

Unveiling the Perception of Attractiveness using Chimeric Photographs

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Abstract:-

Background: Perceiving the symmetry of a face by the Orthodontist and understanding the perception from a Layperson point of view can enable to ensure an effective treatment outcome. It will also allow better understanding of the goals of treatment and execute it to the satisfaction of the individual undergoing Orthodontic treatment.

Methods: Right and Left hemiface Photographs were made into composite photographs and evaluated by observers from different strata such as Orthodontists, Undergraduate BDS students and Laypersons. Each observer were made to complete a questionnaire and evaluation of their perception of 10 samples were done.

Results: The Orthodontists could identify mild asymmetries present in the sample when compared to the Layperson. Also, the Left hemiface seemed to be more attractive than the right hemiface with all the observers.

Conclusion: This study provided an indication that the inherent mild asymmetries present in the individual is not identified by the Lay person to the extent of identification by the Orthodontist or the UG student. this might be mostly because, perfect symmetry might appear slightly out of natural to the common population.

Keywords:- Chimeric Faces, Facial Asymmetry, Landmark Independent Analysis, Perception of Aesthetics.

I. INTRODUCTION

Esthetics is a key motivational reason for patients seeking orthodontic treatment and one of the most important goals of orthodontic treatment. Facial attributes such as averageness, symmetry, and sexual dimorphism contribute to overall facial attractiveness. An accurate assessment of facial symmetry in both lateral and frontal profiles is necessary for accurate diagnosis and treatment planning in orthodontics. An understanding of individual differences in

perceptions of facial symmetry between patients and dentists will lead to more successful and satisfactory treatment¹.

Facial attractiveness plays a key role in social interaction. Beauty criteria are highly subjective, reflecting cultural peculiarities of a population, the region where they live and a determined period of time². Since the beginning of the 20th century, it has been observed in Orthodontics a great concern about esthetics, especially involving concepts of balance and facial proportions³. From the patient's point of view, esthetics is the main motivation for seeking orthodontic treatment. For this reason, it is recommended that orthodontic treatment is planned starting from a global evaluation of the face, paying attention to esthetic necessities as well as to cephalometric and functional matters⁴.

Through diagnosis, the professional must try to identify the unpleasant facial characteristics which can be improved with the orthodontic treatment, as well as the aspects considered pleasant and must be preserved during treatment. It is important, however, that this evaluation consider the ethnical and personal characteristics of the patient, trying to use the same esthetic evaluation parameters of the patient and the society in which he belongs⁵.

Controversy remains in literature as to whether laypeople and professionals agree in their perceptions of facial attractiveness.⁶ Various techniques have been used to evaluate facial attractiveness and profile esthetics. Silhouettes,⁷ line drawings,⁸ photographs,⁹ and artist sketches⁹ have all been used in the past.

The face often presents with a mild degree of asymmetry. Nevertheless, slight asymmetry, also known as relative symmetry, subclinical asymmetry or normal asymmetry, ends up being unperceived by its carriers and everyone around them. It derives from the fact that the lower and midface develop from the medial and lateral nasal processes as well as maxillary and mandibular processes, and despite being intrinsically coordinated, these structures

might imply failure of development or maturation of such embryonic processes¹⁰.

The orthodontic literature usually addresses changes in both anteroposterior and vertical directions; however, little attention is given to craniofacial changes in frontal view.¹¹ Thus, the present study evaluate perception of facial asymmetry among different strata of observers including orthodontists, dental undergraduate students and laypeople.

II. MATERIALS AND METHODS

A total of 10 (5 males and 5 females) facial photographs of patients reported for Orthodontic treatment in the age group of 18-25 years were selected for the study through randomized sampling. The experimental design consisted of one repeated measure within-subjects factor, symmetry level i.e Original 'asymmetrical faces', left 'symmetrical' photograph and right 'symmetrical' photograph. Before commencement of the study, a written informed consent was taken from all the participants of the study. Ethical approval was obtained from the ethical committee. The study was planned and done over a period of 2 months. Sample size of the study was 42 observers, which was divided into 3 different groups of 14 each.

Group 1: Orthodontists
Group 2: Undergraduate students
Group 3: Layperson

The inclusion criteria were clinically acceptable facial symmetry, presence of full complement of teeth, no history of pathology/trauma/surgical intervention or orthodontic treatment, and no congenital abnormalities in the maxillofacial region.

Patient with any history of trauma, craniofacial congenital diseases and tempero-mandibular disorder etc. were excluded from the study.

Photographic procedure: The photographs were standardized being taken by a single operator who were unaware whether patients were included or not in the study. The photographic setup consisted of a tripod stand that held Nikon D 3200 camera with a 55-105mm macro lens and a primary flash. The photographs were taken from a fixed distance of 1.5 meter, from the patient; 30 cm from the lit box wooden stool was placed so that the patient can sit straight with his/her toes just behind a line drawn on the floor, looking straight at the camera with horizontal visual axis and remain expressionless.

The stability of the elements and the easy adjustment of the tripod height allowed us to keep the optical axis of the lens horizontal during the recording. Patients were explained about the photographic procedure and were given identical instructions like tying back hair to allow visualization of the inferior ear insertions, removal of large earrings and glasses, so that the patient's forehead, neck, and ears were clearly visible during the recording. Adobe Photoshop CS 2 (version 9.0; Adobe Systems Inc., San Jose, CA, USA) software was used to create morphed images of faces.

A total of 42 questionnaires were prepared and distributed. Each observer participating in the study were made to view the photographs and its composite images and then evaluate based on their perception of symmetry among the photographs. The observers were requested to observe each of the 10 photographs according to order of their appearance and to rate them in the questionnaire attached.

III. STATISTICAL ANALYSIS

SPSS(Statistical Package For Social Sciences) version 20. (IBM SPASS statistics(IBM corp. released 2011) was used to perform the statistical analysis. Data was entered in the excel spread sheet. Descriptive statistics were calculated by frequency and proportions for qualitative variables. Inferential statistics like Chi-square test was applied to check the association of the perception of facial asymmetry among the groups. The level of significance is set at 5%

IV. RESULTS

The data collected from the study were observed and analysed. Table 1 shows the summary statistics for the association of the perception of facial asymmetry among the three group of observers.

From the values obtained from the analysis, it can be inferred that Orthodontist could identify minor asymmetry as compared to the other two group participating in the study. The laypersons didn't find any significant difference among the right and left composite images, when compared to the Orthodontist group.

The left chimeric face appeared to be more attractive than the right hemiface.

The analysis didn't yield any significant differences between males and females, although, males exhibited more asymmetry when compared to females.

TABLE 1: ASSOCIATION OF THE PERCEPTION OF FACIAL ASYMMETRY AMONG GROUPS

Photos	Facial asymmetry		Groups			Total	Chi-square value	p value
			Orthodontics perception	Dental undergraduates	Layman perception			
P-1	C	Count	6	4	6	16	2.06	0.72
		%	14.3%	9.5%	14.3%	38.1%		
	L	Count	3	3	1	7		
		%	7.1%	7.1%	2.4%	16.7%		
	R	Count	5	7	7	19		
		%	11.9%	16.7%	16.7%	45.2%		
P-2	C	Count	0	12	1	13	38.01	0.00*
		%	0.0%	28.6%	2.4%	31.0%		
	L	Count	0	2	0	2		
		%	0.0%	4.8%	0.0%	4.8%		
	R	Count	14	0	13	27		
		%	33.3%	0.0%	31.0%	64.3%		
P-3	C	Count	0	2	0	2	6.15	0.18
		%	0.0%	4.8%	0.0%	4.8%		
	L	Count	0	0	1	1		
		%	0.0%	0.0%	2.4%	2.4%		
	R	Count	14	12	13	39		
		%	33.3%	28.6%	31.0%	92.9%		
P-4	C	Count	13	0	2	15	33.6	0.00*
		%	31.0%	0.0%	4.8%	35.7%		
	L	Count	0	12	12	24		
		%	0.0%	28.6%	28.6%	57.1%		
	R	Count	1	2	0	3		
		%	2.4%	4.8%	0.0%	7.1%		
P-5	C	Count	1	1	8	10	15.38	0.004*
		%	2.4%	2.4%	19.0%	23.8%		
	L	Count	0	2	1	3		
		%	0.0%	4.8%	2.4%	7.1%		
	R	Count	13	11	5	29		
		%	31.0%	26.2%	11.9%	69.0%		
P-6	C	Count	14	12	14	40	4.2	0.38
		%	33.3%	28.6%	33.3%	95.2%		
	L	Count	0	1	0	1		
		%	0.0%	2.4%	0.0%	2.4%		
	R	Count	0	1	0	1		
		%	0.0%	2.4%	0.0%	2.4%		
P-7	C	Count	4	2	2	8	3.06	0.54
		%	9.5%	4.8%	4.8%	19.0%		
	L	Count	10	10	11	31		
		%	23.8%	23.8%	26.2%	73.8%		
	R	Count	0	2	1	3		
		%	0.0%	4.8%	2.4%	7.1%		
P-8	C	Count	1	0	0	1	5.71	0.22
		%	2.4%	0.0%	0.0%	2.4%		
	L	Count	0	3	1	4		
		%	0.0%	7.1%	2.4%	9.5%		
	R	Count	13	11	13	37		
		%	31.0%	26.2%	31.0%	88.1%		
P-9	C	Count	3	2	2	7	1.46	0.83
		%	7.1%	4.8%	4.8%	16.7%		
	L	Count	1	1	0	2		
		%	2.4%	2.4%	0.0%	4.8%		
	R	Count	10	11	12	33		
		%	23.8%	26.2%	28.6%	78.6%		

P-10	C	Count	3	10	13	26	18.57	0.001*
		%	7.1%	23.8%	31.0%	61.9%		
	L	Count	4	0	0	4		
		%	9.5%	0.0%	0.0%	9.5%		
	R	Count	7	4	1	12		
		%	16.7%	9.5%	2.4%	28.6%		

*significant

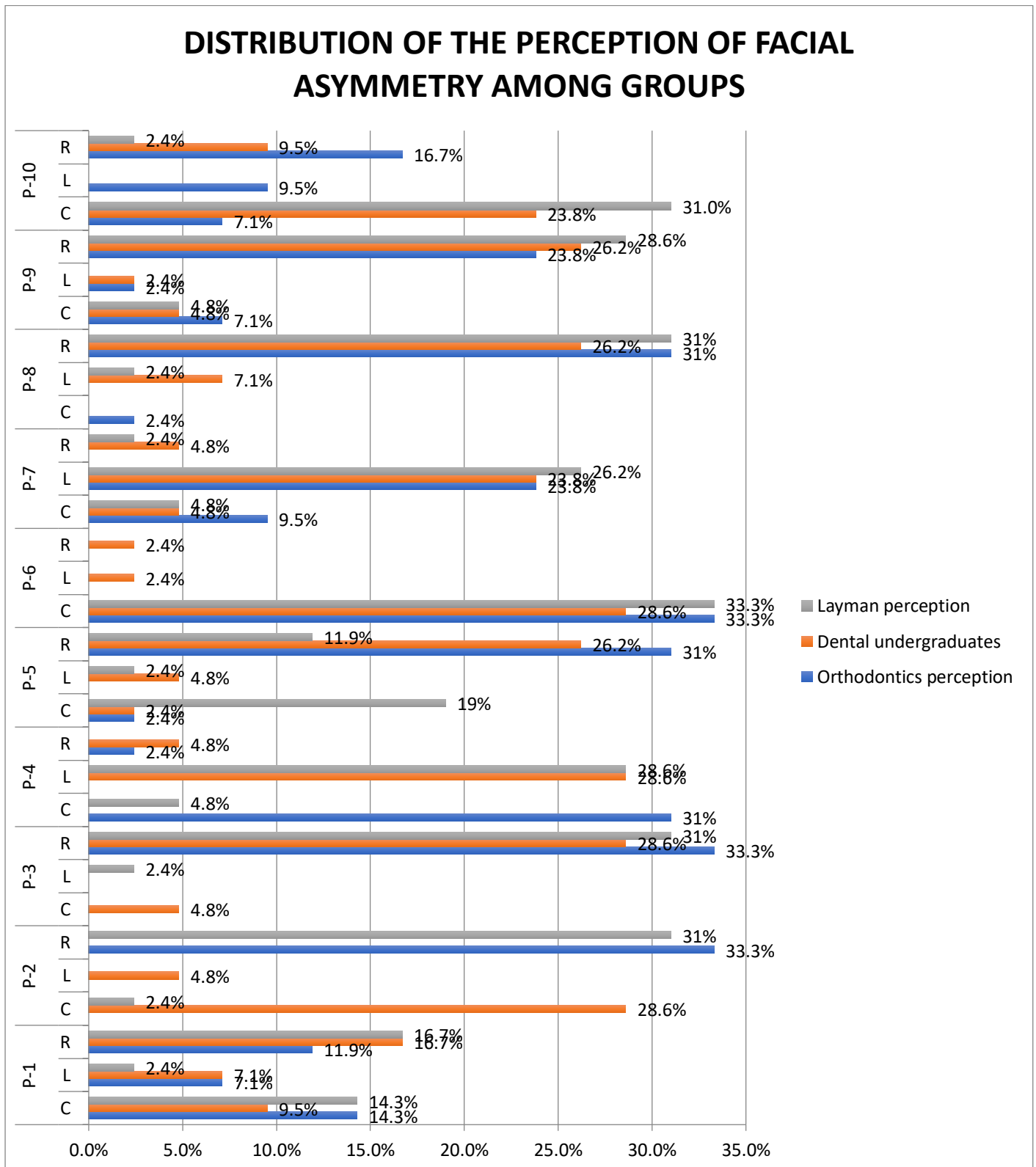
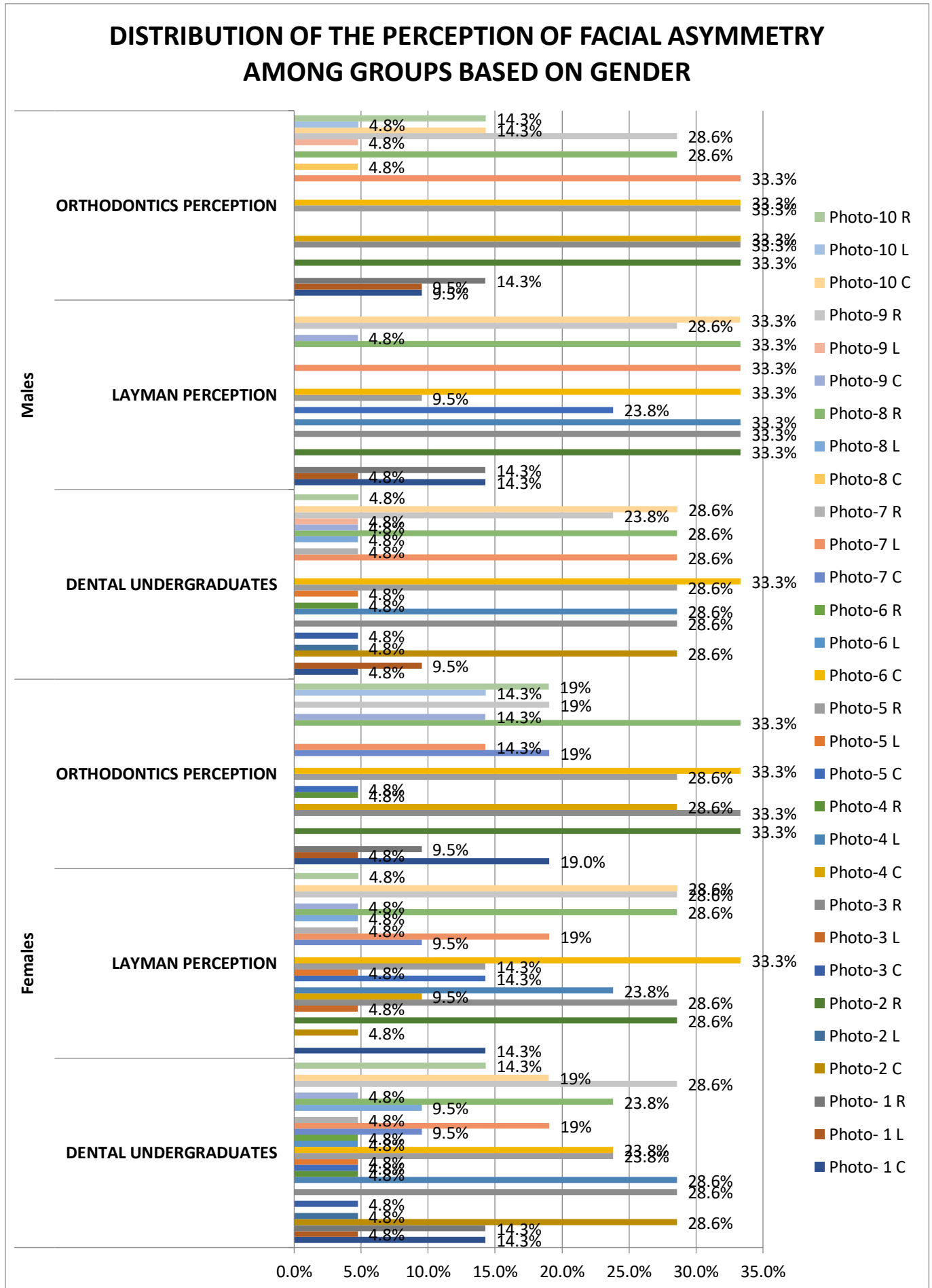


TABLE 2: ASSOCIATION OF THE PERCEPTION OF FACIAL ASYMMETRY AMONG GROUPS BASED ON GENDER

Photos	Facial asymmetry		Females				p value	Males				p value
			Groups			Total		Groups			Total	
			Dental undergraduates	Layman perception	Orthodontics perception			Dental undergraduates	Layman perception	Orthodontics perception		
Photo-1	C	Count	3	3	4	10	0.76	1	3	2	6	0.8
		%	14.3%	14.3%	19.0%	47.6%		4.8%	14.3%	9.5%	28.6%	
	L	Count	1	0	1	2		2	1	2	5	
		%	4.8%	0.0%	4.8%	9.5%		9.5%	4.8%	9.5%	23.8%	
	R	Count	3	4	2	9		4	3	3	10	
		%	14.3%	19.0%	9.5%	42.9%		19.0%	14.3%	14.3%	47.6%	
Photo-2	C	Count	6	1	0	7	0.002*	6	0	0	6	0.00*
		%	28.6%	4.8%	0.0%	33.3%		28.6%	0.0%	0.0%	28.6%	
	L	Count	1	0	0	1		1	0	0	1	
		%	4.8%	0.0%	0.0%	4.8%		4.8%	0.0%	0.0%	4.8%	
	R	Count	0	6	7	13		0	7	7	14	
		%	0.0%	28.6%	33.3%	61.9%		0.0%	33.3%	33.3%	66.7%	
Photo-3	C	Count	1	0	0	1	0.39	1	0	0	1	0.35
		%	4.8%	0.0%	0.0%	4.8%		4.8%	0.0%	0.0%	4.8%	
	L	Count	0	1	0	1		0	0	0	0	
		%	0.0%	4.8%	0.0%	4.8%		0.0%	0.0%	0.0%	0.0%	
	R	Count	6	6	7	19		6	7	7	20	
		%	28.6%	28.6%	33.3%	90.5%		28.6%	33.3%	33.3%	95.2%	
Photo-4	C	Count	0	2	6	8	0.009*	0	0	7	7	0.00*
		%	0.0%	9.5%	28.6%	38.1%		0.0%	0.0%	33.3%	33.3%	
	L	Count	6	5	0	11		6	7	0	13	
		%	28.6%	23.8%	0.0%	52.4%		28.6%	33.3%	0.0%	61.9%	
	R	Count	1	0	1	2		1	0	0	1	
		%	4.8%	0.0%	4.8%	9.5%		4.8%	0.0%	0.0%	4.8%	
Photo-5	C	Count	1	3	1	5	0.46	0	5	0	5	0.005*
		%	4.8%	14.3%	4.8%	23.8%		0.0%	23.8%	0.0%	23.8%	
	L	Count	1	1	0	2		1	0	0	1	
		%	4.8%	4.8%	0.0%	9.5%		4.8%	0.0%	0.0%	4.8%	
	R	Count	5	3	6	14		6	2	7	15	
		%	23.8%	14.3%	28.6%	66.7%		28.6%	9.5%	33.3%	71.4%	
Photo-6	C	Count	5	7	7	19	0.352	7	7	7	21	-
		%	23.8%	33.3%	33.3%	90.5%		33.3%	33.3%	33.3%	100.0%	

	L	Count	1	0	0	1		0	0	0	0	
		%	4.8%	0.0%	0.0%	4.8%		0.0%	0.0%	0.0%	0.0%	
	R	Count	1	0	0	1		0	0	0	0	
		%	4.8%	0.0%	0.0%	4.8%		0.0%	0.0%	0.0%	0.0%	
Photo-7	C	Count	2	2	4	8	0.702	0	0	0	0	0.35
		%	9.5%	9.5%	19.0%	38.1%		0.0%	0.0%	0.0%	0.0%	
	L	Count	4	4	3	11		6	7	7	20	
		%	19.0%	19.0%	14.3%	52.4%		28.6%	33.3%	33.3%	95.2%	
	R	Count	1	1	0	2		1	0	0	1	
		%	4.8%	4.8%	0.0%	9.5%		4.8%	0.0%	0.0%	4.8%	
Photo-8	C	Count	0	0	0	0	0.31	0	0	1	1	0.39
		%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	4.8%	4.8%	
	L	Count	2	1	0	3		1	0	0	1	
		%	9.5%	4.8%	0.0%	14.3%		4.8%	0.0%	0.0%	4.8%	
	R	Count	5	6	7	18		6	7	6	19	
		%	23.8%	28.6%	33.3%	85.7%		28.6%	33.3%	28.6%	90.5%	
Photo-9	C	Count	1	1	3	5	0.35	1	1	0	2	0.71
		%	4.8%	4.8%	14.3%	23.8%		4.8%	4.8%	0.0%	9.5%	
	L	Count	0	0	0	0		1	0	1	2	
		%	0.0%	0.0%	0.0%	0.0%		4.8%	0.0%	4.8%	9.5%	
	R	Count	6	6	4	16		5	6	6	17	
		%	28.6%	28.6%	19.0%	76.2%		23.8%	28.6%	28.6%	81.0%	
Photo-10	C	Count	4	6	0	10	0.01*	6	7	3	16	0.12
		%	19.0%	28.6%	0.0%	47.6%		28.6%	33.3%	14.3%	76.2%	
	L	Count	0	0	3	3		0	0	1	1	
		%	0.0%	0.0%	14.3%	14.3%		0.0%	0.0%	4.8%	4.8%	
	R	Count	3	1	4	8		1	0	3	4	
		%	14.3%	4.8%	19.0%	38.1%		4.8%	0.0%	14.3%	19.0%	

*significant



V. DISCUSSION

Facial expressions play an important role in a person's ability to communicate, comprehend and express their selves. Symmetry plays an important role in enabling the outcome of the medium of expression¹². We always tend to describe facial behaviours based of emotions portrayed rather than the anatomical landmarks. Laypersons are often unaware of the mild asymmetry that is associated with every individual¹³. According to Ekman¹⁴, the difficulty in identifying the asymmetry is because of its location or signs. There are 3 sources of signs.

1. Primary source is the static signs. Static signs are bony structure of skull, shape of various facial features, which change very slowly during the entire lifespan.
2. Secondary source is the slow signs such as the wrinkles, fatty deposits and pigmentations which change with age.
3. Tertiary source is the rapid signs that is the muscular contractions that move the skin and head positions, which change rapidly over a short period of time.

Based on the literature on rapid science Borod (1993)¹⁵ came to the conclusion that in normal adult population, left hemiface is more intense than the right hemiface. Although there are various studies on differences in emotions attributed to the right and left hemifaces usually by comparison of chimeric composites of the two hemifaces. No studies has examined the differences between the symmetrical and asymmetrical faces. Facial asymmetry in resting faces tends to vary, some people have symmetric faces while others show prominent asymmetry¹². While developmental disturbances and ageing seems to have a detrimental effect on asymmetry there are individual differences in its extent¹⁶.

The evidence for the role of symmetry in facial attractiveness is derived from the study of Grammar and Thornhill (1994)¹⁷. In their study composite female faces were rated as more attractive than individual female faces whereas composite male faces were less attractive than individual female patients. However, Farkas (1994)¹⁸ concluded that level of asymmetry did not contribute to the determination of attractive face. Kowner (1996)¹⁹ found that symmetrical faces with neutral expression are rated as more attractive only for portraits but when considering smiling faces asymmetrical faces were rated as more attractive.

VI. CONCLUSION

The findings suggest that the laypersons do not identify the mild asymmetry inherent in each individual as much as the Orthodontist. Most of the observers do not perceive the difference in the chimeric photographs mostly because, perfect symmetry appears to be less natural. Most research is to be directed towards identifying the degree of facial asymmetry and to the level of quantitative estimation of asymmetry to be perceived to the common man.

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