

# The Association Between Lip Print, Gender, Ethnicity and Personality Among Young Adults in University Setting: A Cross-Sectional Study

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## Abstract

Significant differences in lip prints were found in geographically distinct populations, and also in different gender and ethnicities. However, the data on the types of personality and lip prints seen in young adults are sparse. Therefore, this study was conducted to investigate the types of personality and the most common lip print type among young adults, and the association between gender, ethnicity and lip prints with personality along with the study of relationship between gender and ethnicity with lip prints among young adults. This cross-sectional study was carried out in a private medical college in Malaysia from April 2018 to May 2018. Lip print patterns were studied using the Suzuki and Tsuchihashi Classification whereas the socio-demographic and personality information were collected using a International Personality Item Pool (IPIP) Big-Five factor marker. The data were analyzed using the Chi-square test, unpaired T-test and ANOVA. The most common type of lip print seen in undergraduate students are Type I (40.70%) while the personality with the highest mean score is Agreeableness 25.33 (SD 5.06). There is significant association between gender and the personality domain Neuroticism (P value, 0.006), with mean score for male is 20.87 (SD 6.30) and female 17.86 (SD 7.00) respectively. There is association between ethnicity and Openness to experiences (P value, 0.003), in which the highest mean score is other ethnicities which is 26.08 (SD 6.24) whereas lowest mean score is Malay with 21.33 (SD 4.89). There is significant association between lip print and the personality domain Openness to experience (P value, 0.014), where lip print Type II shows the highest mean of 24.32 (SD 5.27). Studies on lip print patterns and personalities were done but correlative studies between lip print, gender, ethnicity and personality are limited. In this study, it is concluded that there is no association between gender, ethnicity and lip print. The most common lip print is Type I whereas the most common personality is Agreeableness. Males are more associated with the personality domain Neuroticism. Besides, there is significant association between Type II lip print and Openness to experiences.

## Keywords

Lip, Personality, Race, Young Adult, Survey

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## 1. Introduction

Based on the Cambridge English Dictionary, a young adult is defined as someone who is in their late teenage years or early twenties. In this phase of life, the personality traits of young

adults will start to mature. A research was once conducted, studying the factors affecting personality maturation in early adulthood and it showed that in Malaysia, it was identified that as age rises, individuals become more agreeable, conscientious and emotionally stable. [1] Personality can be

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defined as individual differences in characteristic patterns of thinking, feeling and behaving as described by the American Psychological Association. Life satisfaction has been found to be strongly correlated with one's personality. [2] Hence, it is important to conceptualize and measure personality. [3] Personality can be classified using the Costa and McCrae five-factor model of personality, also known as the 'The Big Five'. [4] The five-factor model of personality structure demonstrates that individual personality can be classified into five broad facets. The classification of the five-factor model along with their characteristics are as follows: [4, 5, 6]

- a) Extraversion vs. Introversion (Warmth, gregariousness, assertiveness, activity, excitement seeking, positive emotions)
- b) Agreeableness vs. Antagonism (Trust, straightforwardness, altruism, compliance, modesty, tender-mindedness)
- c) Neuroticism vs. Emotional Stability (Anxiety, angry, hostility, depression, self-consciousness, impulsiveness, vulnerability)
- d) Openness vs. Closedness to Experiences (Fantasy, aesthetics, feelings, actions, ideas, values)
- e) Conscientiousness vs. Lack of Direction (Competence, order, dutifulness, achievement striving, self-discipline, deliberation)

Based on an online personality test, 16 Personalities, among the 30 million Malaysian population, about 480 thousand respondents took the test and the results showed that the respondents from Malaysia are more likely to be Introverted, Observant, Feeling, Prospecting and Turbulent compared to other Asian countries. The author of the site has reworked and combined the Myers-Briggs theory along with the Big Five personality traits to achieve accurate results. [7]

A study was once conducted to investigate personality traits among 22 countries and it was found that the differences between personalities among these countries were small. It was reported that within these countries, there were sexual differences in the five traits studied despite showing comparable patterns among different countries. [8] One study showed that compared to the American students, Malay students appeared to score high in Agreeableness and score low in Extraversion and Openness. [9] Similarly, another study showed that the Malay population obtained higher scores in Agreeableness and lower scores in Extraversion and Openness. [9]

The study of lip printing is known as cheiloscropy. Lip print is defined as the vermilion border of the human lip, consisting of elevations and depressions forming characteristic pattern of creases and grooves in each individual. [2] In 1970, the Tsuchihashi classification was put forward by Suzuki and Tsuchihashi [10] where it classifies lip prints into:

Type I: Vertical grooves

Type I': Partial length across the lip grooves of type I

Type II: Branched grooves

Type III: Intersecting grooves

Type IV: Reticular grooves

Type V: Other patterns

Lip print is unique for each individual and studies have been done in the effort to establish a relationship between different variables that could affect the lip pattern. It was found that Type II was particularly common in the population in India. [2, 11, 12] However, a different study comparing Indian and Malaysian students' lip print found that Type I was the most common in both populations. [10] Significant differences in lip prints were found in geographically distinct populations but a principal pattern among those in the same region could be established. [2, 12] This pattern of finding was also found in the Malay, Chinese and Indian population living in Malaysia had a principal pattern that was not statistically different. [13] However, this same study showed that lip print between sexes were statistically different. Similarly, various studies have demonstrated that lip print pattern do have a relationship with gender. [2, 10, 14] On the contrary, a different study found that gender and lip print pattern do not share a statistically significant correlation. [15] These contradicting findings show that there is a research gap and our study aim to address these conflicting findings.

The data on the types of personality and lip prints seen in young adults are sparse therefore; the objective of this study is to investigate the types of personality and the most common type of lip print seen among young adults. In addition to that, this research also focuses on the association between gender, ethnicity, lip prints and personality. Apart from that, the relationship between ethnicity and lip prints is also explored in this study. The research questions are as follows:

- a) What are the types of personality in young adults?
- b) What is the most common lip type among young adults?
- c) What is the association between gender, ethnicity and lip prints with personality usually seen in young adults?
- d) What is the relationship between gender and ethnicity with lip prints among young adults?

The hypotheses of this research are:

- a) There is an association between gender, ethnicity and lip prints with personality in young adults.
- b) There is a relationship between gender and ethnicity with lip prints among young adults.

## 2. Methods

The study was designed as a cross-sectional self-administered questionnaire-based survey to identify the association between ethnicity, lip print and personality. The research was directed towards young adults aged 18 to 27 years old in a private medical college in Malaysia. This study was conducted from March 2018 to April 2018, a total duration of six weeks. According to a study done, it was found that the most common type of lip print was Type I (55%). [16] With a study population of 703 and a proportion of 55% and level of error of 0.07, the sample size of this study was calculated using the finite population proportion formula. The minimum number obtained for our study is 154. With a non-response rate of 20%, our sample size was 193.

Finite Population Proportion formula use for calculation of sample size [17]:

$$n = \frac{Np(1-p)z^2_{1-\frac{\alpha}{2}}}{d^2(N-1) + p(1-p)z^2_{1-\frac{\alpha}{2}}}$$

Where,

Population Size,  $N = 703$

Proportion,  $p = 0.50$

Error,  $d = 0.07$

Alpha,  $\alpha = 0.05$

Minimum number = 154

Purposive sampling was used to select sampling units. A sample of 200 subjects was selected by purposive sampling for this study. It comprises of males and females. When categorized according to ethnicity, there were Malay, Indian, Chinese and other ethnicities. All subjects selected were aged between 18 to 27 years. Our study included young adults without any disease related to lips, with lip mucosa were included. Subjects with known allergy to lipstick components, lip deformities, abnormalities, surgical scars or any lesions were excluded. All subjects without written consent were also excluded.

The first part of data collection was obtaining lip prints from the subjects. After obtaining a written consent, the procedure of lip printing were explained to the subjects. They were asked to sanitize their index finger then clean their lips before a swatch of lipstick was applied to their index finger. The subjects were then instructed to apply the lipstick from their finger to their lips. An adequate amount of lipstick was applied to the subjects' lips. The lipstick used was Chilli Nude in colour with code MNU 09 by Maybelline and it was matte in texture. After the application of lipstick, each subject were required to in-fold and lip bite a folded paper repeatedly

until the lipstick stain on their lip was exhausted to obtain multiple imprints. This was done to prevent smudges and decrease the chances of error during the process of identifying the lip print pattern. [12] Only the middle portion of the lip was studied as it was consistently visible in all the imprints. [18] The lip print patterns were then studied and classified according to the Suzuki and Tsuchihashi Classification [10] where it classifies lip prints into:

Type I: Vertical grooves

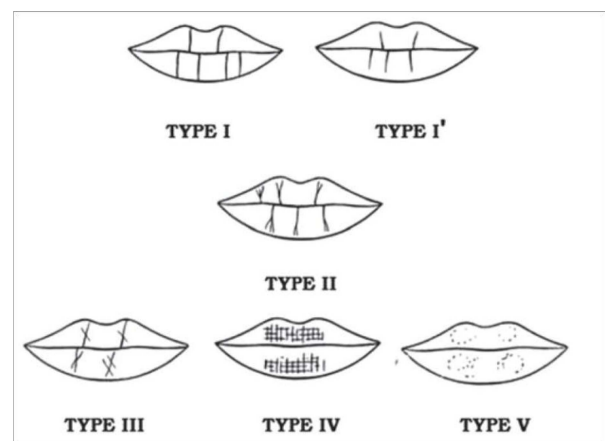
Type I': Partial length across the lip grooves of type I

Type II: Branched grooves

Type III: Intersecting grooves

Type IV: Reticular grooves

Type V: Other pattern



**Figure 1.** Lip print patterns based on the Suzuki and Tsuchihashi Classification.

The second part of data collection involved a self-administered questionnaire which consists of 2 sections. The first section comprises the socio-demographic information, which had 6 components that included age, gender, ethnicity, religion, course and semester of the participant. The second section contains the International Personality Item Pool (IPIP) Big-Five factor marker which consists of a 50-item inventory. The questionnaire was developed by Goldberg, L. R. [19] and is a 5-point, Likert-type scale ranging from 1 (Disagree) to 5 (Agree). The score was then calculated and the value was in between 0 to 40. The obtained score from each facet was then interpreted. Extroversion (E) is the personality trait of seeking fulfilment from sources outside the self or in community. High scorers are outgoing and social while low scorers are more solitary. Agreeableness (A) reflects many individuals adjust their behaviour to suit others. High scorers are polite, friendly and optimistic. Low scorers are more critical and aggressive. Conscientiousness (C) is the personality trait of being honest and hardworking. High scorers are careful and diligent while low scorers may

impulsive and disorganised. Neuroticism (N) is the personality trait of being emotional. Openness to Experience (O) is the personality trait of seeking new experience and intellectual pursuits. High scores may day dream a lot. Low scorers may be more traditional and conventional. [19] Informed consent was obtained before questionnaire distribution. Students were assured that the data collected was confidential and solely for study purposes. A total of 200 questionnaires were distributed to selected students and a total of 186 questionnaires were collected back. Among 186 questionnaires, there were 172 questionnaires that was fully completed and 14 questionnaires were not filled completely thus was not included in the study. The response rate was 86%.

All the data were compiled and recorded in Microsoft Excel 2007 and analysed using the Epi Info version 7.2.2.6. The frequency, percentage, mean and standard deviation were calculated and compared between groups. The association between lip print, ethnicity, gender and personality were explored by using Statistical Chi-square test. The level of significance was set at 95% with p value of <0.05.

Approval from the Research Ethic committee of the university was obtained prior to commencement of this study. All samples units had voluntarily participated in the study. Informed consent and written consent were obtained before conducting the study. Students were also assured that data collected will remain confidential and solely for study purposes.

### 3. Results

**Table 1.** Sociodemographic profiles among young adults.

Variables	Frequency (%)
Age (years)	
18-20	63 (36.6)
21-24	104 (60.5)
25-27	5 (2.9)
Mean (SD)	20.97 (2.34)
Gender	
Male	60 (34.9)
Female	112 (65.1)
Ethnicity	
Chinese	70 (40.7)
Indian	63 (36.6)
Malay	27 (15.7)
Others	12 (7.0)
Religion	
Buddhist	63 (36.6)
Christianity	20 (11.6)
Hinduism	54 (31.4)
Islam	29 (16.9)
Others	6 (3.5)

A sample size of 200 were taken where 172 subjects

responded (response rate: 86%), out of which 112 were females and 60 were males. The mean age of participants was 20.95 (SD 2.34). A total of 40.70% of the participants were Chinese, 36.63% Indian, 15.70% Malay and 6.98% others. The religions of the participants were Buddhism (36.63%), Hinduism (31.40%), Islam (16.86%), Christianity (11.63%) and others (3.49%) respectively (Table 1).

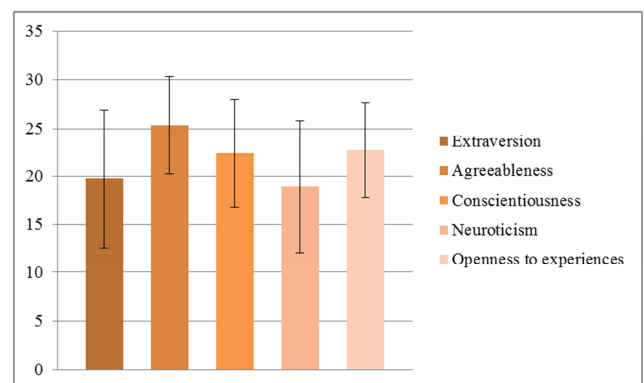
**Table 2.** Frequency of lip print among young adults.

Lip Print	Frequency (%)
Type I	70 (40.70%)
Type I'	18 (10.47%)
Type II	50 (29.07%)
Type III	2 (1.16%)
Type IV	18 (10.47%)
Type V	14 (8.14%)

The most common type of lip print is Type I followed by Type II. 70 (40.70%) were Type I and 50 (29.07%) were Type II respectively. Type I' and Type IV was similar in frequency and it was noted that Type III is the least common lip print type (Table 2).

**Table 3.** Types of personality among young adults.

Personality Types	Mean (SD)	Minimum value	Maximum value
Extraversion	19.74 (7.17)	1	40
Agreeableness	25.33 (5.06)	1	40
Conscientiousness	22.42 (5.60)	1	40
Neuroticism	18.91 (6.89)	1	40
Openness to experiences	22.74 (4.94)	1	40



**Figure 2.** Types of personality among young adults.

Table 3 and Figure 2 depict the average score for each personality type. The highest mean score was seen in Agreeableness, 25.33 (SD 5.06) followed by Openness to experiences, 22.74 (SD 4.94), Conscientiousness, 22.42 (SD 5.60), Extraversion, 19.74 (SD 7.17) and Neuroticism 18.91 (SD 6.89).

**Table 4.** Association between gender, ethnicity and lip print among young adults.

Independent variable	Lip print						X <sup>2</sup>	P value
	Type I n (%)	Type I' n (%)	Type II n (%)	Type III n (%)	Type IV n (%)	Type V n (%)		
Gender								
Male	28 (46.67)	6 (10.00)	16 (26.67)	0 (0.00)	5 (8.33)	5 (8.33)	2.48	0.78
Female	42 (37.50)	12 (10.71)	34 (30.36)	2 (1.79)	13 (11.6)	9 (8.04)		
Ethnicity								
Chinese	32 (45.71)	7 (10.00)	15 (21.43)	1 (1.43)	7 (10.00)	8 (11.43)	15.52	0.41
Indian	28 (44.44)	7 (11.11)	17 (26.98)	1 (1.59)	8 (12.70)	2 (3.17)		
Malay	6 (22.22)	4 (14.81)	13 (48.15)	0 (0.00)	2 (7.41)	2 (7.41)		
Others	4 (33.33)	0 (0.00)	5 (41.67)	0 (0.00)	1 (8.33)	2 (16.67)		

Table 4 shows the association between gender, ethnicity and lip print among young adults. The association between gender and lip print was done using chi-square test and is not significant (P value, 0.78). Based on table 6, the most prevalent lip type among males are Type I which is 28 (46.67%) of them but among the females Type I is most common which is 42 (37.50%) of them. The least common type among males is Type IV and Type V which are 5 (8.33%). Among females, the least type of lip print identified is Type III which is only 2 (1.79%). There is no Type III lip print among the males.

The association between ethnicity and lip print is done using chi-square test and was not significant (P value, 0.41).

Among the different ethnicities, the most common lip print type among Chinese and Indian ethnic group is Type 1 which are 32 (45.71%) and 28 (44.44%) respectively. Among the Malays and others ethnic group the most commonly occurring lip type is Type II which are 13 (48.15%) and 5 (41.47%) respectively. The least common type of lip print among Chinese and Indians are Type III which are 1 (1.43%) and 1 (1.59%) respectively. The least common type of lip print among Malays and others are Type IV which are 2 (7.41%) and 1 (8.33%) of them respectively. There were no Type III lip prints found among Malays and no Type IV and Type I' lip prints found among the Malays and Others ethnic group.

**Table 5.** Association between gender, ethnicity and personality among young adults.

Independent variable	Personality														
	Extraversion			Agreeableness			Conscientiousness			Neuroticism			Openness to experience		
	Mean (SD)	t (df) / F (df <sub>1</sub> , df <sub>2</sub> )	P value	Mean (SD)	t (df) / F (df <sub>1</sub> , df <sub>2</sub> )	P value	Mean (SD)	t (df) / F (df <sub>1</sub> , df <sub>2</sub> )	P value	Mean (SD)	t (df) / F (df <sub>1</sub> , df <sub>2</sub> )	P value	Mean (SD)	t (df) / F (df <sub>1</sub> , df <sub>2</sub> )	P value
Gender															
Male	19.18 (6.91)	0.74 (170) <sup>a</sup>	0.459	24.92 (4.70)	0.78 (170) <sup>a</sup>	0.439	21.88 (5.13)	0.93 (170) <sup>a</sup>	0.356	20.87 (6.30)	-2.78 (170) <sup>a</sup>	0.006	23.07 (4.54)	-0.64 (170) <sup>a</sup>	0.525
Female	20.04 (7.32)			25.54 (5.25)			22.71 (5.84)			17.86 (7.00)			22.63 (5.16)		
Ethnicity															
Malay	18.74 (6.09)			25.19 (4.63)			22.07 (5.29)			19.39 (6.77)			21.33 (4.89)		
Chinese	21.05 (7.81)	1.32 (3, 168) <sup>b</sup>	0.275	25.73 (4.81)	0.93 (3, 168) <sup>b</sup>	0.427	22.65 (6.02)	0.17 (3, 168) <sup>b</sup>	0.859	18.38 (7.07)	0.53 (3, 168) <sup>b</sup>	0.664	23.11 (4.57)	4.76 (3, 168) <sup>b</sup>	0.003
Indian	18.93 (8.35)			25.70 (5.91)			22.56 (5.63)			19.59 (5.33)			24.04 (4.28)		
Others	20.50 (6.30)			23.17 (6.64)			23.00 (5.64)			17.33 (9.78)			26.08 (6.24)		

<sup>a</sup>unpaired t-test; <sup>b</sup>ANOVA

Table 5 shows the association between gender, ethnicity and personality. Using the unpaired T-test, there was no significant association between gender, Extraversion, Agreeableness, Conscientiousness and Openness to experiences personality. However, there is association between gender and Neuroticism personality (P value, 0.006), the mean score for male is 20.87 (SD 6.30) and female 17.86 (SD 7.00) respectively.

The association between ethnicity and personality was done using ANOVA test. There is significant association between ethnicity and Openness to experiences personality (P value 0.003), in which the mean score for Malay is 21.33 (SD 4.89), Chinese is 23.11 (SD 4.57), Indian is 24.04 (SD 4.28) and Others is 26.08 (SD 6.24). There is no significant association between ethnicity, Extraversion, Agreeableness, Conscientiousness Neuroticism personality.

Table 6. Association between lip print and personality among young adults.

Independent variable	Personality														
	Extraversion			Agreeableness			Conscientiousness			Neuroticism			Openness to experience		
	Mean (SD)	F (df <sub>1</sub> , df <sub>2</sub> )	P value	Mean (SD)	F (df <sub>1</sub> , df <sub>2</sub> )	P value	Mean (SD)	F (df <sub>1</sub> , df <sub>2</sub> )	P value	Mean (SD)	F (df <sub>1</sub> , df <sub>2</sub> )	P value	Mean (SD)	F (df <sub>1</sub> , df <sub>2</sub> )	P value
<b>Lip print</b>															
I	20.01 (6.87)			24.86 (4.25)			22.47 (5.54)			19.07 (6.62)			21.91 (4.82)		
I'	18.39 (7.90)			26.78 (4.81)			21.83 (5.42)			18.28 (7.11)			23.61 (3.50)		
II	20.54 (7.47)	0.57 (5, 166)	0.726	26.04 (6.07)	1.68 (5, 166)	0.141	22.58 (5.97)	0.06 (5, 166)	0.997	18.74 (6.99)	0.82 (5, 166)	0.535	24.32 (5.27)	2.95 (5, 166)	0.014
III	16.50 (16.26)			31.50 (10.61)			23.50 (10.61)			11.50 (0.71)			17.50 (9.19)		
IV	18.00 (7.02)			24.28 (4.70)			22.39 (6.64)			20.83 (7.82)			23.28 (4.55)		
V	19.71 (6.12)			23.71 (4.16)			22.29 (3.17)			18.07 (6.87)			20.14 (4.20)		

Table 6 shows the association between lip print and personality among young adults. The association between lip print and personality was done using the ANOVA test with significance level of 0.05. There is no significance difference seen in the lip print when associated to Extraversion, Agreeableness, Conscientiousness and Neuroticism. However, there is significance (P value, 0.014) of lip print when associated with the Openness to experience domain of personality. In addition to that, the highest mean of lip print seen in the Openness domain was Type II lip print 24.32 (SD 5.27) followed by Type I' 23.61 (SD 3.50), Type I 21.91 (SD 4.82), Type V 20.14 (SD 4.20) and Type III 17.50 (SD 9.1).

### 4. Discussion

This cross-sectional study was designed to investigate the types of personality and the most common type of lip print seen among young adults. The association between gender, ethnicity and lip print with personality was also tested along with the association between gender and ethnicity with lip print. In this study, undergraduate students showed a prevalence of Type I lip print (40%). This finding is similar to a study done whereby the most common lip print in Malaysia is Type I. [13, 20] A different study carried out on Indians (Kerala & Maharashtra) showed that the dominant lip print seen in Kerala was Type IV (53%) and in Maharashtra was Type II (42%). [21] The difference in findings could be due to the fact that lip print has an inheritance of 51% [20], with other discontinuous variations that contribute to the remaining lip print patterns. Hence, it is fair to see a discrepancy in lip print patterns amongst people of the same ethnicity that reside in a different geographical location.

The most common personality that was determined in this study was Agreeableness. The Agreeableness domain had the highest mean score of 25.33 (SD 5.06) compared to other facets. This is a good sign as Agreeableness indicates a better

academic performance among students. [22] Students that scored high in Agreeableness have been proven to be warmer and more optimistic which would help them in their career and social life. [23]

Our study also revealed that the most common lip print pattern between males and females was Type I. The least common type of lip print among males were Type IV and V while females had the least Type III lip print. On the contrary, Type III lip print was not seen in males. Our study determined that there is no significant association between gender and type of lip print. One study showed similar findings, where the most common lip print type was Type I in both males and females. In the similar study, Type IV lip pattern was also the least common in males. [24] In another study done, contradictory to our results, the common type of lip prints in males was Type III and Type I and Type I' was seen the most in females. The study also showed that the least common type of lip print in both gender is Type V while Type II lip print was not seen in females. [13]

The association between lip print and ethnicity was tested in this study and it showed that among the Chinese and Indian ethnicity, the highest occurring lip print type was Type I with 45.71% and 44.44% respectively. Among the Malay and other ethnicity groups, the most common lip print type was Type II with 48.15% and 41.67% respectively. Our study also concluded that there were no significant association between lip print and ethnicity. However, a previous study that was done among the Malaysian students of Melaka Manipal Medical College, Manipal Campus, India, showed that Type IV lip print was common in the Chinese and Malays while Type II lip print was prevalent among the Indians. [25] Contrary to our study, the study showed that there is a significant association between lip print and personality. Even so, according to previous study done among students aged 20 - 26 years old in an institution in Malaysia, Type I lip print was most commonly seen in the Chinese and Indians while Type I'

lip print was commonly seen among Malays. Similar to our study, the study showed that there was no significant association found between lip print and ethnicity as well. [29] In one of a study done in India comparing 3 different racial groups of Kodavas, Keralites and Tibetans, it was seen that the difference of lip prints in the mentioned races was statistically significant, inconsistent with our findings. [26]

When gender was associated with personality, it was found that there is significant association between gender and the Neuroticism trait where the mean score for males were 20.87 (SD 6.30) and female 17.86 (SD 7.00). Our study clearly showed that male has a higher score in Neuroticism compared to females, which is inconsistent with previous study. In one study that was done comparing gender differences and Neuroticism in 37 nations, it was seen that females obtained a higher score compared to males in all the nations. [27] In another study done where pancultural gender stereotypes were reanalysed, it was found that the mean score for the Neuroticism trait in males were higher than female. Even so, there was no significant association between gender and Neuroticism which is inconsistent with the findings in our study. [28]

In terms of ethnicity and personality, our study showed a significant association between different ethnic group and Openness to Experiences personality, in which the highest mean score among the group was Others, 26.08 (SD 6.24) whereas the lowest mean score is Malay, 21.33 (SD 4.89). The Others group consists of individuals from other ethnicity other than the major three ethnic groups in Malaysia. With that being said, majority of the Malaysian students have low scores in Openness to Experiences domain. [9] Hence, our study showed significant differences in mean personality trait scores between ethnic groups, as hypothesised, and as consistent with previous research. The observed differences are unlikely to be caused by differences in the structure of personality across ethnic or country groups, as the personality assessment analysed was based on the five-factor model of personality. Research has repeatedly demonstrated that this model is cross-culturally generalizable. [29]

Based on our results on the association of lip print and personality, there is no significant association seen in lip prints when associated with Extraversion, Agreeableness, Conscientiousness and Neuroticism. However, studies have shown that personality was constantly significantly when associated with lip print Type III and IV. [29, 30] It was also shown that only certain personality domains were significantly associated, namely Empathy, Need achievers, Self-confidence, Dominance [30] Liveliness and Intellect [31]. On the contrary, our study only showed significant association with the personality domain Openness to Experiences. According to the Interpersonal Reactivity Index,

which is a measure commonly used for Empathy, the subscale Fantasy refers to a person's ability to empathize or transpose themselves in a context that is fictional. [32] It was shown in a study that the subscale Fantasy is closely related to Openness. [33] Hence, based on the finding that lip print patterns are related to empathy and empathy to openness, a relation between lip print patterns and openness is plausible.

There are several limitations of our study that require consideration. The sample size of some ethnic group was small where the Others group involved in this study had a relatively small sample size. There was also a time restriction that came along with this study which limited our selection of samples from different institutions. In addition to that, our study was done only among undergraduate students of a private medical college which is not representative, thus it is impossible to generalise our results to the whole young adult population. Furthermore, other studies have proven association between lip prints and other variables by analysing all the different types of lip prints of all the quadrants of the lips. Unfortunately, our study only focused more on the middle portion of the lips as it was constantly detectable in all the imprints.

In this study, only a small sample size of young adults was studied and the approach is limited to undergraduate students. It is recommended for future studies to conduct their study on a larger sample including various young adults of different ethnicities while focusing more on minor ethnicities. Apart from that, only the middle portion of both upper and lower lip is analysed in our study therefore, the distribution of different types of lip print in all quadrants of the lips should be studied.

## 5. Conclusion

Our study showed that there was no association between gender, ethnicity and lip print. The studies on lip prints and personality have been done numerous before but the association of both parameters along with gender and ethnicity are still sparse, especially in Malaysia. Similar studies like this should be explored deeper to establish facts that could justify the association between gender, ethnicity, lip print and personality. Malaysia is known for its multiracial population thus making resource for samples easily accessible. Nevertheless, our study did identify a significant association between Type II lip print and Openness to Experiences. This could shine a light on a whole new scope that can provide not only the identification and differentiation between different genders and ethnicities but also on other fields like genealogy. Besides that, in this study, it was seen that there was no similar lip print pattern seen in different individuals which makes lip prints unique and

essential for future studies. As for personality, there was a significant association between the male gender and the Neuroticism trait. Moreover, other ethnicities also showed a significant association with the Openness to Experiences personality. This is useful in differentiating genders and ethnicities through their personality, which could also aid in nurturing different skills of various racial groups in multiracial countries.

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