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Facial shape variations between heterosexual and homosexual Filipino males

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Abstract: Many studies show the human face can provide insights or predictions of the character and behavior of the individual. While many persons argue that one should focus on how the individual acts and not how they look, studies have shown that many individuals perceive the face can describe the person's identity, emotional states, and the social categories. Several studies had been conducted to assess the facial morphology in individuals pertaining to recognition, investigations, and most to health-related issues but not on sexual preference. One of the most interesting topic for research is describing biological traits such as the face of homosexuals. Studies on sexual preference use traditional methods but these were only limited to the application of multivariate statistical analysis to sets of quantitative variables. With the advances in statistics, biology, geometry and imaging, the facial morphological characteristics of the homosexual and heterosexual populations in Iligan City, Philippines, were described using the tools of Geometric Morphometrics (GM). Digital images were taken from 60 heterosexual and 72 homosexual males who participated in the study. Using the standard number of landmarks, forty-three points were positioned on the front face images, the Cartesian of which were extracted using an image analysis and processing software. Four relative warps were generated for definite results in shape variations between the two groups. The significant relative warps revealed that most homosexuals have drooping eyes, eyebrows and nose that are slightly distanced from the eyes, smaller chin, obvious facial width and prominent jaws and cheekbones which could overall give us a picture of a relative widened face compared to the consensus (mean) shape while most heterosexuals have a shorter distance between the eyes and the nose region, longer chin, less facial width and less prominent jaws and cheeks that could be imagined as faces with a slight elongated shape. In this particular study, sexual orientation is strongly associated with changes in the face shape and thus, it adds to the growing evidence that there could be biological basis in the expression of such facial characteristics in exclusive homosexuals.

Key words: Face Shape; Homosexuality; Image analysis; Relative warp analysis; Sexual orientation

1. Introduction

It is argued that decisions about sexual partners were seen as entirely a matter of individual choice and responsibility (Lehrman, 2005). The concept of homosexuality had undergone an evolutionary perspective basically on the sexual behavior involving sexual attraction to people of the same sex (Bailey and Pillard, 1991). As to what causes homosexual attractions is argued to be due either to genetic and or biological factors or as a result of psychological and environmental influences and of early experiences but still unclear whether this exist at birth or developed after homosexual experience later in life (Bailey and Pillard, 1991). As to the biological attributes of homosexuals, some studies show link of homosexuality with selected morphological traits such as left-handedness and male sexuality (Whitehead, 1999), fraternal order, 2D:4D ratio and handedness (Blanchard, 2004) and on the features of the face (Rule & Ambady, 2008-Ruleet al., 2009]. In the Philippines, gay people always say they can always identify with high frequency that is also gay. As the saying goes, "We know one when we see one because we are one". The face of the perceived gay person provides the cue that triggers the perception aside from various aspects of nonverbal behavior such as eye gaze that usually serve as a deliberate cue of sexual interest (Nicholas, 2004; Shelp, 2002). While intentionally controlled traits such as hairstyle might also serve as a sign of male sexual orientation (Rule et al., 2008) recent studies however show sexual orientation can be accurately judged on the basis of involuntary facial cues (Ambady et al., 1999, Lyons et al., 1999). To have a clearer understanding as to what's in the face of homosexuals and heterosexuals that could be the basis for their differentiation is a focus of the current study. In a related study by Valentova et al., (Valentova et al., 2013), differences in facial shapes between homosexual and heterosexual men were observed. Homosexual men showed relatively wider and shorter faces, smaller and shorter noses, and rather massive and more rounded jaws, resulting in a mosaic of both feminine and masculine features. To further evaluate whether the variations observed is also true to other races or groups, we describe the morphological features of the face of Filipino male homosexuals by using the tools of landmark-based geometric morphometrics (Valentova et al., 2013).

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2. Methodology

A target total of 160 subjects comprised of adult males from Iligan City, Philippines were asked to volunteer. Photographs of their faces were taken and asked to answer a questionnaire. They were also asked if they could share their names so that the researcher can contact them when necessary but identity was made absolutely confidential. The evaluation of the extent of their claims as whether being a true homosexual or a complete heterosexual was based on the results of the survey using the Klein Sexual Orientation Grid Questionnaire and the Kinsey Scale (Kinsey et al., 1948/1998). For many years, the Kinsey Scale is used as the identification of male sexuality. However several criticisms arise from this test as it only measures two dimensions of sexual orientation (Coleman, 1987). The Klein Sexual Orientation Grid (KSOG) was then developed by Fritz Klein. It is a multidimensional grid that investigates sexual orientation in the past, present, and future with respect to seven questions. This questionnaire uses values 0-6 scale of the Kinsey Scale to describe a continuum from exclusively heterosexual to exclusively homosexual. A score of (0) would depict an answer pertaining to "exclusive heterosexual", (1) for "predominantly heterosexual but incidentally homosexual", (2) for "predominantly heterosexual but more than incidentally homosexual", (3) for "bisexual", (4) for "predominantly homosexual but more than incidentally heterosexual", (5) for "predominantly homosexual but incidentally heterosexual", and lastly, a score of (6) for an answer of "exclusive homosexual". The Multidimensional Sexuality Scale (MSS) is also considered to be used in the study but its questions are generated as if to create confusions to the respondents. Thus, this study used the KSOG questionnaire but with the help of the Kinsey Scale and was answered by the 160 subjects. The questionnaire also included identification of age, sexual orientation, address, occupation and contact number. Moreover, the researcher only evaluated facial shapes by the exclusive heterosexuals and exclusive homosexuals thus those who scored an average of zero (0) and six (6) were only the subjects for this study.

There were a total of 160 subjects, using the combined methods of convenience and purposive sampling who participated in the study. The main goals of the mentioned methods sampling is to focus on particular characteristics of a population that are of interest, which will best enable the researchers to answer specific research questions (Lund, 2012).

The participant's front view of the face, eyes looking straightforward, closed mouth, haired pulled back from the forehead, exposure of ears were taken using GE D300 SLR Camera with 14.0 megapixels and built-in flash with standard conditions and a uniform distance of 1 meter. Neutral expressions were observed by the participants (as if they were on an elevator or listening to a lecture in a boring class), as well as the consideration of not wearing eyeglasses and earrings, not putting on lipstick, and not having beards, and mustache as they may alter the facial analysis in the long run. Through the use of CS4 Adobe™ Photoshop, the images were cropped and standardized uniformly and finally converted to 24-bit Bitmap file (instead of JPEG).

In every captured image of the face, forty-three landmark points were plotted in areas that would demonstrate facial variations. The researcher will made use of two-dimensional coordinate data for land marking and were placed into mutually corresponding positions on the photographs. Tps Dig ver. 2.14 (Rohlf, 2006) software was used for this process and was done in three different sessions resulting to three replicates. Replication would quantify and minimize measurement error (Palmer, 1994; Klingenberg and McIntyre, 1998) (Fig. 1).

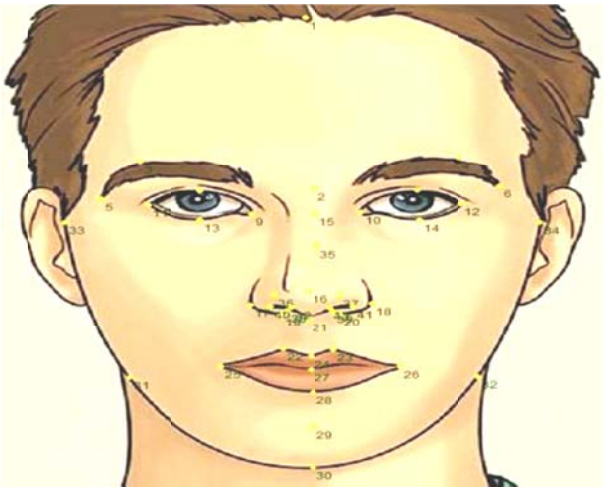

Fig. 1: Anatomical landmarks of the face

The landmarks were depicted along the outlines so that their number correspond individual objects. All landmark configurations were then superimposed by generalized Procrustes analysis (GPA), implemented in TpsRelw software, ver. 1.46 (Rohlf, 2007). Superimposition by GPA removes variation that may be attributed to differences in position, rotation or size of the individual objects (faces).What remained after GPA is the "pure" shape variation, such that morphological differences among objects that have not been caused by differences in their position, rotation or size was analyzed by subsequent multivariate statistical methods (Valentova et al., 2013) to determine morphometric variation among the landmark data configurations. It is generally a geometrical ordination method that compresses variables into a reduced number of derived variables or components. Most of the original information can be represented by a smaller number of new variables by picking out patterns in the relationship between the variables. Shape regressions were displayed by thin-plate splines as deformation from the overall mean landmark configuration (Valentova et al., 2013). Calculation of variables using relative warps was done by using the tpsRelw version 1.49 programs (Hammer et al., 2001). The relative warp scores that were obtained were used for the generation of

histograms and box plots using the Paleontological Statistics software (PAST) version 2.17 (Hammer et al., 2001).

Finally, from the obtained data of the PAST, the researchers performed Kruskal-Wallis test, a nonparametric test used to compare independent groups of sampled data (Anies et al., 2013). This test was used to determine the significance differences (at level=0.05 of significance) in the shape variations between heterosexual and homosexual males of Iligan City.

3. Results and discussion

The distribution of the 160 individuals surveyed showed they were distributed to seven categories corresponding to the scores they have attained in the self-reported survey questionnaire (Fig. 1). The survey was scored based on their individual perceptions of their own sexual orientation using the Kinsey Scale with scores ranging from zero (0) to six (6). A score of zero and six corresponds to the extreme definitions of sexuality (exclusive heterosexual and exclusive homosexual respectively (Fig. 1)). These groups were the ones described based on face shapes using landmark-based geometric morphometrics. Results of the canonical variate analysis and discriminant analysis of relative warp scores are presented in Table 2 and Fig. 2. Detailed descriptions of the shape variations from the significant relative warps (RW1-RW4) are displayed in Table 2.

Table 1: Descriptions of the anatomical landmarks of the face

Landmark	Description of Landmark
1	Midpoint of the hairline
2	Midpoint of the nasofrontal suture
3	Highest point on the upper margin of the middle portion of the eyebrow (left)
4	Highest point on the upper margin of the middle portion of the eyebrow (right)
5	Most lateral point of the eyebrow (left)
6	Most lateral point of the eyebrow (right)
7	Highest point of the eyelid (left)
8	Highest point of the eyelid (right)
9	Medial hinge of the eyelid (left)
10	Medial hinge of the eyelid (right)
11	Lateral hinge of the eyelid (left)
12	Lateral hinge of the eyelid (right)
13	Lowest point on the middle of the margin of the lower eyelid (left)
14	Lowest point on the middle of the margin of the lower eyelid (right)
15	Deepest point of the nasofrontal angle
16	Most protruded point of the nasal lip
17	Most lateral point on the nasal ala (left)
18	Most lateral point on the nasal ala (right)
19	Most lateral point on the nose (left)
20	Most lateral point on the nose (right)
21	Most inner point between the nose tip and the upper lip
22	Highest point of the upper lip (left)
23	Highest point of the upper lip (right)
24	Midpoint of the vermilion border of the upper lip
25	Most lateral point where the upper and lower lip meet (left)
26	Most lateral point where the upper and lower lip meet (right)
27	Midline point where the upper and lower lip meet
28	Midpoint of the lower margin of the lower lip
29	Most anterior point of the chin
30	Lowest point in the midline on the lower border of the chin
31	Most lateral point at the angle of the mandible (left)
32	Most lateral point at the angle of the mandible (right)
33	Most lateral point on the zygomatic arch (left)
34	Most lateral point on the zygomatic arch (right)
35	Nose bridge
36	Medial point of the nasal ala outer margin (left)
37	Medial point of the nasal ala outer margin (right)
38	Lowest lateral point of the nasal ala inner margin (left)
39	Lowest lateral point of the nasal ala inner margin (right)
40	Highest point of the nasal ala inner margin (left)
41	Highest point of the nasal ala inner margin (right)
42	Medial point of the nasal ala inner margin (left)
43	Medial point of the nasal ala inner margin (right)

Based on the works of Anies et al., 2013

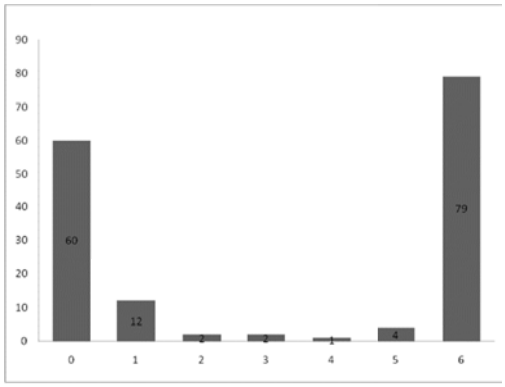

Fig. 1: Distribution of male individuals described

Based from the CVA and discriminant analysis and on the distribution of points along the scatterplot, the two groups are differentiated from each other (Table 2, Fig. 2). RW1-RW4 describes the nature of the variations observed in the 2 groups. The face shape of heterosexual males (blue) is described in the positive axis while homosexual males (red) are positioned on the opposite axis (Fig. 3, Table 3). However, only 2 relative warps describe significant differences between the shapes of the 2 groups after the K-W test (Table 4). The overall variations between the homosexual and heterosexual males are described in Table 5.

Table 2: Results of the MANOVA (A) and DFA (B) of relative warp scores.

MANOVA/CVA	
Wilk's lambda: 0.2828	Pillai Trace: 0.7174
Df1: 4	Df1: 4
Df2: 391	Df2: 391
F: 248.2	F: 248.2
P(same): 7.112E-10[8]	P(same): 7.117
Eigenvalue 1: 2.539	
Eigenvalue 2: 4.654E-16	
Discriminant analysis	
	Hostelling's t2
	P(same) : 7.117 E-106

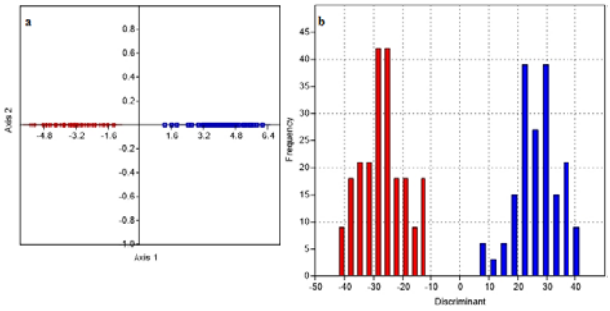

Fig. 2: Canonical variate analysis (CVA) scatter plot (a) and discriminant analysis of the relative scores of exclusive heterosexual and exclusive homosexual males based on all relative warp scores.

Table 4: Results of the Kruskal-Wallis test on the exclusive male heterosexuals and homosexuals face shape variations

RW	P-Value	Remarks
1	5.94E-16	Significant
2	3.639E-46	Significant

The first and second relative warp face descriptions were the only ones considered in this study since they showed significant differences at p=0.05 between the independent groups. Table 6 displays the different detailed descriptions of the face that are common to all significant relative warps of each studied population.

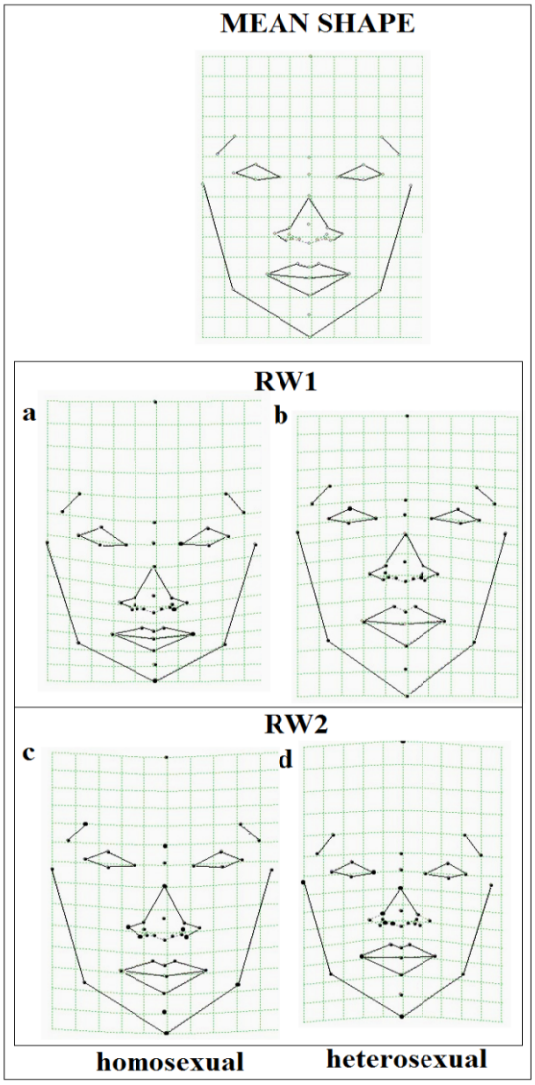

Fig. 5: Visualization of face shapes found between heterosexuals (a, c) and homosexuals (b, d) based on RW1 and RW2.

Table 5: Summarized variation in the face shapes of exclusive homosexuals and heterosexuals from RW 1-4 along the axis

RWs	HOMOSEXUALS	HETEROSEXUALS
RW 1 and RW 2	Eyebrows move elevated upward, medial hinges of the eyes slightly lowered (eyes drooping), nose region moves downward, smaller chin, increased distance between jawbones and cheekbones, prominent jaws and cheekbones (slightly widened face)	Eyebrows pointed downward, nose region elevated upward, longer chin, decreased distance between jawbones and cheekbones, decreased distance between nose and upper lip

The result of the relative warp analysis show homosexuals have drooping eyes, eyebrows and nose that are slightly distanced from the eyes, smaller chin, obvious facial width and prominent jaws and cheekbones which could overall give us a picture of a relative widened face compared to the consensus (mean) shape. For the heterosexuals, their faces seem to have a shorter distance between the eyes and the nose region, longer chin, less facial width and less prominent jaws and cheeks that could be imagined as faces with a slight elongated shape. These observed differences are additional information to other studies conducted on the role of the face as an important social cue when compared to other types of visual information (Yin, 1969). The face then not only provide insights or predictions of the character and behavior of the individual like person's identity, emotional states, social categories (e.g., sex, race, age) (Bruce and Young, 1998), belongingness (Ekman, 1993; Macrae and Bodenhausen, 2000), trustworthiness, attractiveness, health status (Rhodes et al., 2003; (Thornhill and Gangestad, 2006), dominance (Mazur et al., 1984; Mueller and Mazur, 1996), flirtworthy, religiosity, promiscuity, aggressiveness (Rule et al., 2009), competence (Todorov et al., 2005; Ballew et al., 2007), intelligence but also on the sexual orientation of men (Rule & Ambady, 2008; Rule et al., 2008). This current study is complementing the results of the work of Valentova et al. (2013) showing morphological differences in face shape between homosexual and heterosexual men. While the two studies studied different races, both have clearly shown the existence of additional morphometric evidence for the differences observed between homosexual and heterosexual men (Blanchard and Bogaert, 1996; Martin and Nguyen, 2004).

4. Conclusion

The results of this study provide additional evidence that, on the average, homosexual individuals not only show behavioral, psychological and morphological traits that are in some ways similar to heterosexual individuals of the opposite sex but also in knowing that sexual orientation has morphometric evidence as reflected on the shape of the face. The study also showed the importance of geometric morphometrics as an important tool in the quantitative description of the nature of shape differences thus providing a better understanding and evidence for the nature of sexual orientation in human males.

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