่วนแรกมีรูปทั้งหมด 18 คู่ ให้ผู้ตอบแบบสอบถามพิจารณาเป็นเวลา 15 วินาที ต่อ 1 คู่ กรุณาวงกลมรอบรูปที่
ท่านชื่นชอบมากที่สุด ส่วนในข้อสุดท้ายกรุณาตอบตามความความคิดของท่าน

1.	ก.	ข.	10.	ก.	ข.
2.	ก.	ข.	11.	ก.	ข.
3.	ก.	ข.	12.	ก.	ข.
4.	ก.	ข.	13.	ก.	ข.
5.	ก.	ข.	14.	ก.	ข.
6.	ก.	ข.	15.	ก.	ข.
7.	ก.	ข.	16.	ก.	ข.
8.	ก.	ข.	17.	ก.	ข.
9.	ก.	ข.	18.	ก.	ข.

19. จากทั้งหมดที่ดูฟันซี่ใดมีผลต่อความพึงพอใจมากที่สุด
          ก. ฟันตัดซี่กลาง   ข. ฟันตัดซี่ข้าง   ค. ฟันเขี้ยว   ง. ทุกซี่เท่าๆกัน

Figure 8. Questionnaire used in the present study

Statistical Analysis

Data was analyzed using SPSS 20.0. A common feature of the data sample was analyzed by using frequency distribution, mean and standard deviation. The resulting smile preferences were analyzed with Binomial Test, Fisher's Exact Test and Chi square Test. Binomial test was used to show the significant difference between of the preference of the proportion and ratio. Fisher's Exact Test and Chi square were used to assess the effect of related factors that influenced preference; gender, years in practice and field of main practice.

CHAPTER IV
RESULTS

A total of 242 responses from Thai dentists was collected: 167 were female, 73 were male, and 2 did not identify their gender. The average age of the subjects was 33, ranging between 23 and 72 years of age. Most of the participants were between 20 and 29 years of age, which equaled to 114 dentists (47.11%). The average years of practice was 8.47 years (Table III), ranging from 2 months to 46 years. Due to the small sample size for each field of study, we decided to separate the respondents into two groups. The first group was the restorative group; this group included operative and prosthodontic dentists (n=55). The second group (n=155) was comprised of the respondents from all other fields.

Thai dentists' preferences of constructed smiles are displayed in Table IV. The results of the binomial test are shown in Figure 10-15. The comparison of the result in the same ratio is presented below. In the normal ratio, there was no significant difference among the levels of preference between the normal Preston proportion (53%) and the normal golden proportion (47%) (Figure 10). The same results were shown between the normal RED (53%) and the normal Preston (47%) (Figure 10), the normal RED (56%) and the normal Golden (44%) (Figure 10). Similar results were evident in the tall ratio group, the tall Preston (50%) and the tall Golden (50%) (Figure 11); the tall RED (55%) and the tall Preston (45%) (Figure 11); and the tall Golden (50%) and the tall RED (50%) (Figure 11). All the results in the normal ratio and the tall ratio did not show any significant difference.

However, in the short ratio, there were significant differences in the levels of preference between the short Preston proportion (77%) and the short Golden proportion (23%) (Figure 12). Similarly, the difference in percentage of Thai dentists' preference was also significant in the short RED (63%) and the short Preston (37%) (Figure 12), the short Golden (21%) and the short RED (79%) (Figure 12).

When considering the same proportion, there were significant differences in the levels of preference in six sets from the total of nine sets (in the golden proportion and the RED proportion). The normal golden (71%) (Figure 13) was more preferable than the tall golden (29%), and the normal golden (92%) was also more preferable than the short golden (8%) (Figure 13). In addition, in the comparison between the tall golden and the short golden, the tall golden (68%) was more preferred than the short Golden (32%) (Figure 13). In the RED proportion, the tall RED (17%) was less preferred than the normal RED (83%) (Figure 14). The tall RED (37%) was less preferred than the short RED (63%) (Figure 14), while the normal RED (65%) was preferred more than the short RED (35%)

(Figure 14). In the Preston proportion, there were significant differences in two of the three sets. The tall Preston (12%) was less preferred than the normal Preston (88%) (Figure 15), and the normal Preston (76%) was preferred more than the short Preston (24%) (Figure 15). However, there was no significant difference between the short Preston (56%) and the tall Preston (44%) (Figure 15).

Almost all differences occurred in the sets that compared the ratios of the teeth in the same proportion. The only exception was found in the short ratio, which showed a significant difference between the proportions. The golden proportion was the least preferred among short ratio teeth.

Figures 16-21 show the survey set responses divided by gender. The different genders showed significant differences in only 2 of the 18 sets. Similarly, the factor of years in practice showed a difference in only 1 of the 18 sets (Figure 22-27). On the other hand, the field of main practice showed more differences than the gender and the years in practice (in 7 of the 18 sets) (Figure 28-33).

Table III. Demographic data of the Thai dentist respondents.

Demographics	N	%
Gender		
Female	167	69
Male	73	30.2
Not reported	2	0.8
Total	242	100
Age (years)		
20–29	114	47.11
30–39	80	33.06
40–49	29	11.98
50–59	12	4.96
60+	4	1.65
Not reported	3	1.24
Total	242	100
Average (SD)	32.81(8.85)	
Years in practice		
00–09	164	67.77
10–19	46	19.01
20+	29	11.98
Not reported	3	1.24
Total	242	100
Average (SD)	8.47(8.708)	
Field of main practice		
Restorative	55	22.7
Others	187	77.3
Total	242	100

Table IV. Thai dentists' preferences of constructed smiles.

Survey set	Category	N	%
1	Normal Preston	128	53
	Normal Golden	114	47
2	Normal RED	129	53
	Normal Preston	113	47
3	Normal RED	136	56
	Normal Golden	106	44
4	Tall Preston	121	50
	Tall Golden	121	50
5	Tall RED	134	55
	Tall Preston	108	45
6	Tall Golden	120	50
	Tall RED	122	50
7	Short Preston	186	77
	Short Golden	56	23
8	Short RED	152	63
	Short Preston	90	37
9	Short Golden	50	21
	Short RED	192	79
10	Tall Golden	71	29
	Normal Golden	171	71
11	Tall Golden	164	68
	Short Golden	78	32
12	Normal Golden	222	92
	Short Golden	20	8
13	Tall RED	40	17
	Normal RED	202	83
14	Tall RED	89	37
	Short RED	153	63
15	Normal RED	157	65
	Short RED	85	35
16	Tall Preston	29	12
	Normal Preston	213	88
17	Short Preston	135	56
	Tall Preston	107	44
18	Normal Preston	184	76
	Short Preston	58	24

Normal Ratio

Figure 9. The graphs of the survey set responses in the normal ratio
(* means significant difference between set)
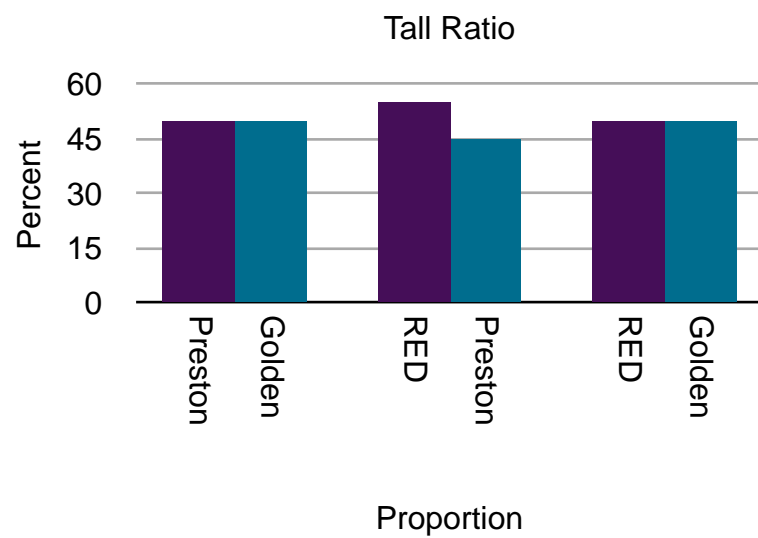
Tall Ratio
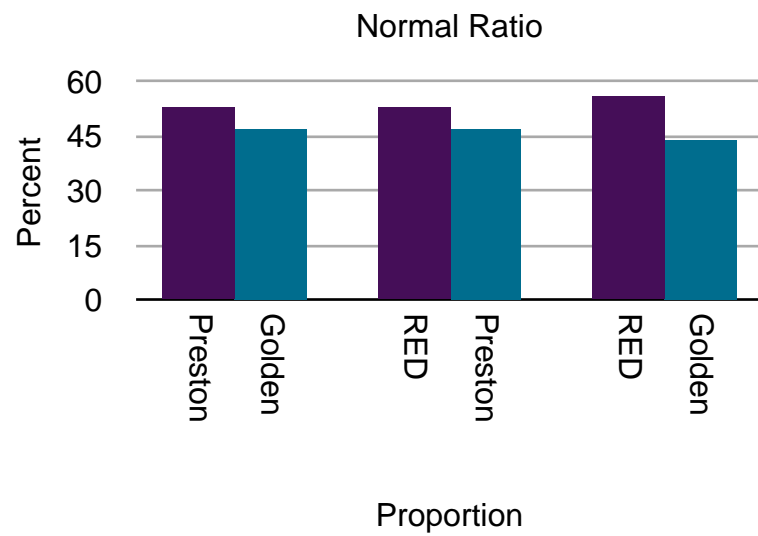

Figure 10. The graphs of the survey set responses in the tall ratio
(* means significant difference between set)
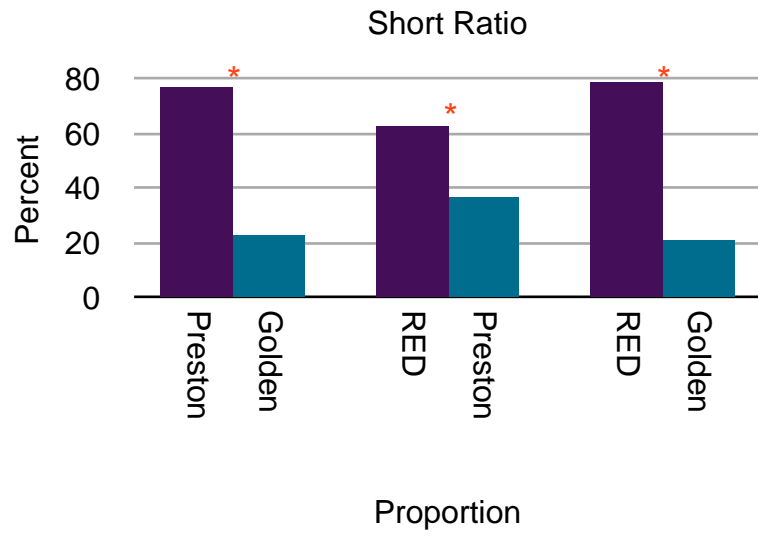
Short Ratio

Figure 11. The graphs of the survey set responses in the short ratio

(* means significant difference between set)
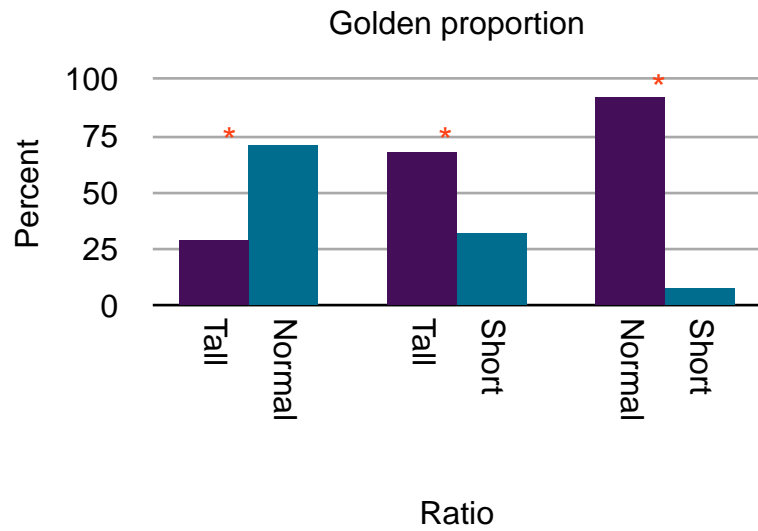
Golden proportion

Figure 12. The graphs of the survey set responses in the golden proportion

(* means significant difference between set)
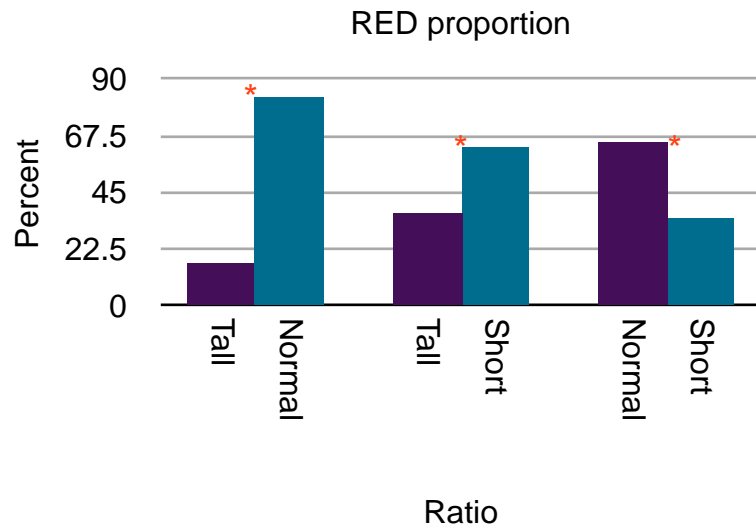
RED proportion

Figure 13. The graphs of the survey set responses in the RED proportion
(* means significant difference between set)

Preston proportion
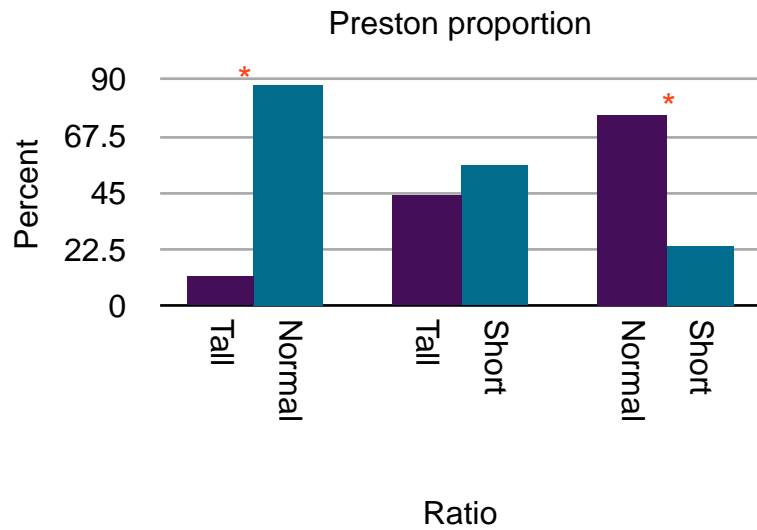
Figure 14. The graphs of the survey set responses in the Preston proportion
(* means significant difference between set)
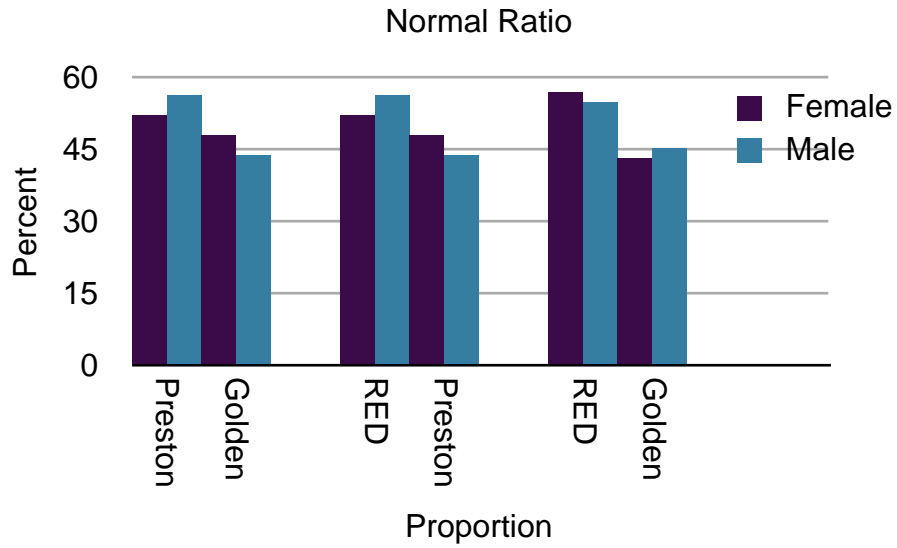
Normal Ratio

Figure 15. The graphs of the survey set responses in the normal ratio divided by gender
(* means significant difference between gender)
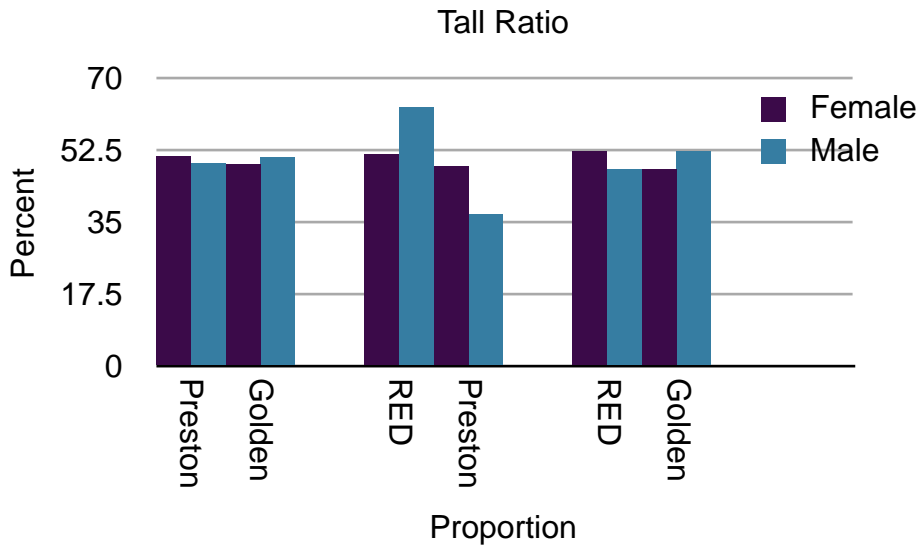
Tall Ratio

Figure 16. The graphs of the survey set responses in the tall ratio divided by gender
(* means significant difference between gender)
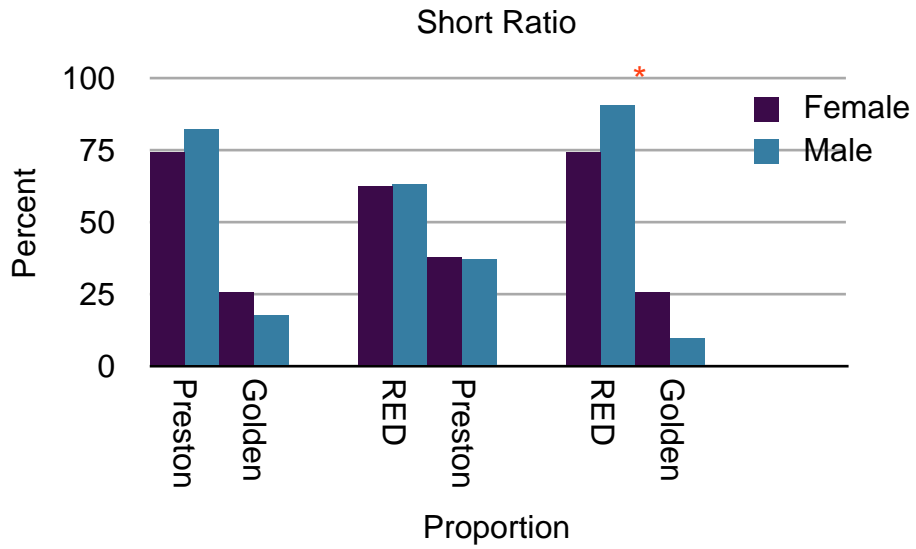
Figure 17. The graphs of the survey set responses in the short ratio divided by gender
(* means significant difference between gender)
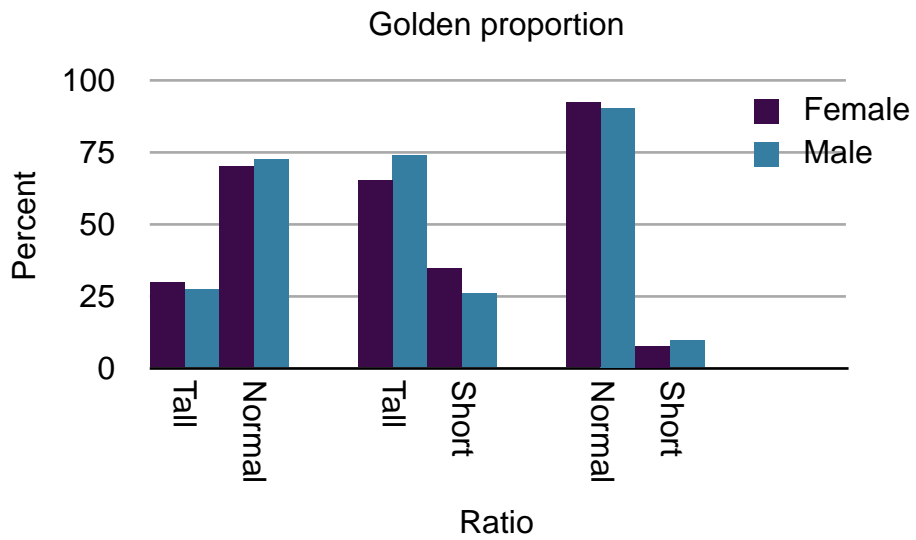
Figure 18. The graphs of the survey set responses in the Golden proportion divided by gender
(* means significant difference between gender)

Figure 19. The graphs of the survey set responses in the RED proportion divided by gender
(* means significant difference between gender)

Figure 20. The graphs of the survey set responses in the Preston proportion divided by gender
(* means significant difference between gender)

Normal Ratio

Figure 21. The graphs of the survey set responses in the normal ratio

divided by years in practice

(* means significant difference between years in practice)

Tall Ratio

Figure 22. The graphs of the survey set responses in the tall ratio

divided by years in practice

(* means significant difference between years in practice)

Figure 23. The graphs of the survey set responses in the short ratio
divided by years in practice
(* means significant difference between years in practice)

Figure 24. The graphs of the survey set responses in the Golden proportion
divided by years in practice
(* means significant difference between years in practice)

Figure 25. The graphs of the survey set responses in the RED proportion
divided by years in practice
(* means significant difference between years in practice)

Figure 26. The graphs of the survey set responses in the Preston proportion
divided by years in practice
(* means significant difference between years in practice)

Figure 27. The graphs of the survey set responses in the normal ratio
divided by field of main practice
(* means significant difference between field of main practice)

Figure 28. The graphs of the survey set responses in the tall ratio
divided by field of main practice
(* means significant difference between field of main practice)

Short Ratio

Figure 29. The graphs of the survey set responses in the short ratio

divided by field of main practice

(* means significant difference between field of main practice)
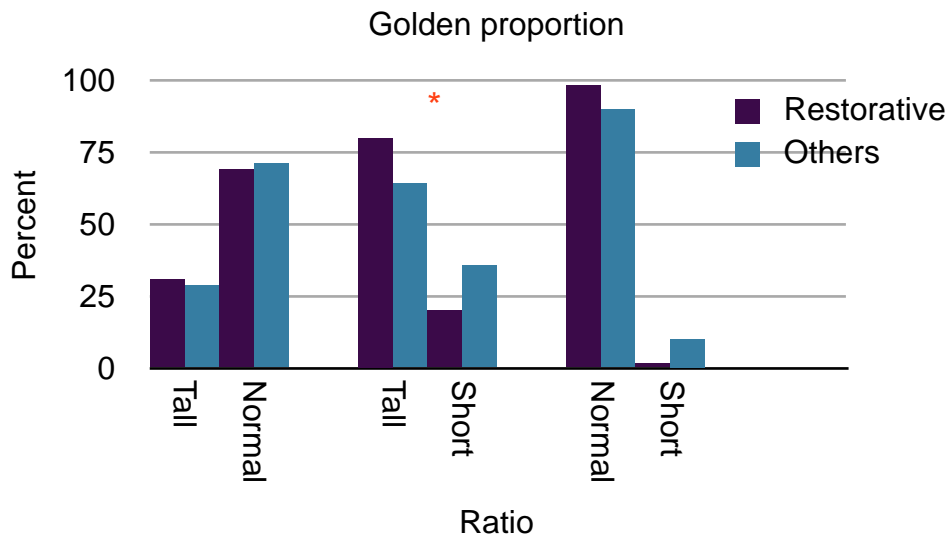
Golden proportion

Figure 30. The graphs of the survey set responses in the Golden proportion

divided by field of main practice

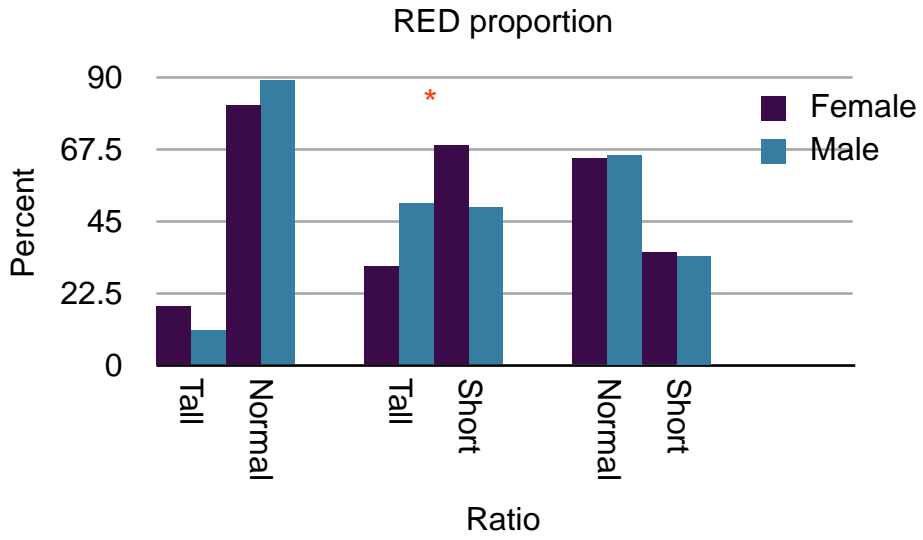(* means significant difference between field of main practice)
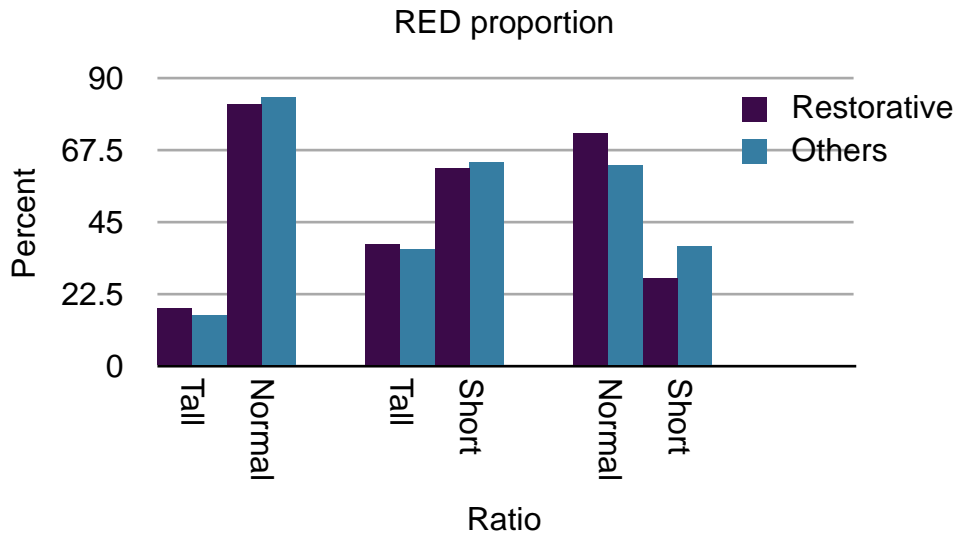
Figure 31. The graphs of the survey set responses in the RED proportion
divided by field of main practice
(* means significant difference between field of main practice)
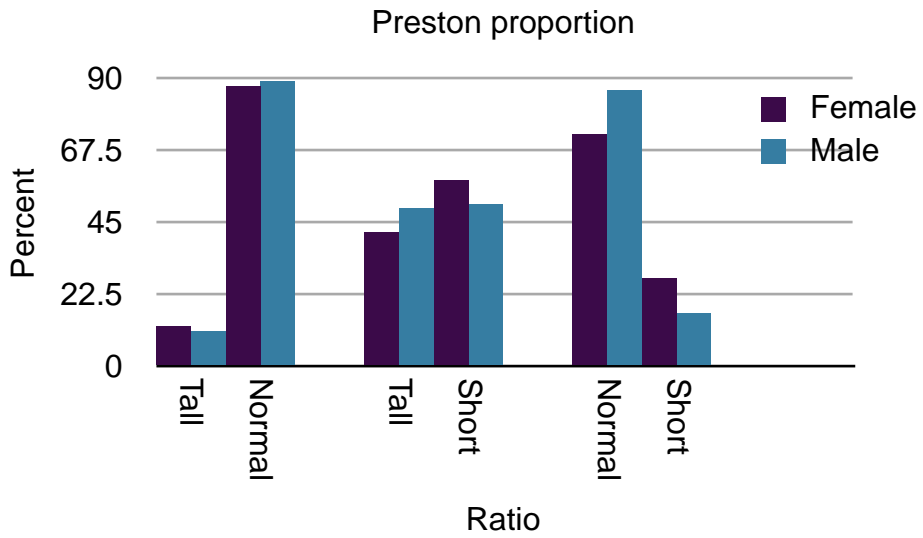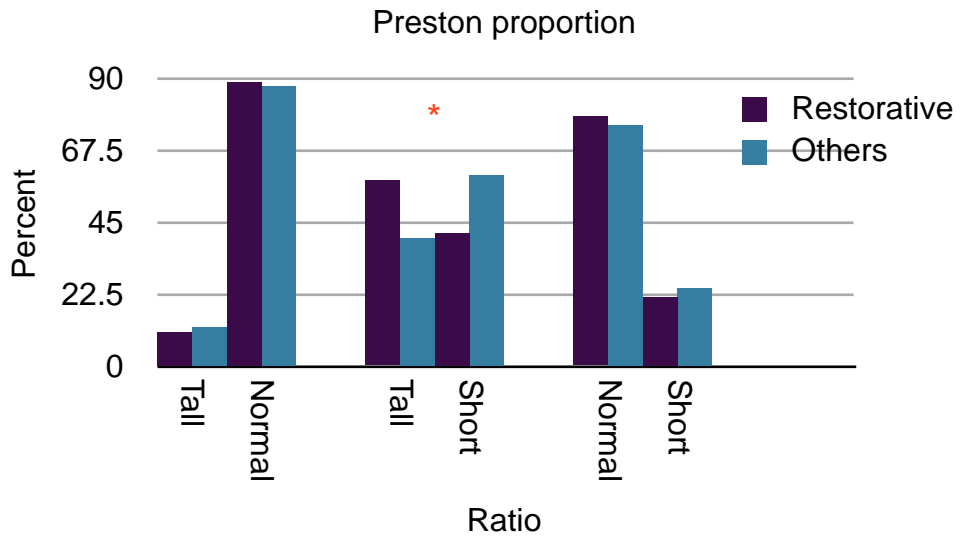

Figure 32. The graphs of the survey set responses in the Preston proportion
divided by field of main practice
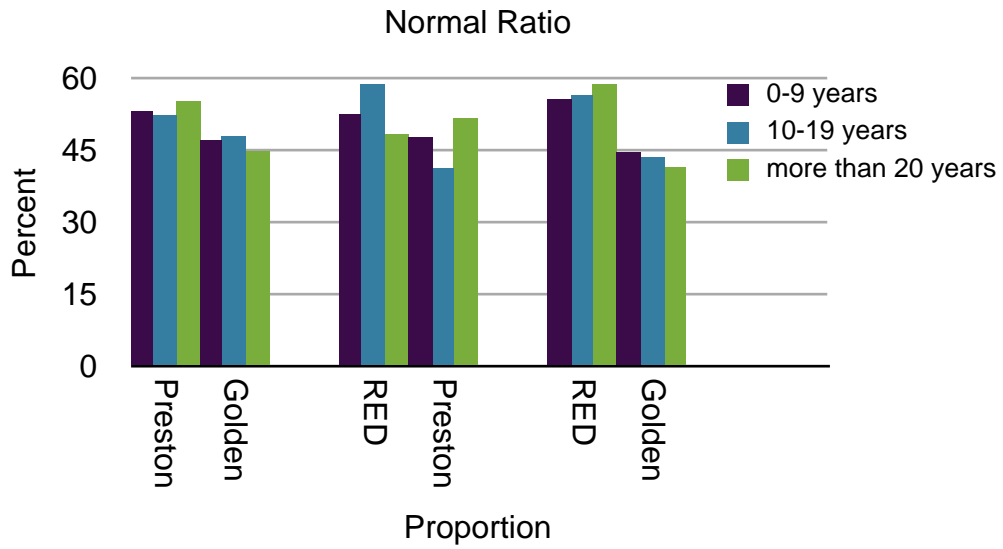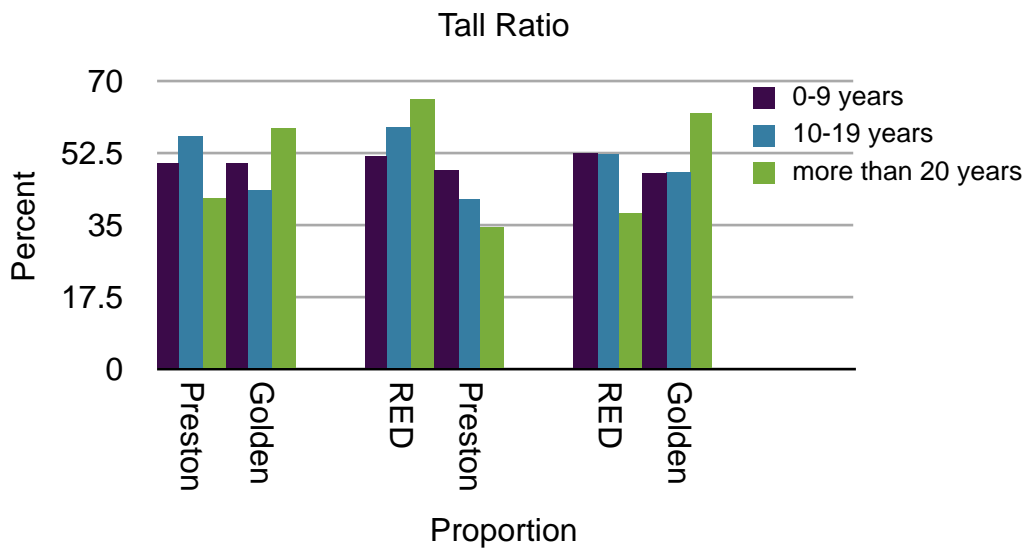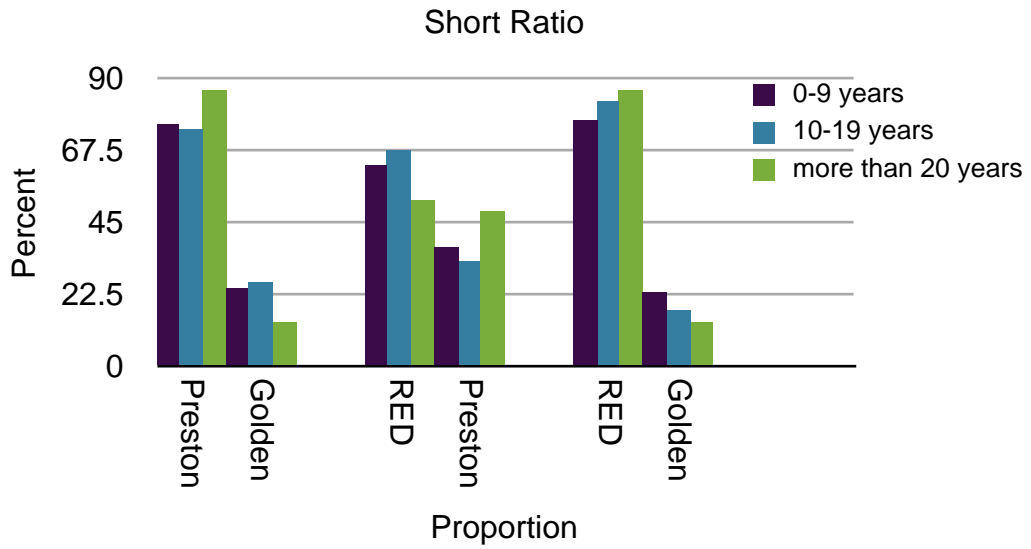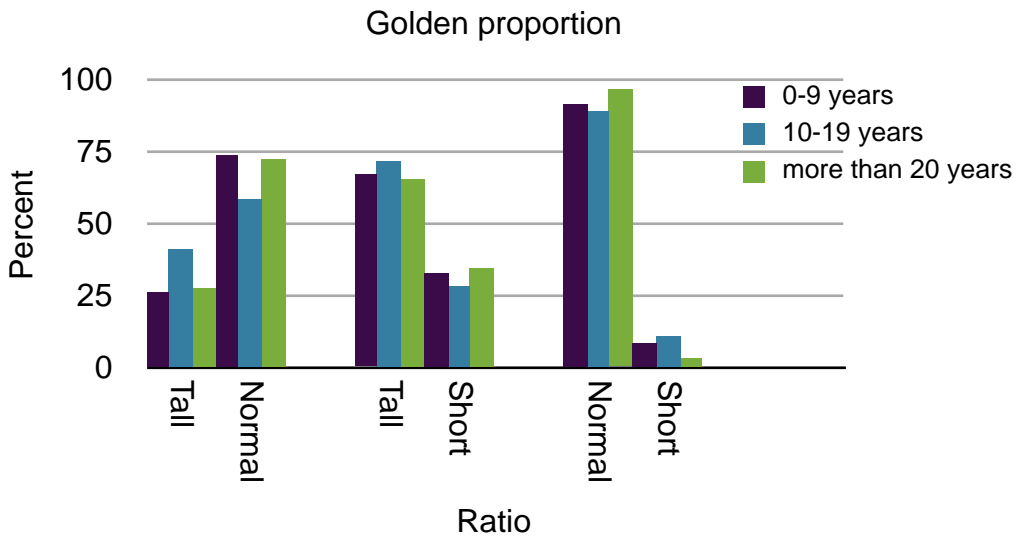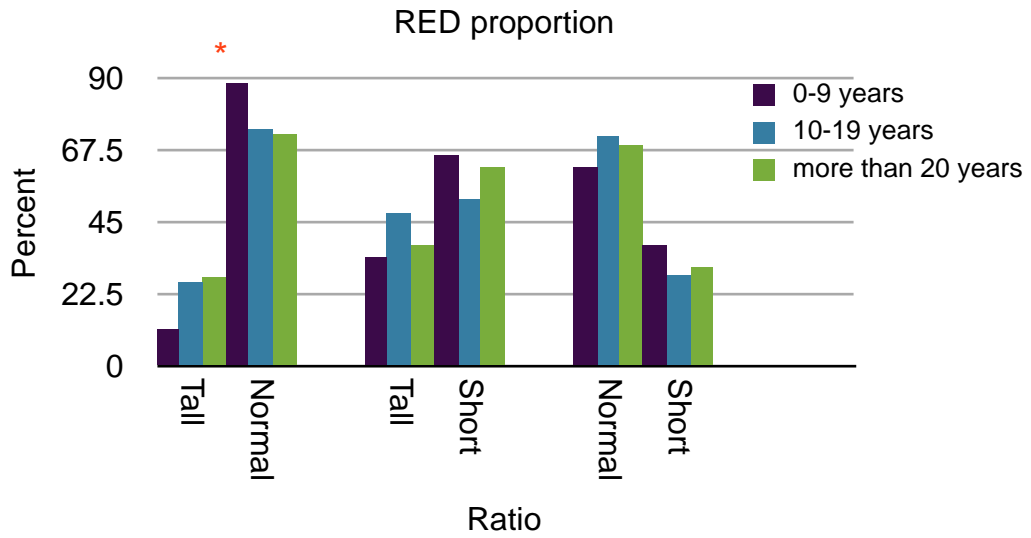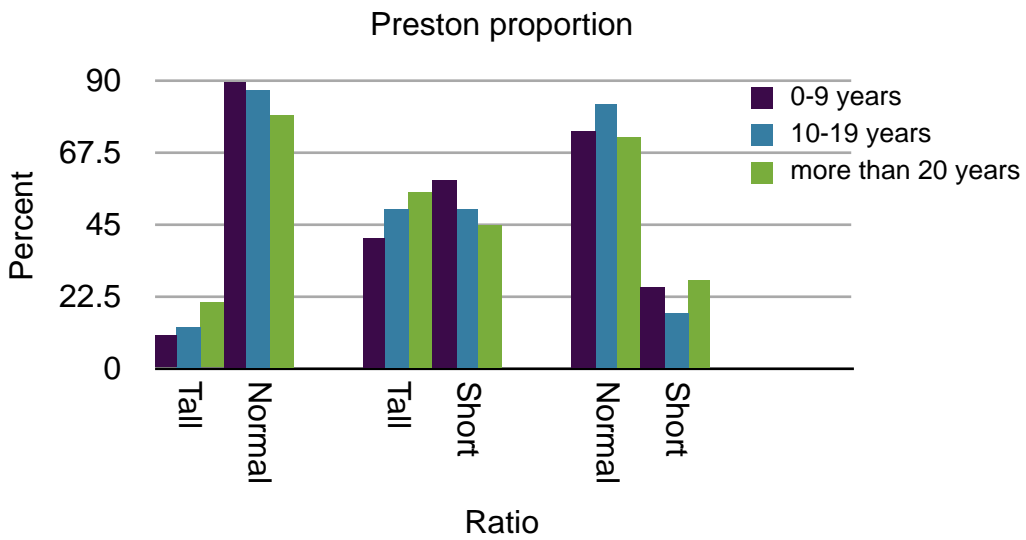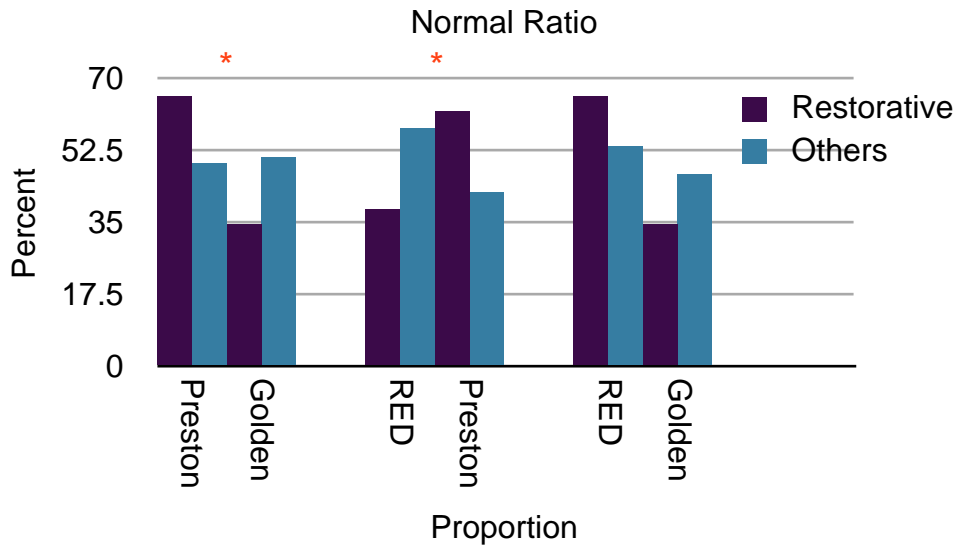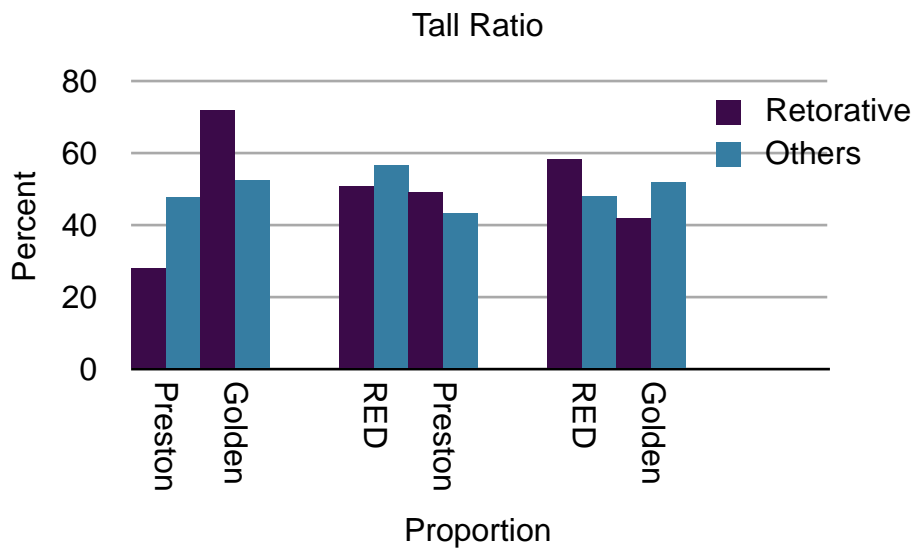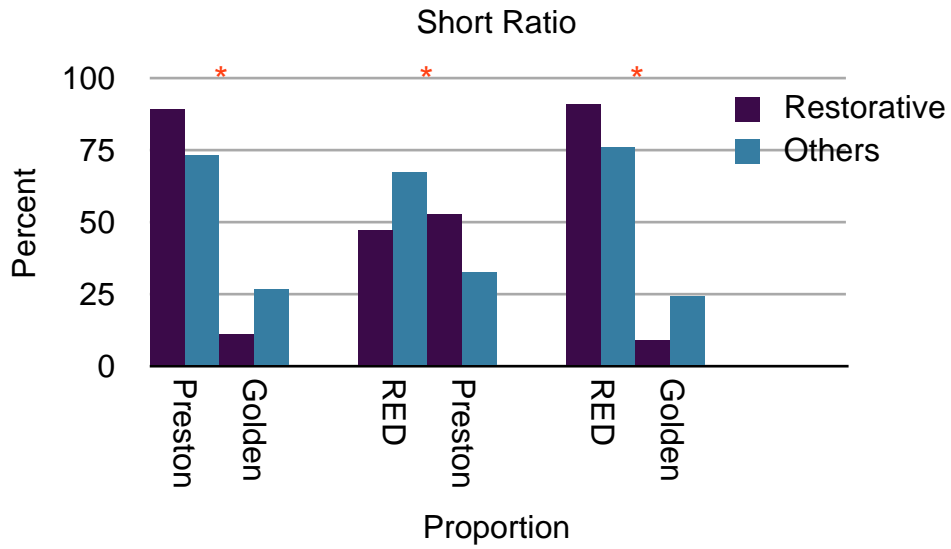(* means significant difference between field of main practice)

CHAPTER V
DISCUSSION

From this survey research, it has been found that in the normal (78%) and the tall (86%) ratio of the teeth, there was no significant difference in the preference of Thai dentists in each proportion (Figure. 10). This finding was different from those of Ward (1) and Rosenstiel (2), who found that the golden proportion was less preferable in the normal ratio, but more preferable in the tall ratio. The results, that normal and tall ratios showed no significant difference, might be caused by an equal preference of the three proportions.

However, the majority of Thai dentists did not prefer the golden proportion when teeth were a short ratio. This finding was similar to that of Rosenstiel in 2000, who found that in the short and very short ratio, the golden proportion was the worst (2). In the short ratio, Thai dentists preferred the 70 RED over the Preston proportion.

When looking at the width/height ratio to be preferred at the same proportion, we found that in all proportions (golden, RED and Preston), Thai dentists preferred the normal (78% width/height ratio) at the central incisor than the short (70%) and the tall (86%). In the golden proportion, the tall ratio was preferred more than the short ratio. On the other hand, the short ratio was preferred more than the tall ratio in the RED proportion. However, there was no significant difference between the tall ratio and the short ratio in the Preston proportion.

The differences in the gender (male or female) response did not reveal any significant difference in most survey sets. Differences were found in only 2 of the 18 sets. This finding means that gender had an influence on the preference in survey sets 9 and 14.

Likewise, years in practice showed an influence to the preference in survey set 13. Only one significant difference was found in the eighteen sets. This finding was close to what Rosenstiel found in 2000, which was that dentist preferences were not affected by gender, field of main practice, years in practice, or patient load (2).

The field of study also influenced the preferences of Thai dentists. Differences in the preferred choices of the restorative groups (operative and prosthodontic) and the other groups were found in 7 of the 18 sets. The different preferences of Thai dentists in the restorative group might be a factor of the dentists' field of the study. The fields of study might enable Thai dentists to identify the difference and allow them to make their choice more accurately. However, this finding was not similar to Rosenstiel's in 2000, which found no significant difference between general dentists and prosthodontic dentists (2).

The benefit of this study when compared to the previous study was the better control of the variables such as the computer model, monitor density, the environment and the distance between the chair and the table. On the other hand, no previous studies controlled all of above, which might explain the different outcome.

This study decided to use convenience sampling to collect the data due to the size of the sample. The advantages of this sampling technique were that it was easy, took less time and was a low cost. However, this technique could lead to the over- or under-representation of particular groups within the sample. This study showed that most of the participants are between 20-29 years old, which equaled 114 dentists (47.11%), which meant the distribution of the sample was not same as the populations. Future studies should focus on the disadvantage of this sampling technique.

CONCLUSIONS

Within the limitations of this study, we concluded that the preferences of Thai dentists for proportions of the six anterior upper teeth in the normal and tall ratio were not significantly different, although the short ratio with the golden proportion was least preferable. It was clear that for Thai dentists, the normal ratio (78% width/height) was more preferable than the short and tall ratio in all proportions. This difference was significant.

From the result above, we also concluded that the width/height proportion had more influence on the preference of Thai dentists than the width proportion.

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APPENDICES

Appendix A. Table of Thai dentist respondents with the results of binomial test

Survey set	Category	N	%	Exact Sig. (2-tailed)
1	Normal Preston	128	53	.403
	Normal Golden	114	47	
2	Normal RED	129	53	.335
	Normal Preston	113	47	
3	Normal RED	136	56	.062
	Normal Golden	106	44	
4	Tall Preston	121	50	1.000
	Tall Golden	121	50	
5	Tall RED	134	55	.108
	Tall Preston	108	45	
6	Tall Golden	120	50	.949
	Tall RED	122	50	
7	Short Preston	186	77	.000
	Short Golden	56	23	
8	Short RED	152	63	.000
	Short Preston	90	37	
9	Short Golden	50	21	.000
	Short RED	192	79	
10	Tall Golden	71	29	.000
	Normal Golden	171	71	
11	Tall Golden	164	68	.000
	Short Golden	78	32	
12	Normal Golden	222	92	.000
	Short Golden	20	8	
13	Tall RED	40	17	.000
	Normal RED	202	83	
14	Tall RED	89	37	.000
	Short RED	153	63	
15	Normal RED	157	65	.000
	Short RED	85	35	
16	Tall Preston	29	12	.000
	Normal Preston	213	88	
17	Short Preston	135	56	.082
	Tall Preston	107	44	
18	Normal Preston	184	76	.000
	Short Preston	58	24	

Appendix B. The Fisher's Exact results of significant effects between the fields of mainly practice and the preferences

Survey set	Category	Restorative	Others	Exact Sig. (2-sided)
1	Normal Preston	36	92	.045
	Normal Golden	19	95	
2	Normal RED	21	108	.014
	Normal Preston	34	79	
3	Normal RED	36	100	.125
	Normal Golden	19	87	
4	Tall Preston	32	89	.220
	Tall Golden	23	98	
5	Tall RED	28	106	.537
	Tall Preston	27	81	
6	Tall Golden	23	97	.221
	Tall RED	32	90	
7	Short Preston	49	137	.017
	Short Golden	6	50	
8	Short RED	26	126	.011
	Short Preston	29	61	
9	Short Golden	4	45	.014
	Short RED	50	142	
10	Tall Golden	17	54	.866
	Normal Golden	38	133	
11	Tall Golden	44	120	.033
	Short Golden	11	67	
12	Normal Golden	54	168	.052
	Short Golden	1	19	
13	Tall RED	10	30	.684
	Normal RED	45	157	
14	Tall RED	21	68	.874
	Short RED	34	119	
15	Normal RED	40	117	.199
	Short RED	15	70	
16	Tall Preston	6	23	1.000
	Normal Preston	49	164	
17	Short Preston	23	112	.021
	Tall Preston	32	75	
18	Normal Preston	43	141	.723
	Short Preston	12	46	

Appendix C. The Fisher's Exact results of significant effects between the gender and the preferences

Survey set	Category	Female	Male	Exact Sig. (2-sided)
1	Normal Preston	87	41	.577
	Normal Golden	80	32	
2	Normal RED	87	41	.577
	Normal Preston	80	32	
3	Normal RED	95	40	.779
	Normal Golden	72	33	
4	Tall Preston	85	36	.889
	Tall Golden	82	37	
5	Tall RED	86	46	.121
	Tall Preston	81	27	
6	Tall Golden	80	38	.577
	Tall RED	87	35	
7	Short Preston	124	60	.245
	Short Golden	43	13	
8	Short RED	104	46	1.000
	Short Preston	63	27	
9	Short Golden	43	7	.005
	Short RED	124	66	
10	Tall Golden	50	20	.759
	Normal Golden	117	53	
11	Tall Golden	109	54	.229
	Short Golden	58	19	
12	Normal Golden	154	66	.620
	Short Golden	13	7	
13	Tall RED	31	8	.183
	Normal RED	136	65	
14	Tall RED	52	37	.006
	Short RED	115	36	
15	Normal RED	108	48	1.000
	Short RED	59	25	
16	Tall Preston	21	8	.831
	Normal Preston	146	65	
17	Short Preston	97	37	.324
	Tall Preston	70	36	
18	Normal Preston	121	61	.072
	Short Preston	46	12	

Appendix D. The Chi-square results of significant effects between the years in practice and the preferences

Survey set	Category	0-9 years	10-19 years	20+ years	Asymp. Sig. (2-sided)
1	Normal Preston	87	24	16	.968
	Normal Golden	77	22	13	
2	Normal RED	86	27	14	.645
	Normal Preston	78	19	15	
3	Normal RED	91	26	17	.950
	Normal Golden	73	20	12	
4	Tall Preston	82	26	12	.440
	Tall Golden	82	20	17	
5	Tall RED	85	27	19	.331
	Tall Preston	79	19	10	
6	Tall Golden	78	22	18	.345
	Tall RED	86	24	11	
7	Short Preston	124	34	25	.413
	Short Golden	40	12	4	
8	Short RED	103	31	15	.385
	Short Preston	61	15	14	
9	Short Golden	38	8	4	.419
	Short RED	126	38	25	
10	Tall Golden	43	19	8	.136
	Normal Golden	121	27	21	
11	Tall Golden	110	33	19	.804
	Short Golden	54	13	10	
12	Normal Golden	150	41	28	.523
	Short Golden	14	5	1	
13	Tall RED	19	12	8	.014
	Normal RED	145	34	21	
14	Tall RED	56	22	11	.237
	Short RED	108	24	18	
15	Normal RED	102	33	20	.432
	Short RED	62	13	9	
16	Tall Preston	17	6	6	.285
	Normal Preston	147	40	23	
17	Short Preston	97	23	13	.249
	Tall Preston	67	23	16	
18	Normal Preston	122	38	21	.468
	Short Preston	42	8	8	

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