

# Penile Morphometrics and Erectile Function in Healthy Portuguese Men

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## ABSTRACT

**Objective:** This study aimed to evaluate the relationship between penile morphometrics and erectile function in a sample of healthy Portuguese men.

**Methods:** A sample of 1416 adult men with an average age of 39 years were surveyed and completed the following measures: socio-demographic questionnaire, penile morphometrics evaluation questionnaire, and the Portuguese version of the International Index of Erectile Function-5 (IIEF-5).

**Results:** The average result for penis length was 16.75 cm (SD=2.25) and a circumference of 9.56 cm (SD=2.38). Levels of satisfaction with the morphometrics of the penis were relatively high (7.61 on a scale of 1 to 10, SD=1.87), as well as overall levels of erectile function (4.21 on a scale of 1 to 5; SD=0.61). Results showed a negative association between penis length and erectile function ( $r=-.242$ ;  $p<0.05$ ), and positive association between the circumference and erectile function ( $r=0.183$ ;  $p<0.05$ ); penile length and circumcision was associated with less erectile function.

**Conclusion:** This study provides evidence that penile morphometrics interferes with erectile function and this is an important source of information for professionals working in the male sexual health field.

**Keywords:** Penile morphometric; Penis size; Penis circumference; Erectile function; Portugal

## INTRODUCTION

Human penile morphometry has been the target of much curiosity in all historical and cultural contexts of social evolution, insofar as it traditionally represented considerations associated with hegemonic masculinity, describing values such as potency, fertility, strength, and power [1,2]. More specifically, the size of the penis has been portrayed since prehistoric art, passing through classical Greece and Rome, with an accentuation of its length and thickness, emphasizing the validation of sexual function [3], and creating an overvaluation of culture measurement of the penis, even though it is currently necessary in some situations, for example, in the diagnosis of micro or micro-penis or assessments before penile surgical interventions [4].

The possibility of measuring the length of the penis and evaluating the measurement standards for the human population allows the necessary knowledge to resolve clinical situations related to dissatisfaction with its length [5,6], but, at the same time, may raise concerns about the normativity of this

length and, with this, feelings of dissatisfaction or anxiety, such as the small penis syndrome, in which the man is ashamed because of the size of his penis [7], or still, penile dysmorphism that describes a condition where the man seeks aesthetic or medical-surgical treatment for believing that his penis is too short, even if both the measure and the sexual function are normal [8,9]. Given the scientific and academic importance of penile morphometry, it is possible to find several studies in literature, focusing mainly on the length and circumference of the penis [10-18], making it possible to state that, according to the systematized data collected in a total of 15.521 men from around the world, on average, the measurements for length are: 9.16 cm (SD=1.57) while flaccid, 13.24 cm (SD=1.89) while stretched, and 13.12 cm (SD=1.66) while erected [19]. The standard measures for the Portuguese man were defined as follows [20], 9.85 cm (SD=1.83) while flaccid and 15.14 cm (SD=2.11) while stretched. Penis length is defined as the linear distance between the pubic symphysis and the tip of the glans [21]. However, the various population surveys demonstrate the lack of universality in the standardization of

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these measured parameters, depending on the assessment techniques, nationality or race of the participants, the body mass index, disease conditions or others, which can generate difficulties in the adequate treatment of sexual problems, namely, in erectile dysfunction.

A global view of the epidemiology of sexual dysfunction forces us to accept that erectile dysfunction is very prevalent today (33.7% for American men or 47% for middle-eastern men) [22], and on the other hand, some studies show that men who have erectile dysfunction have smaller penises when compared to men without erectile dysfunction [23]. However, this relationship is not clear, since other variables may be mediating this difference such as an overall self-assessment of dissatisfaction with the size of the penis. In fact, men with greater concerns for their penis size have significantly smaller penises than men without such concerns [22], which may justify some interference with sexual function in general and erectile function in particular. Thus, given the lack of Portuguese studies on the relationship between penile morphometry and erectile function, the present study was developed.

## MATERIALS AND METHODS

### Participants

1416 Portuguese men participated in this study, 33.40% were single and 38.10% were married, mostly with university degrees. With regard to sexual orientation, 93.40% of the participants identified themselves as heterosexual and 45.80% said they had children. With regard to the place of residence, 88.40% said they lived in an urban environment and the majority (72.30%) said they were employed. With regard to age, the average age was 38.74 years (SD=13.63), ranging from 18 to 65 years old, who said they had no physical or mental health problems diagnosed at the time. All of these data can be better analyzed in (Table 1).

**Table 1:** Sociodemographic characteristics of the sample participants (n=1416).

|                               | n   | %     |
|-------------------------------|-----|-------|
| <b>Marital status</b>         |     |       |
| Single                        | 490 | 33.40 |
| Married                       | 548 | 38.10 |
| De facto union                | 129 | 10.00 |
| Widower                       | 16  | 1.10  |
| Dating                        | 129 | 10.00 |
| Other                         | 104 | 7.40  |
| <b>Educational attainment</b> |     |       |
| Up to 9 years of school       | 35  | 2.90  |
| Up to 12 years of school      | 185 | 12.90 |

|                                |      |       |
|--------------------------------|------|-------|
| University training            | 3    | 0.37  |
| Pre-graduation                 | 464  | 32.80 |
| Post-Graduation/Master's level | 535  | 37.40 |
| Ph.D.                          | 191  | 13.63 |
| <b>Sexual Orientation</b>      |      |       |
| Heterosexual                   | 1320 | 93.40 |
| Bisexual                       | 27   | 1.90  |
| Gay                            | 69   | 4.70  |
| <b>Children</b>                |      |       |
| No                             | 767  | 54.20 |
| Yes                            | 649  | 45.80 |
| <b>Place of residence</b>      |      |       |
| Rural                          | 164  | 11.60 |
| Urban                          | 1252 | 88.40 |
| <b>Occupation</b>              |      |       |
| Unemployed                     | 82   | 6.20  |
| Student                        | 202  | 15.30 |
| Employed                       | 1061 | 72.30 |
| Retired                        | 56   | 4.60  |
| Other                          | 15   | 1.60  |

### Measures

In order to obtain information about the participants, a sociodemographic questionnaire was built which included items such as age, current place of residence, level of education, marital status, sexual orientation, having or not children and the professional situation were included. It was also asked what their current weight and height was to determine the body mass index and whether the penis was circumcised or not. In order to assess the general health status, two self-reported items were formulated ("Do you have any physical health problems diagnosed at this time?" And "Do you have any mental health problems diagnosed at this time?"). Regarding the assessment of penis length and circumference, we opted for the operationalization of Lever et al. [24] based on self-report, which can be a viable source for this type of measurement [25]. The following questions were asked: "How long is your penis erect, in centimetre's?" and "What is the circumference of your penis when erected, in centimetre's?". The level of satisfaction with penis morphometry was also assessed with the question: "On a scale of 0-10, indicate how satisfied you are with your penis size

and circumference". For the evaluation of erectile function, the Portuguese version of the International Index of Erectile Function-5 (IIEF-5) [26], was used. This is a scale with good psychometric properties, so its use in the Portuguese male population is recommended. The five items are: "How do you rate your confidence in being able to have and maintain an erection?"; "When you had erections with sexual stimulation, how often were your erections hard enough to achieve penetration?"; "During sexual intercourse, how often were you able to maintain your erection after penetration?"; "During sexual intercourse, what was the difficulty you had in maintaining your erection until the end of sexual intercourse?"; and "When you tried to have sex, how often did you feel satisfied?" These five items were submitted to reliability assessment, and a very good Cronbach's alpha score was obtained (0.82), which indicates that the scale has very good internal consistency [27].

### Procedures

The survey was conducted between September 2019 and December 2019. Recruitment consisted of online notifications (emails and electronic messages) and advertisements sent to community organizations, mailing lists, and social networks, such as Facebook. Participants responded to the study's

outreach online through a website created for this purpose. All advertisements referred participants directly to the online survey, where they were informed that their responses would be anonymous and confidential, in accordance with the Helsinki Declaration of ethical principles concerning research involving human subjects. The first page of the questionnaire explained the study's objectives and informed participants about how to complete the survey, their freedom to withdraw from the study at any time, and how to contact the author for further information about the study if needed. Confidentiality was ensured by using codes on documents containing study data, by encrypting identifiable data, by assigning security codes to computerized records and by limiting access to identifying information (e.g., IP addresses).

### RESULTS

As can be seen in Table 2, men have normative height and weight, with a penis length of 16.75 cm (SD=2.25) and a circumference of 9.56 cm (SD=2.38). The level of satisfaction with penis morphometry is relatively high (7.61 on a scale of 1 to 10; SD=1.87), as well as the total assessment of the level of erectile function (4.21, on a scale of 1 to 5; SD=0.61). The majority of men reported being uncircumcised (81.8%).

**Table 2:** Results for the descriptive measures (n=1416).

|      | Height   | Weight   | Penis length while erected | Penis circumference while erected | Level of satisfaction (1-10) | Level of Erectile Function |
|------|----------|----------|----------------------------|-----------------------------------|------------------------------|----------------------------|
| Mean | 174.5 cm | 76.98 kg | 16.75 cm                   | 9.56 cm                           | 7.61                         | 4.21                       |
| SD   | 7.46 cm  | 14.65 kg | 2.25 cm                    | 2.38 cm                           | 1.87                         | 0.61                       |

Table 3 describes the results for the association between morphometric measurements, satisfaction with penile morphometry, IIEF-5 items and total level of erectile function, and it can be seen that statistically significant values were obtained (p<0.05) for all associations, using Pearson's coefficients for correlational measures. The following stand out: there is a moderate and negative correlation between penis length and total erectile function, that is, the greater the length of the penis, the lower the erectile function (r=-.242; p<0.05);

although there is a significant and positive correlation (despite being weak) between penis circumference and erectile function (r=0.183; p<0.05), there is a strong correlation between length and circumference. On the other hand, penis circumference seems to be more associated to satisfaction with penis morphometry than penis length. It should also be noted that the all five items of the IIEF-5 are strongly correlated with the total IIEF-5.

**Table 3:** Correlation matrix between penis morphometrics and erectile function.

|                                  | 1       | 2       | 3       | 4      | 5 | 6 | 7 | 8 |
|----------------------------------|---------|---------|---------|--------|---|---|---|---|
| 1. Penis length                  |         |         |         |        |   |   |   |   |
| 2. Penis circumference           | 0.347** |         |         |        |   |   |   |   |
| 3. Satisfaction with morphometry | 0.256*  | -0.189* |         |        |   |   |   |   |
| 4. IIEF -1                       | 0.268*  | -0.195* | 0.309*  |        |   |   |   |   |
| 5. IIEF -2                       | -0.198* | 0.189*  | -0.282* | 0.161* |   |   |   |   |

|               |         |         |        |         |         |         |         |         |
|---------------|---------|---------|--------|---------|---------|---------|---------|---------|
| 6. IIEF -3    | -0.206* | 0.144*  | 0.140* | 0.389** | 0.326** |         |         |         |
| 7. IIEF -4    | -0.146* | -0.158* | 0.189* | 0.604** | 0.243*  | 0.481** |         |         |
| 8. IIEF -5    | -0.169* | 0.180*  | 0.154* | 0.337** | 0.233*  | 0.430** | 0.500** |         |
| 9. Total IIEF | -0.242* | 0.183*  | 0.170* | 0.721** | 0.587** | 0.718** | 0.815** | 0.790** |

\*<0.05; \*\*<0.001

Also, there are significant differences both for item IIEF-2 and for the total IIEF depending on whether the participants are circumcised or not, as it can be seen in Table 4, where the t-student statistic for independent samples was used. No

differences were found in relation to the morphometric measurements, however, it was found that for both IIEF-2 and total IIFE, uncircumcised men show higher levels of erectile function.

**Table 4:** Results by circumcision.

|                          | Circumcision | Mean  | SD   | p      |
|--------------------------|--------------|-------|------|--------|
| Penis length             | Yes          | 16.30 | 3.43 | 0.488  |
|                          | No           | 16.84 | 2.08 |        |
| Penis circumference      | Yes          | 9.58  | 2.40 | 0.271  |
|                          | No           | 9.54  | 2.36 |        |
| Morphometry satisfaction | Yes          | 7.77  | 2.94 | 0.836  |
|                          | No           | 7.65  | 1.61 |        |
| IIEF -1                  | Yes          | 4.38  | 0.74 | 0.764  |
|                          | No           | 4.45  | 0.69 |        |
| IIEF -2                  | Yes          | 3.90  | 0.99 | 0.048* |
|                          | No           | 4.39  | 0.80 |        |
| IIEF -3                  | Yes          | 4.38  | 0.92 | 0.467  |
|                          | No           | 4.41  | 0.66 |        |
| IIEF -4                  | Yes          | 4.25  | 0.89 | 0.375  |
|                          | No           | 4.39  | 0.75 |        |
| IIEF -5                  | Yes          | 3.92  | 0.95 | 0.496  |
|                          | No           | 4.15  | 0.83 |        |
| IIEF total               | Yes          | 3.92  | 0.77 | 0.049* |
|                          | No           | 4.29  | 0.65 |        |

\*<0.05; \*\*<0.001

## DISCUSSION

This study sought to assess the morphometry of the penis in a sample of Portuguese men based on self-report and to determine the degree of association between these measures and erectile function. Thus, the value of 16.75 cm ( $\pm$  2.38 cm) was obtained, which, despite being slightly higher than the value obtained for the Portuguese population [20], is within the normative standard and equal to the French study [28]. The same was true for the circumference. These results were already expected as, even in large-scale studies based on internet collection, most men tend to report median values when measuring their penis size [24], attributing an eventual but not significant bias to the lack of control of the measure, either because there is no standard instrument or because of the subjective look with which each man may have carried out his measurements. Even so, given the size of the sample, the fact that it is differentiated in relation to academic training and perceives itself as healthy, allows us to accept these data as reliable.

Most men said they were very satisfied with the morphometry of their penis, unlike other studies where aspects associated with anxiety about a small penis may have interfered with the results [24-29]. However, these studies were carried out in other cultural contexts or with groups of specific men, for example, men diagnosed with dysmorphophobia or gay men [25-30]. What seems to be linked to good satisfaction with penile morphometry is, precisely, a good erectile function [31] which, in this sample, was also verified.

The most interesting and surprising data of this study concerns the fact that a longer penis length is associated with a lower erectile function, the opposite being true for the perimeter. These results contradict the conclusions of other authors [23-32], but this is probably due to the fact that their results compare men diagnosed with erectile dysfunction under treatment. The fact that larger penises are subject to less erectile function can be explained by age (possible decline in erectile function associated with age and decreased testosterone production) [33], given that, on average, participants are 39 years old, but on the other hand, longer penises may be more prone to damage to spongy and cavernous bodies or Peyronie's disease [34], and sub consequent erectile dysfunction.

Circumcision as being associated with the less erectile function was also an important result. As other studies have concluded [35-37], circumcised men have more erectile problems, not only for mechanical reasons associated with glans exposure and decreased sensitivity, but also for reasons of an emotional or stress-related nature, since in Portugal the overwhelming majority of men are not circumcised, being only those who have some kind of clinical situation, such as phimosis, those who are referred for circumcision.

Very few studies have focused on the study of the relationship between penile morphometry and erectile function, especially in a positive perspective of studying a healthy sample and in Portugal. For this reason, the present study is pioneering, although it is not exempt from some limitations: it is a cross-sectional study conducted through the internet, which does not

allow the generalization of the results. It will, therefore, be beneficial to carry out more population-based studies and also using clinical populations, in order to explore other possible relationships in order to deepen the understanding of the relationship between penis morphological factors and erectile function.

## CONCLUSION

In conclusion, this study shows that penile morphometry interferes with erectile function, constituting an important source of information and training for professionals working in the field of male sexual health.

## CONFLICT OF INTEREST

The authors report no conflicts of interest concerning the materials or methods used in this review or the findings specified in this paper. The authors have no competing financial interests related to this study.

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