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Influence of Facial Symmetry and Physical Appearance in Patients Perception of Medical Students: A Gender Differences Study

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Abstract: Background: Studies have shown that symmetry plays an aesthetic role and has a positive effect on the perception of human faces. Our work hypothesizes that facial symmetry positively correlates with physical attractiveness and, thus, with higher visual evaluations of future doctors. Materials and methods: Observational study of 46 students (26 women and 20 men), comparing subjective indicators, symmetry of their facial features, and students' academic performance. Results: We found no correlation between these subjective results and an objective factor of symmetry facial recognition. User evaluators' subjective assessments of students' physical appearance showed significant gender differences for almost all the domains assessed. Moreover, these variables were correlated to each other: women were perceived more positively than men. There were also correlations in the variables related to academic performance but no gender differences. We did not observe any relationship between subjective variables related to physical appearance and objective ones related to academic performance. Conclusion: Facial symmetry was not correlated with positive physical appearance and, therefore, with a better evaluation of future doctors by patients. Users perceive women physicians more positively, despite there being no difference at an academic level.

Keywords: physical appearance; medical students; symmetry facial; attractiveness; kindness; trustworthiness; cleanliness; knowledge

1. Introduction

Facial deformities with asymmetry have an important negative impact on perceptions related to social functions, such as employability, honesty, trustworthiness, and even intelligence [1]. All of this has an impact on their job opportunities after graduation. Even in teaching, physical appearance is a decisive factor, as evidenced by one study showing that students consider attractive teachers significantly better than unattractive ones [2].

Symmetry has a role as an aesthetic primitive. Artists have taken advantage of symmetry for a long time [3]. However, subjective perceptions of physical beauty are not mathematic: certain proportions tend to be associated with it [4]. We must take into account two determinants in the objective assessment of beauty. On the one hand, facial symmetry can play an important role in the ratings of attractiveness and beauty standards [5], which is universally true across cultures [6]. However, facial symmetry is not the only determinant of attractiveness, and there are other determinants, such as averageness and secondary sex characteristics, such as hormone markers [7,8]. A recent study on human faces showed that symmetrical faces were chosen more often than their unmanipulated versions [9]. One study suggested that mothers are more affectionate and playful if their

babies are more attractive [10], while babies have also shown a preference for prototypes; when mathematically averaged for attractive and symmetrical faces [11]. In an interesting study from 1990, researchers observed that 12-month-old babies showed more pleasure, participation, less anguish, and lower withdrawal when they interacted with strangers who wore attractive masks than when they interacted with strangers wearing unattractive masks. They also played longer with dolls with attractive faces than with dolls that had unattractive faces. However, the relationship between facial symmetry and attractiveness is not as clear, as recent articles do not support it [12,13]. In addition, making evaluations is not always easy since, in the case of evaluative judgments, a positive concept predominates over others [14].

Fluctuating asymmetry (FA) has been suggested to increase with exposure to pathogens, toxins, and parasites during development [15]. FA also increases with genetic alterations such as mutations and inbreeding [15]. Healthy and evolutionarily healthy individuals have lower FA and more symmetry in their bodily facial features; as a result they appear more attractive. We do not know exactly the influence of fluctuating asymmetry in nature, as some authors present it as negative [16], while others see it as a better predisposition for adaptation to the environment [17]. Therefore, there is no unified view in relation to fluctuating asymmetry [12]. On the other hand, it is interesting that fluctuating asymmetry has not been related to the socioeconomic level [18].

According to the stereotype "what is beautiful is good" [19], physical appearance is also described as influencing the perceptions of others, in that people who are more attractive are perceived more favorably, to the benefit of the products or elements that they represent [20]. Regarding gender, some authors suggest that an observer can determine intelligence based on the photograph of a man but not of a woman [21].

Current studies show that facial masculinity is associated with competence and femininity with kindness [22]. There are diverse theories about differences between genders in human behavior and the division of labor [23]. One study showed that teachers had more hope in the potential of attractive students, favoring them in class [24]. In the courtroom, juries were not only more likely to condemn less attractive people but also to give them harsher sentences [25].

Several studies have examined the influence of gender on the perception of care, showing that medicine is not neutral in this regard [26]. For example, some authors have reported that female doctors in the emergency department are perceived more positively than men [27]. Other studies have observed that patients tend to prefer receiving treatment from a doctor of the same gender as them, albeit women are considered more compassionate and men more technically skilled [28]. In the context of managing patients with type 2 diabetes, another study reported that female doctors treated patients better than male doctors [29], while in pediatrics, patients preferred women doctors, even if their parents preferred men [30]. In general, most studies show that women are perceived as better than men in medicine, except in a few technical or other isolated domains, such as surgery, where users believe men perform better. Thus, gender influences consumers' perceptions of the medical care received.

Therefore, since medical competence is a defining characteristic of a good medical educator, physical or symmetry attributes may play a role in the perception of clinical competence.

Our work hypothesizes that facial symmetry is correlated with positive physical aspects and, therefore, with a better evaluation of future doctors by patients.

For this, our objectives are to determine if beauty and other physical aspects correlate with facial symmetry and if some of these aspects (beauty or facial symmetry) correlate with future doctors' academic performance. We include, as an objective, studying if gender affects any of these variables.

2. Materials and Methods

2.1. Study Environment

We designed a retrospective, observational study of 46 sixth-year medical students at the Medical School of Spain: 20 men (43.5%) and 26 women (56.5%) who took the OSCE (final practical grade exam). This exam evaluates clinical, professional, and communication skills acquired during students' medical studies by means of 20 clinical situations. In addition to the prespecified objective criteria, evaluators assign students a subjective score on different dimensions related to their communication skills [31].

The sample size was the total number of students who participated in the final practical grade exam in the morning session. The study involved 46 students (two-fifths signed up for the examination). We sought the collaboration of participating students, who all signed informed consent.

Participants were photographed from the waist up in identical conditions (lighting, location, and posture) with a Canon SX400 IS camera. They had the same physical appearance as when they took the exam (Figure 1).

Figure 1. Example photograph to be evaluated.

The photograph was taken minutes before beginning the test in a hospital room. After being photographed, students could not change their clothes, accessories, hairstyles, glasses, or other elements that would modify their physical appearance during the exam.

Theoretical models of facial attractiveness were not used in this study. In the specific context of future doctors, the analysis of facial attractiveness would benefit from a multivariate approach using pictures of real faces [32].

2.2. Objective Score

We used methods based only on facial appeal, using facial symmetry scores as a proxy for physical attractiveness, in line with other published research in the literature [33].

The photographs were analyzed by means of online beauty recognition software (http://prettyscale.com/es, accessed on 15 November 2018), which assigns a score of 1 to

100 to different photographs based on the symmetry of test users' facial features (Figure 2). Based on facial symmetry, we used this software to obtain an objective score on participants' appearance [34].
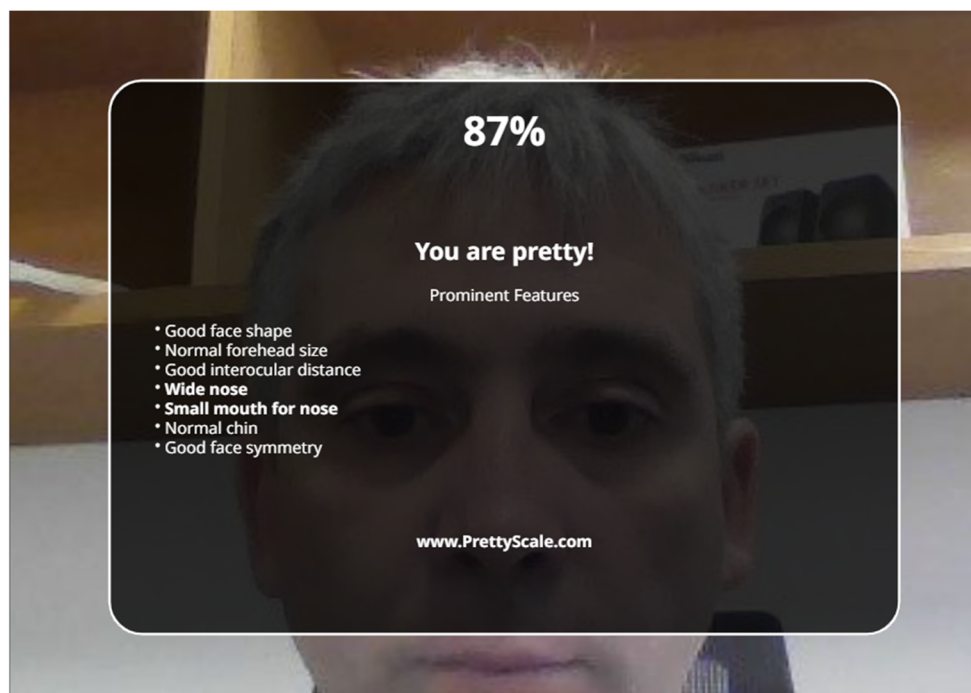

Figure 2. Example of facial symmetry program analysis.

2.3. Subjective Score

A sample of convenience was obtained from thirty volunteers who were users of the health system; that is, patients (henceforth user evaluators). The volunteers examined the photographs. The user evaluators were adults (mean age 39.8 years, standard deviation [SD] 15.7, range from 18 to 82), and there were similar numbers of men and women. The viewing time of the photographs by the volunteers was not controlled. Each volunteer was able to observe the photographs for as long as they thought necessary. The selection criteria were that the volunteers did not know any of the student participants or have uncorrected visual defects or neurological pathologies that would impede their evaluation of a photograph.

The students' photographs were shown to the user evaluators on a 9.7 Apple iPad Air. They completed a paper-based survey on the photographs, subjectively scoring students using a Likert scale from 0 to 10 on the following variables: (a) attractiveness; (b) cleanliness; (c) trustworthiness; (d) kindness; and (e) knowledgeability. These questions were asked in the same order. The volunteers were shown the images in one of five randomized sequences.

The survey results were entered into an Excel 2016 spreadsheet and the statistical program SPSS 22.0.13 (Statically Product and Service Solutions). The average values corresponding to each student were obtained for the individual variables, and as a composite score in all the domains (average subjective score).

To detect a minimum linear correlation of 0.5 between two quantitative variables, with a statistical power of 80% and a significance level of 0.05, a minimum of 30 patients are needed [35].

2.4. Variables Related to Academic Performance

We collected the following variables: (a) overall mark on the OSCE (range from 0 to 2000 points); (b) mark on the communication section of the OSCE (range from 0 to 190

points); (c) grade point average (GPA, range from 1 to 4), based on the university transcripts, this is the average of each of the subjects of the career where 1 is approved, 2 notable, 3 excellent, and 4 honors; (d) net number of questions residency exam (range from 0 to 250), as obtained from the website of the Ministry of Health, Consumer Affairs, and Social Welfare (https://fse.mscbs.gob.es/fseweb/view/index.xhtml, accessed on 1 April 2020).

2.5. Statistical Analysis

Statistical analysis was performed with the IBM SPSS software (version 22.0.13). All data underwent a descriptive analysis and were then compared according to different variables. We used the Shapiro–Wilk statistic to test the normality of continuous variables and then analyzed differences according to gender using the Student's *t*-test or the Mann–Whitney U test [36], as appropriate.

Correlation between continuous variables was assessed using Pearson's correlation coefficient (for normally distributed variables) or Spearman's correlation (for non-parametric variables). *p*-values of less than 0.05 were considered statistically significant.

The research committee of the university approved this study.

3. Results

Forty-six students participated in this study: 20 men (43.5%) and 26 women (56.5%). No volunteer suffered from any disease or important asymmetry that interfered with the results. The characteristics of the overall sample population (without disaggregation by gender) are presented in Table 1. In five cases, we did not obtain grade point average (GPA) or residency entrance exam results because these participants did not finish their grades in the year of completion of the study.

Table 1. Descriptive characteristics of the study sample.

Variable	Participants (*N* = 46)	Scale Range
Objective beauty (facial recognition software), mean (SD)	61.3 (1.22)	0–100
Attractiveness, mean (SD)	5.33 (1.13)	0–10
Cleanliness, median (IQR)	6.40 (0.99)	0–10
Trustworthiness, mean (SD)	6.11 (0.65)	0–10
Kindness, median (IQR)	6.85 (0.77)	0–10
Knowledgeability, mean (SD)	6.61 (0.39)	0–10
Composite score on physical appearance, mean (SD)	6.20 (0.64)	0–10
Total points, OSCE, mean (SD)	1341 (17.06)	0–2000
Score on OSCE communication section, mean (SD)	115.59 (12.22)	0–190
GPA, median (IQR) *	1.75 (0.43)	1–4
Residency entrance exam *	135.26 (22.03)	0–250

GPA: grade point average; IQR: interquartile range; OSCE: Objective Structured Clinical Exam; SD: standard deviation. * Data obtained for 43 of the 46 students.

Table 2 compares the study variables according to gender. In general, students of both genders scored on all items positively, except for the attractive item, that did not reach a score of 5 in the case of men. Women were scored significantly higher on attractiveness, cleanliness, trustworthiness, kindness, and in the composite score. On the other hand, men in the Symmetry software scored higher (6 vs. 6.30, *p* = 0.43) The largest gender-specific differences in the rating concerned the dimension of attractiveness.

There were no significant differences between genders with regard to the variables of knowledgeability, objective beauty (based on facial analysis software, facial asymmetry), total OSCE mark, OSCE communication score, GPA, or rank on the residency exam.

Table 2. Study results by gender.

Variable	Scale Range	Women (N = 26)	Men (N = 20)	*p*-Value
Objective beauty (facial recognition software), mean (SD)	0–100	60.0 (13.0)	63.0 (11.1)	0.43
Attractiveness, mean (SD)	0–10	5.77 (1.05)	4.76 (0.98)	<0.01
Cleanliness, median (IQR)	0–10	6.64 (0.91)	6.19 (1.32)	<0.01
Trustworthiness, mean (SD)	0–10	6.39 (0.50)	5.79 (0.68)	<0.01
Kindness, median (IQR)	0–10	6.93 (0.81)	6.52 (0.85)	0.02
Knowledgeability, mean (SD)	0–10	6.70 (0.34)	6.48 (0.43)	0.06
Composite score on physical appearance, mean (SD)	0–10	6.45 (0.53)	5.87 (0.63)	<0.01
Total points, OSCE, mean (SD)	0–2000	1135.9 (105.7)	1347.8 (132.9)	0.74
Score on OSCE communication section, mean (SD)	0–190	114.10 (12.83)	117.52 (12.69)	0.37
GPA, median (IQR) *	1–4	1.74 (0.36)	1.75 (0.59)	0.36
Residency entrance exam *	0–250	130.60 (22.89)	141.14 (19.94)	0.12

GPA: grade point average; IQR: interquartile range; OSCE: Objective Structured Clinical Exam; SD: standard deviation. * For GPA and residency entrance exam, data obtained for 24 women and 19 men.

That said, the user evaluators subjectively judged that women had a little more knowledge than men (*p* = 0.06).

Table 3 shows the results obtained on the correlation between the variables associated with physical appearance, and Table 4 shows correlations between the variables associated with academic performance.

We found no correlation of these subjective results with the objective factor of symmetry facial recognition. There was a correlation between all the subjective variables related to physical appearance (attractiveness, cleanliness, trustworthiness, kindness, knowledgeability, and composite score).

We also observed correlations between academic performance variables (the total OSCE mark, the communication score, GPA, and residency test score). All were related, so better communication skills correlated with better scores. It also showed that the academic results in our faculty were consistent with the results of the national residency entrance exam.

However, Table 5 shows that neither the subjective variables (user evaluator perceptions) nor the academic performance variables were related to an objective measure of appearance (the score obtained in the facial recognition software). The only correlation found MONG physical appearance variables and academic performance variables was a negative relationship between GPA and perceived kindness and knowledgeability.

Table 3. Correlations between variables related to physical appearance.

		Attractiveness	Cleanliness *	Trustworthiness	Kindness *	Knowledgeability	Subjective Composite Score	Objective (Facial Recognition) Score
Attractiveness	*p*-value	—	<0.01	<0.01	<0.01	0.02	<0.01	0.98
	Correlation		(0.80)	(0.79)	(0.46)	(0.35)	(0.88)	(0.00)
Cleanliness *	*p*-value	<0.01	—	<0.01	<0.01	<0.01	<0.01	0.94
	Correlation	(0.80)		(0.86)	(0.53)	(0.52)	(0.91)	(−0.01)
Trustworthiness	*p*-value	<0.01	<0.01	—	<0.01	<0.01	<0.01	0.61
	Correlation	(0.79)	(0.86)		(0.75)	(0.71)	(0.96)	(−0.08)
Kindness *	*p*-value	<0.01	<0.01	<0.01	—	<0.01	<0.01	0.60
	Correlation	(0.46)	(0.53)	(0.75)		(0.64)	(0.74)	(−0.08)
Knowledgeability	*p*-value	0.02	<0.01	<0.01	<0.01	—	<0.01	0.49
	Correlation	(0.35)	(0.52)	(0.71)	(0.64)		(0.70)	(−0.11)
Subjective composite score	*p*-value	<0.01	<0.01	<0.01	<0.01	<0.01	—	0.79
	Correlation	(0.88)	(0.91)	(0.96)	(0.74)	(0.70)		(−0.04)
Objective (facial recognition) score	*p*-value	0.98	0.94	0.61	0.60	0.49	0.79	—
	Correlation	(0.00)	(−0.01)	(−0.08)	(−0.08)	(−0.11)	(−0.04)	

* The analysis of the correlation with the variables "cleanliness" and "kindness" was performed with the non-parametric Spearman's correlation, as these variables were not normally distributed. The rest of the analyses were undertaken with Pearson's correlation coefficient.

Table 4. Correlations between variables related to academic performance.

		Total Score on OSCE	OSCE Communication Score	GPA *	Residency Entrance Exam
Total score on OSCE	*p*-value	—	<0.01	<0.01	<0.01
	Correlation		(0.65)	(0.52)	(0.63)
OSCE communication score	*p*-value	<0.01	—	<0.01	<0.01
	Correlation	(0.65)		(0.41)	(0.51)
GPA *	*p*-value	<0.01	<0.01	—	<0.01
	Correlation	(0.52)	(0.41)		(0.65)
Residency entrance exam	*p*-value	<0.01	<0.01	<0.01	—
	Correlation	(0.63)	(0.51)	(0.65)	

GPA: grade point average; OSCE: Objective Structured Clinical Exam; * The analysis of the correlation with the variable "GPA" was performed with the non-parametric Spearman's correlation, as this variable was not normally distributed. The rest of the analyses were undertaken with Pearson's correlation coefficient.

Table 5. Correlations between variables related to academic performance and physical appearance.

		Attractiveness	Cleanliness *	Trustworthiness	Kindness *	Knowledgeability	Subjective Composite Score
Total score on OSCE	*p*-value	0.15	0.29	0.43	0.59	0.77	0.35
	Correlation	(0.22)	(0.16)	(0.12)	(−0.08)	(0.05)	(0.14)
OSCE communication score	*p*-value	0.72	0.56	0.72	0.43	0.34	0.51
	Correlation	(−0.06)	(0.09)	(−0.06)	(−0.12)	(−0.15)	(−0.10)
GPA *	*p*-value	0.70	0.36	0.12	0.02	<0.01	0.18
	Correlation	(0.06)	(−0.14)	(−0.24)	(−0.36)	(−0.51)	(−0.21)
Residency entrance exam	*p*-value	0.51	0.53	0.37	0.39	0.61	0.46
	Correlation	(−0.10)	(−0.10)	(−0.14)	(−0.14)	(−0.08)	(−0.12)

GPA: grade point average; OSCE: Objective Structured Clinical Exam; * The analysis of the correlation with the variables "cleanliness", "kindness", and "GPA" were performed with the non-parametric Spearman's correlation, as these variablee were not normally distributed. The rest of the analyses were undertaken with Pearson's correlation coefficient.

4. Discussion

In our study, facial symmetry was not related to gender or the perception of the users. Further, we did not observe any differences in academic performance, as measured by the overall GPA, the OSCE mark (overall and in the communication section), or the residency exam score. That said, in Spain, incoming university students are accepted into the medical school program based on a strict selection between those scoring highest on the national Baccalaureate Entrance Examination and probably all the students were moderately attractive. This may be the cause of no differences being found. However, we have not found similar studies that allow us to establish similarities.

Our results also showed a significant relationship between all the variables related to subjective perceptions of physical appearance, showing that students seen as more attractive are also considered kinder, more trustworthy, more knowledgeable, and more hygienic than their male counterparts. These findings are coherent with studies affirming that perceived attractiveness also has a positive impact on other aspects [20].

An attractive facial appearance is considered to be a decisive factor in establishing successful interactions between humans, including beauty and trustworthiness [37].

Recent studies show that beauty is not only found in facial symmetry but also in the normality of the face [13]. In this way, if we make a more symmetrical face, it moves away from naturalness and is valued less positively. In a study of Mexican Students, attractiveness was not correlated to levels of asymmetry in either sex [38]. This may be in accordance with our study, where greater symmetry was not associated with greater beauty.

A recent meta-analysis concluded that there is no association between fluctuating asymmetry in men as a signal of genetic quality [39], and that there are other elements, such as hormonal factors, that affect attractiveness [8,40]. In addition, another author indicated that there was little evidence of a strong association between fluctuating asymmetry and sexual dimorphism [41]. At this time, this association between facial symmetry and beauty had not been clearly demonstrated. Although our study was not designed with this objective, we did not observed this association either.

Traditionally, medicine has been a male-dominated profession. The study of the gender-related differences in medicine is very relevant in a context in which there is a high rate of female participation in the sector.

Over the last several decades, there has been an increase in the number of women pursuing university studies, and this rise has been more pronounced in certain areas, including health sciences [42]. In fact, in medicine, female graduates now outnumber their male counterparts. In 2017, for the first time in the history of the United States, women comprised more than half (50.7%) of the students entering medicine. This trend is apparent worldwide and is also very pronounced in Spain, where in 2018, the Spanish Medical Professional Association estimated that women made up around 60% of new medical residents [43].

The reason we performed the study during the OSCE was that passing this exam is the last step before graduating, and it also evaluates all the competencies acquired during students' university studies. Our results indicated significant differences in all the variables assessed by users, including attractiveness, cleanliness, trustworthiness, and kindness. Women were scored significantly higher on all domains except knowledgeability, although this result was also borderline significant in favor of women. However, it did not have an objective reason for facial symmetry to justify it.

Facial symmetry has not been reported in the performance of physicians or medical students. On the other hand, differences according to gender have been described. Studies have reported that patients and other health services users find female doctors to be kinder, more compassionate, and more trustworthy than men—all crucial aspects of the doctor–patient relationship that could influence user satisfaction with the medical care received in both adults and children [29]. There are many reasons why patients can request concordant gender care, and the way in which institutions and clinical doctors address these requests require a serious commitment to the ethical principles of patient well-being, respect for people, and justice [44]. This coincides with our study since no gender difference in academic performance data or even facial symmetry was found, but there was in the physical assessment by the patients, favoring women.

Although academic performance and communication scores did not show differences according to gender, women were perceived more favorably in physical appearance.

Our results also showed a significant relationship between all the variables related to subjective perceptions of physical appearance, showing that students seen as more attractive are also considered kinder, more trustworthy, more knowledgeable, and more hygienic than their male counterparts. These findings are coherent with studies affirming that perceived attractiveness also has a positive impact on other aspects [20]. It is interesting that although beauty has been associated with symmetry, it has not been demonstrated in our study population.

In a recent study in the United States, investigating the existence of a gender bias in the Certification Examination of General Surgery of the American Board of Surgery, researchers obtained results similar to ours, observing that gender had no significant

influence on examination performance [45]. Therefore, men and women have the same knowledge and technical skills (according to the American study), regardless of the subjective assessment that patients may have.

Moreover, our study shows that women were seen as more attractive than men, but when participants' faces were subjected to an analysis through facial recognition software which assesses beauty based on proportions, there were no gender-related differences. Given that there are measurable, mathematic parameters that can be used to assess beauty [4,46], we speculate that our female participants were perceived more positively because of the healthcare context in which this study took place. In this case, we should think again about the role of caretaker of women as the cause of this result.

The best results in the communication section (and, therefore, those with better communication skills) were correlated with better academic performance (GPA and Residency entrance exam). However, the causal relationship is unknown. These students may have acquired good communication skills at the same time they acquired other knowledge of medicine, or they may have had good communication skills upon starting their studies, which could have favored dynamic and comprehensive participation in learning in both the classroom and during hospital internships. The authors acknowledge that academic performance may not necessarily be an objective indicator of "knowledgeability" as this, too, may be affected by the variables under study. The physical appearance of medical students modifies the degree of charisma or teaching effectiveness with which they are perceived [24]. The same happens with gender [23].

This study had a number of limitations. First, surveyed students were only from our university. As such, the findings may not be susceptible to generalization for other population groups. The sample number is limited, although the results shown were statistically significant. Therefore, we believe that increasing the number of participants would not change our results. In our study, fixed images were used, although there are studies that show that when moving, evaluations can change [47].

In future studies, it would be necessary to generalize it to other population groups. We believe that the approach to clarify whether facial symmetry affects the skills or subjective assessments of professionals is interesting.

Future research could also examine whether perceptions differentiating workers according to traditional gender roles extend to other professions, such as engineers, truck drivers, and pilots [23].

5. Conclusions

In conclusion, facial symmetry was not correlated with positive physical appearance and, therefore, with a better evaluation of future doctors by patients.

Other physical aspects were not correlated with facial symmetry, and no one of these two aspects (physical appearance or facial symmetry) was correlated with the academic performance of future doctors.

Users perceived women more favorably on subjective criteria, even if objective measures of beauty, as assessed by facial recognition software, did not show significant differences between sexes. Likewise, no gender-related differences existed in any of the academic performance indicators.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to are academic students results from a university.

Conflicts of Interest: The authors declare no conflict of interest.

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