

RESEARCH ARTICLE

RELATIVE PERCEPTION IN MATING PREFERENCES USING FEET SIZE STIMULI AMONGST STUDENTS OF SOME TERTIARY INSTITUTIONS WITHIN NORTHWESTERN NIGERIA

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Abstract

Background: The age-old adage 'beautiful feet, beautiful soul' may hold more truth than we think, as research suggests, foot size and shape can influence perceptions of attractiveness and overall physical appeal. This study was designed to assess sex differences and effect of ethnicity on perceived attractiveness ratings of feet size stimuli amongst students of some tertiary institutions within northwestern Nigeria. **Methods:** Participants consisting of 1487, male (726) and females (761) were randomly selected with age frequency of 20-29 years. Questionnaire consisting stimuli, showing male and female figures with different foot sizes; from head-to-toe and arranged, from smallest to largest foot size, as Images 1 to 5, the baseline image being Image 3. Feet only stimuli which is randomly arranged was used to understand whether participant preferences depend on whole body stimuli or feet only. The participant rated the stimuli on a scale of 1, most attractive to 5, least attractive respectively. The feet of the participants were also measured using tape rule to the nearest 0.1cm, following the standard protocol. Ethical approval obtained from Ahmadu Bello University Ethics Committee. The anthropometric variables for both male and female was sexually dimorphic with $p < 0.001$ considering p value of < 0.05 for statistical significance. **Results:** Sexual dimorphism were observed in anthropometric parameters of feet size with males having higher mean value, with left feet bigger than the right feet in both sexes. Sex differences were also observed in the most attractive female feet size with male preferring medium and small size by female participants. Across culture, the size of physically attractive man and woman shoe without stimuli, the most attractive male and female feet size with head to toe stimuli and the most and least attractive women feet only stimuli was the medium size. **Conclusion:** The present study reveal that females generally have smaller feet than males, and both genders prefer smaller feet for females, with females showing a stronger preference for this trait.

Keywords: Asymmetry, Attractiveness, Feet size, Mating preferences, Sex differences

INTRODUCTION

Physical attractiveness is an important factor in sexual selection (Clarkson *et al.*, 2020; Rosenthal and Ryan, 2022; Duval *et al.*, 2023) in Tanabe and Yamamoto, (2024). The components of attraction differ between the sex. Several key features are dimorphic, indicating

intersexual selection. However, determining causality is challenging since aesthetic standards can both originate from and cause dimorphism (Fessler *et al.*, 2012; Voracek *et al.*, 2007). Argument exists to whether mating preferences are universal or culture dependent (Pisanski & Feinberg, 2013), were both sex differ in several mate preferences across cultures. Researchers have observed

gender differences in the process of perceiving physical attractiveness (Tanabe & Yamamoto, 2024). For instance, when observing both men's and women's body images, male observers pay faster and longer attention to women's chests, whereas female observers pay faster attention to men's legs (Hewig *et al.*, 2008). The context of these gender differences in the attractiveness perception process reflects an evolutionary psychological adaptation (i.e., attractiveness evaluation allows for the avoidance of bad genes in one's mating strategy) (Tanabe and Yamamoto, 2024). These gender differences in body parts that reflect reproductive ability have led researchers to presume differences in body parts focused on by both genders. There is interesting issue in the relationship between foot features and perception of footwear comfort. Puszczalowska-lizis *et al.* (2024), showed that as foot length increased, the perception of overall shoe comfort decreased. Vrdoljak *et al.* (2017) and Herbaut *et al.* (2019), pointed that the length of the foot is a crucial dimension in selecting the most appropriate size of footwear. As foot length increased, the perception of overall comfort of footwear decreased. This may be due to differences between the real size and the estimated size, which would suggest the need to consider different widths for the same length size in medical footwear designs (Puszczalowska-lizis *et al.*, 2024). The aim of the study was to assess sex differences and effect of ethnicity on perceived attractiveness ratings of feet size stimuli and to ascertain asymmetry in foot comfort due to differences in

foot length amongst students of some tertiary institutions within northwestern Nigeria.

MATERIALS AND METHODS

Participants consisting of 1487, male (726) and females (761) were randomly selected with age frequency of 20-29 years. Questionnaire consisting ranges of male and female stimuli figures with different foot size and images displayed from head-to-toe were arranged, from smallest to largest foot size, as Images A to E respectively, the baseline image being Image C, adopting Fessler *et al.*, 2012 study. Feet only stimuli which is randomly arranged was used to understand whether participant preferences depend on whole body stimuli or feet only. The participant rated the stimuli on a scale of 1 most attractive to 5, least attractive. In the absence of both whole body and feet only stimuli, participants were asked to select what the size of a physically attractive man or woman shoe or feet will be, and which among them they think is preferred or they find to be more pleasing using small, medium or large shoe size as options. The participants were also asked when they wore new shoes, which foot do they think or feel is more uncomfortable and therefore, the feet of the participants was also measured using tape rule as proxy for vernier digital calliper to the nearest 0.1cm, following the standard protocol (ISO, 2019; Kuponiyi *et al.*, 2023), to ascertain the view of the participants. Ethical approval was obtained from Ahmadu Bello university ethics committee.

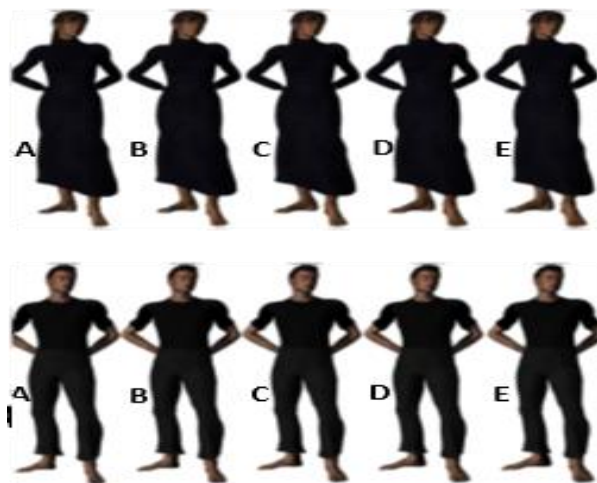


Fig. 1: Feet size (Whole body) stimuli (Fessler *et al.*, 2012)

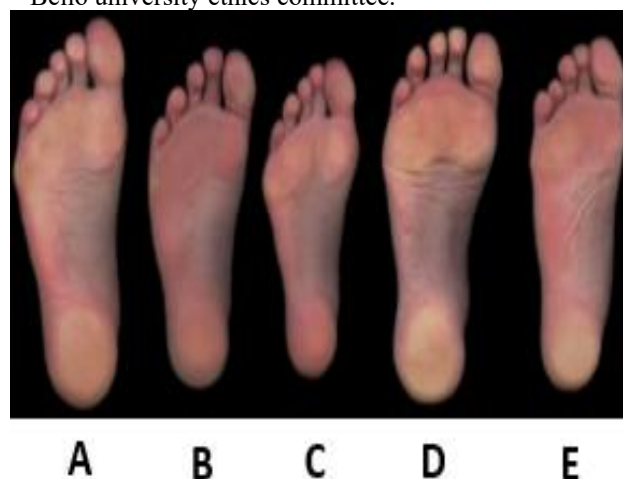


Fig. 2: Feet size (ONLY) stimuli (Fessler *et al.*, 2012)

Data were expressed as mean ± standard deviation and in median inter-quartile range. Student’s t-test was used to test for significance difference in means of all continuous variables of males and females participants. Mann Whitney test was used to investigate sex differences in perceived attractiveness. Kruskal Wallis test was use to check for significance differences in perception of attractiveness across ethnic groups. P<0.05 was set for statistical significance. SPSS version 20 statistical software was used for the statistical

analysis and Microsoft excel was used to enter the data.

RESULTS

Table 1, shows sexual dimorphism of anthropometric parameters of the participants. A significant sexual dimorphism was observed in all the anthropometric parameters with males having higher mean values except for BMI where female have higher mean value.

TABLE 1: Sexual dimorphism in anthropometric parameters of the participants

Variables	Mean± SD		t-value	p-value
	Male (n=726)	Female (n=761)		
Weight (kg)	64.02±11.20	59.81±14.72	6.135	<0.001
Height (cm)	171.69±11.19	165.33±13.01	9.99	<0.001
BMI (kg/m ²)	20.87±3.91	23.47±13.33	-2.256	0.026
Right foot (cm)	26.71 ±1.46	24.49±2.04	22.48	<0.001
Left foot (cm)	26.86 ±1.46	24.59±1.97	23.52	<0.001

Table 2, shows sexual differences in perceived attractiveness ratings of feet stimuli, a significant sexual dimorphism was observed in most attractive male feet size with female having higher 75th percentile value and in most attractive female feet size with females having higher median and 25th percentile values

Table 3, shows effect of ethnicity on attractiveness ratings of feet size stimuli, it was observed that there is significant difference of ethnicity on the following attractiveness ratings namely; size of physically attractive man shoe, preference for men feet size, most attractive male feet size and least attractive male feet size, among the variables exhibiting significant difference a higher median value was observed in Igbo ethnic group except for least attractive male feet size, where Yoruba’s had a higher median value and preference for men feet size where other ethnic group had a higher median value.

DISCUSSION

In the present study, the average mean value for the left foot in males was slightly larger than the right foot. Similarly, in females, mean value for the left foot was larger than the right foot. This indicates that males generally have longer feet than females and that in both sexes, the left foot tends to be longer than the right. These findings are consistent with previous studies, such as those by Fessler *et al.* (2005a,b; 2012), which reported that women have

proportionately smaller feet than men. Additionally, Danborno and Elupko (2007), also reported that males have significantly longer feet than females when foot length is measured using standard protocols. That was also observed across various populations (Voracek *et al.*, 2007). However, Fessler *et al.* (2005a) and Krauss *et al.* (2008), also noted some inconsistencies in the sex differences in foot-length asymmetry across different populations, highlighting that in some cases, men might have a longer right foot, while in others, women have a longer left foot. Despite these variations, the current study supports and confirms the general trend of left foot dominance in length within both sexes, also majority of the participant `stated that the left foot is more uncomfortable when wearing their shoes. Moreover, this study aligns with research by Krauss *et al.* (2008), which suggested that while there are proportional differences in foot dimensions between men and women, these differences are generally consistent within the same length category. The study also corroborates findings by Jana *et al.* (2024) & Krishan *et al.* (2011), who observed that foot length is sexually dimorphic and asymmetric, with males having significantly longer feet than females and the left foot typically being longer than the right in both genders.

TABLE 2: Sex differences in perceived attractiveness ratings of feet stimuli

Variables	Median (25 th , 75 th)		U-value	p-value
	Male (n=726)	Female (n=761)		
Size of physically attractive woman shoe ¹ [1(small), 2(medium), 3(large)]	2(2,2)	2(2,2)	5.00×10 ²	0.534
Size of physically attractive man shoe ¹ [1(small), 2(medium), 3(large)]	2(2,2)	2(2,2)	2.51×10 ⁵	0.129
Preference for men feet size ² [1(larger), (smaller), (medium)]	3(2,3)	3(2,3)	2.48×10 ⁵	0.422
Uncomfortable foot ³ [1(right foot), 2(left foot)]	2(1,2)	2(1,2)	2.43×10 ⁵	0.793
Least attractive male feet size (whole stimuli) ⁴ [A(1 and small)-E(5 and largest)]	2(1,4)	3(1,5)	2.42×10 ⁵	0.243
Most attractive male feet size (whole stimuli) ⁴ [A(1 and small)-E(5 and largest)]	3(2,3)	3(2,4)	2.23×10 ⁵	0.000
Least attractive female feet size (whole stimuli) ⁴ [A(1 and small)-E(5 and largest)]	3(2,5)	3(2,5)	2.45×10 ⁵	0.076
Most attractive female feet size (whole stimuli) ⁴ [A(1 and small)-E(5 and largest)]	3(2,3)	2(1,3)	2.34×10 ⁵	0.003
Least attractive women feet (feet only) ⁵ [A(1)-E(5)]	3(1,4)	3(1,4)	2.49×10 ⁵	0.714
Most attractive women feet (feet only) ⁵ [A(1)-E(5)]	3(2,4)	3(2,4)	2.46×10 ⁵	0.110

⁵[A(1)-E(5)], [C(3) smallest then B(2), E(5), D(4) and A(1) largest]

TABLE 3: Effect of ethnicity on attractiveness ratings in feet stimuli

Variables	Median (25 th , 75 th)			f-value	p-value
	Yoruba (n=437)	Igbo (n=144)	Hausa (n=610)		
Size of physically attractive woman shoe ¹ [1(small), 2(medium), 3(large)]	2(2,2)	2(1,2)	2(2,2)	0.461	0.709
Size of physically attractive man shoe ¹ [1(small), 2(medium), 3(large)]	2(2,2)	2(2,3)	2(2,2)	8.387	<0.001
Preference for men feet size ² [1(larger), (smaller), (medium)]	3(2,3)	3(2,3)	3(2,3)	7.8	<0.001
preference for women feet size ² [1(larger), (smaller), (medium)]	3(2,3)	3(2,3)	3(2,3)	1.568	0.196
Uncomfortable foot ³ [1(right foot), 2(left foot)]	2(1,2)	1(1,2)	2(1,2)	1.281	0.279
Least attractive male feet size (whole stimuli) ⁴ [A(1 and small)-E(5 and largest)]	3(2,5) ^{ac}	2(1,5) ^a	2(1,4) ^c	3.446	0.016
Most attractive male feet size (whole stimuli) ⁴ [A(1 and small)-E(5 and largest)]	3(2,4)	3(2,4)	3(2,4)	7.627	<0.001
Least attractive female feet size (whole stimuli) ⁴ [A(1 and small)-E(5 and largest)]	3(2,5)	3(2,5)	3(2,5)	0.887	0.447
Most attractive female feet size (whole stimuli) ⁴ [A(1 and small)-E(5 and largest)]	2(2,3)	3(1,3)	2(1,3)	1.706	0.164
Least attractive women feet (feet only) ⁵ [A(1)-E(5)]	3(1,4)	3(2,4)	3(1,4)	1.895	0.128
Most attractive women feet (feet only) ⁵ [A(1)-E(5)]	3(2,4)	3(2,4)	3(2,4)	0.072	0.975

⁵[A(1)-E(5)], [C(3) smallest then B(2), E(5), D(4) and A(1) largest]

Overall, the current study reinforces the understanding that foot length exhibits sexual dimorphism, with males generally having longer feet than females, and that a slight asymmetry exists, with the left foot being longer than the right in both sexes. These findings have implications for understanding physical development patterns and may also be relevant for fields such as anthropometry and ergonomics.

In addition, findings revealed that females generally have smaller feet than males, and both genders prefer smaller feet for females, with females showing a stronger preference for this trait. This preference aligns with evolutionary theories suggesting that smaller feet in females may be associated with health, youthfulness, and reproductive capacity, which could drive sexual selection for smaller feet in women (Voracek *et al.*, 2007; Little *et al.*, 2011).

In contrast, previous research by Fessler *et al.* (2005a) posited that natural selection would favor larger proportionate foot sizes in women due to pregnancy-related changes in center of gravity and increased fall risks.

They hypothesized that pedal dimorphism reflects historical intersexual selection based on male preferences for signs of female youth and nulliparity. Barber (1995), also identified feet as another potential index of nubility because they provide reliable information about both age and parity.

As woman ages and bears children, the size of her foot increases (Barber, 1995; Kushnick, 2013) and this can possibly advocate larger feet to be seen or perceived as unattractive. This is in contrast with the current study, which finds that females perceive slightly larger male feet as more attractive, while males rate slightly smaller female feet as attractive.

In contrast with the present study, Kushnick, (2013), revealed that the Karo Batak prefers women with big feet and men in the community were overheard saying that a woman with larger feet was stronger and thus more industrious in the rice fields.

The results supplement to a growing body of evidence that mating preferences may be governed by socially transmitted norms of recent origin (Tovee *et al.* 2006; Little *et al.* 2011).

Moreover, the results indicate that, in choosing foot size for attractiveness, females preferred smaller feet more than males, who favored medium-sized feet for both genders. This finding is consistent with Fessler *et al.* (2005b), which found a general preference for smaller feet in women across various cultures. However, discrepancies exist, as other studies, including those by Fessler *et al.* (2012), found mixed preferences for female foot size depending on the region, with some showing a preference for larger feet and others for smaller.

However, when participants were asked to choose foot sizes without visual stimuli, both genders preferred medium-sized feet for both men and women. This preference was consistent with their ratings of feet size when stimuli were presented.

The study also noted that the left foot was often considered more uncomfortable, likely due to its larger size compared to the right foot, which has practical implications for shoe manufacturing and this conforms to the foot measurement in this present study. This study supports the hypothesis that relative foot size, rather than absolute foot size, plays a significant role in attractiveness judgments, especially in females.

It highlights how foot size preferences align with evolutionary theories and cultural contexts. Smaller relative foot sizes are preferred in females, consistent with evolutionary theories suggesting that smaller feet in women are associated with youthfulness and reproductive potential while for males, larger absolute foot size might be preferred due to its association with stature and dominance. However, in the absence of other information, preferences tend to favor medium-sized feet for both genders (Fessler *et al.*, 2005a).

Generally, this study contributes to the understanding of foot size preferences and their evolutionary and cultural implications, highlighting differences between perceived and actual attractiveness and the influence of cultural and environmental factors on these preferences.

The study reveals slight variations in foot size preferences across ethnic groups.

While the medium foot size is generally preferred for both males and females, the Igbo participants preferred smaller female feet compared to other groups. In consistency, Fessler *et al.* (2012) and other studies like, Voracek *et al.*

(2007); Krauss *et al.* (2008), found that preferences for smaller female feet are consistent across various cultures, although some regions displayed unique patterns.

For males, the preference often leaned toward medium-sized feet.

In the context of ethnicity, this study found that all ethnic groups prefer medium-sized feet for males when no stimuli are presented.

This preference was reflected in the choice of intermediate foot sizes as attractive while preferences for female foot sizes varied, with the Yoruba and Hausa favoring smaller sizes while the Igbo preferred medium sizes.

This suggests a cultural influence on attractiveness standards. In this current study, the left foot was generally perceived as more uncomfortable across various ethnic groups, which aligns with the observation that it is often larger than the right foot.

This has practical implications for shoe manufacturing, suggesting that shoes should be designed to accommodate slightly larger left feet. Overall, this study contributes to understanding how relative foot size influences attractiveness judgments and how these preferences may vary by culture and ethnicity.

It underscores the importance of considering both evolutionary and cultural factors when examining perceptions of physical attractiveness.

Conclusion

There is asymmetry in foot comfort which might be due to the differences in foot length among the participants and it is also sexually dimorphic. Medium size foot was perceived as the most attractive foot between gender, and across ethnicity. Gender and ethnicity may affect attractiveness perception of an individual which might have a link to reproductive and overall health of an individual. It is recommended that this kind of study should be applied in fertility clinic to ascertain some link of smaller feet to fecundity.

Acknowledgements:

We wish to thank all those students that participated in the study as well as those who contributed in this study.

Conflict of Interest:

No existing or potential conflict of interest

Source of Funding:

None

Authors' Contributions

RMK, KBU, HU; Data collection, LHA; Data cleaning, Data Analysis and Discussion, JAT; Supervision of entire thesis and informed the appropriate Data, Analysis to be used, BD; Supervision of the entire thesis and Editing, OHE- Supervision.

Article History:

Received: 3rd January, 2025.

Accepted: 04th June, 2025.

Published online: 1st October 2025

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