The Self-Assessment of Genital Anatomy, Sexual Function and Genital Sensation (SAGASF-M) Questionnaire in a Belgian Dutch-speaking male population: A validating study.

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ABSTRACT

Introduction

Penile and genital surgery for congenital or acquired conditions is daily practice in reconstructive urology. These procedures, which carry the risk of disrupting nerves and blood vessels, may impair the genital sensation, and affect the capacity for sexual pleasure. Self-reported tools are needed to systematically assess the male genitalia before and after reconstructive surgeries in terms of genital sensation and sexual experience.

Aim

This study validated the Dutch translation of the self-assessment of genital anatomy and sexual functioning (SAGASF-M) questionnaire and investigated the perceptions of healthy men regarding their genital anatomy and sensory function.

Methods

Eight-hundred and eight sexually active men with a median age of 39 years (18-79 years) and no history of genital procedures other than circumcision filled out an online version of the questionnaire. Twenty-four participants were randomly recruited to confirm the responses of the SAGASF-M questionnaire by a clinical evaluation.

Main outcome measures

The SAGASF-M questionnaire comprises of multiple-choice questions and clarifying illustrations asking men to rate their genital appearance, overall sexual sensitivity, and pain perception as well as the intensity

and the effort to reach orgasm. Prespecified regions of the glans, penile shaft, scrotum, perineum, and anus are evaluated through this questionnaire.

Results

Only slight variability in anatomical ratings was observed. Overall discrimination between different genital areas in terms of genital sensation was significant. The bottom of the glans or frenular area was rated the highest contributor to "Sexual pleasure", followed by the other regions of the glans and shaft. The same distribution was found for "Orgasm intensity" and "Orgasm effort". The anal region was generally rated the lowest. "Discomfort/Pain" was rated lower than any of the other sensory function indicators and the top of the glans and anal region were rated most likely to perceive this unpleasant sensation. Participants reported significantly more sexual pleasure and intense orgasms when stimulated by a sexual partner compared to self-stimulation. Homosexual and bisexual men reported a higher contribution of the perineal and anal regions in sexual pleasure and orgasm. No significant difference between circumcised and uncircumcised individuals regarding overall genital sensation could be found.

Conclusion

The Dutch translation of the SAGASF-M questionnaire is a valuable and reliable tool for self-assessment of genital anatomy and sensation, providing a site-specific attribution of a patient's perceived sexual function. Further prospective research with this questionnaire could aid in the patient-centered improvement of genital surgery.

INTRODUCTION

Penile and genital surgery for congenital or acquired conditions, including hypospadias, buried penis, urethral stenosis, and curvature is part of the daily practice for the reconstructive and pediatric urologist. Surgical procedures for personal reasons such as circumcision at the request of the patient or the parents, are also very common. Apart from surgical complications and objective measurements, patient-reported outcome after penile surgery often emphasizes on voiding function, erectile function, and ejaculation. Within these topics, validated Reported Outcome Measure (USS-PROM), International Index for Erectile Function (IIEF) and Sexual Health Inventory for Men (SHIM) are readily available (1–4). Like other surgeries, genital surgery carries the risk of disruption of nerves and blood vessels. This may impair the genital sensation and therefore affect the ability to experience sexual pleasure (5). Anatomic and

physiologic studies have shed light on the innervation of the human penis (6–9). Yet, little is known about the sensory regions being innervated by these genital branches. Various sensory function tests such as Semmes-Weinstein monofilaments, the bio-thesiometer and somatosensory evoked potential (SSEV) tests have been used to evaluate sensitivity thresholds of the male genital area (10–12). All of them measure the objective decrease or increase in sensitivity of certain genital areas after surgery, but it has been argued that objective evaluation does not always match that of the patient in an erotic setting (13–15). Therefore, the evaluation for self-reported genital sensation and its relation to sexual function between patients with and without a history of genital surgery is highly needed but no normative large body of data exists to date.

Tools are needed to systematically assess the male genitalia, as reported by the patient, before and after reconstructive surgeries in terms of genital sensation and sexual experience in an actual erotic situation. To address this shortcoming, the 'Self-Assessment of Genital anatomy and Sexual function in Male' (SAGASF-M) questionnaire was developed by Schober et al. in 2009 (16). The present study aimed to validate the translated version of the SAGASF-M questionnaire in Belgian, Dutch speaking men. We investigated whether a large sample of men without genital surgeries can discriminate between different areas of the genital region in terms of sexual function. In addition, we compared the responses from this questionnaire with respones to comparable questions asked by an examining urologist. We also performed a physical examination to let patients rate their sensory function of this region as confirmation.

METHODS

To be eligible for inclusion, participants must be cisgender male, above 18 years of age and have been sexually active in the past 12 months. Transgender men, gender non-conforming persons, individuals with a history of surgery to the genitalia other than circumcision, or individuals who were sexually inactive in the past year, were excluded. Over the course of eight consecutive months, respondents were randomly recruited through flyers that were distributed in public places in the Dutch speaking region of Belgium. In addition, the local press and social media were used to include participants. The leaflet explained that the Ghent University Hospital was conducting a survey on genital sensitivity and sexual function in a cisgender male population. Each individual was invited to complete the online version of this questionnaire and was asked to provide informed consent for use of the provided information in scientific research. Participants' privacy and confidentiality were ensured by use of a secured and anonymous database. Quality control was performed by use of repetitive questions. Entries with clear inconsistencies in these control questions were excluded. All participants were asked to leave their contact information if they wished to continue participating in the second part of the study. Of these, a test sample was randomly invited to participate in a

urological examination performed by an experienced reconstructive urologist (A.F.S.). Ethics approval was obtained from the university's ethics committee (EC2009-629).

The original version of the SAGASF-M questionnaire (16) was translated into Dutch by two independent researchers. Consensus between the two translations was obtained with discussion in case of inconsistencies. The final version of the Dutch questionnaire was back translated by a native English speaker. Comparison between the two versions of this questionnaire did not lead to substantial loss of information (previous work). In the first part of the questionnaire, participants were asked to describe their genital anatomy by selecting one of several options on questions like penile deviation, penile size, form of scrotum and position of the urethral meatus. In the second part, participants were asked to rate genital sensitivity on five-point Likert scales for sexual pleasure, discomfort or pain, effort for achieving orgasm and orgasm intensity for several areas indicated on illustrations. Each of these areas were to be rated for sexual self-stimulation or stimulation by a sexual partner. As an example, sexual touch or stimulation of the lower (ventral) side of the shaft (area F) by self or partner produced sexual pleasure rated as 1, None; 2, Mild; 3, Moderate; 4, Strong or 5, Very strong. Furthermore, feelings of numbness or a tingling in these indicated areas as well as their intensity were assessed. In total 11 assessed anatomical locations were included in this questionnaire (Figure 1).

For the assessment of genital sensation by a urologist (A.F.S.), participants were randomly recruited and invited to the Urology department of the Ghent University Hospital for a clinical evaluation. Those participants were placed in supine position with the legs spread out after having undressed the lower body. The urologist rated genital anatomy in the same manner as the men had done before in the SAGASF-M questionnaire. A cotton swab was used to designate the different areas of the genital region while the participants were looking at the ceiling. For each of the different areas, participants were asked to rate sexual pleasure, discomfort/pain, orgasmic intensity, and effort for achieving orgasm on five-point Likert scales in a sexual context. The interval between the participants filling in the online questionnaire and having the clinical evaluation was two weeks.

Descriptive statistics were used to report on the epidemiological features as well as genital anatomy of included individuals. The different assessed anatomical locations of the genital area were compared using a Bonferroni corrected repeated measures ANOVA tests with a significance level of $p < 0.05$. As the effort for

achieving orgasm was only indicated on those genital areas that contributed to orgasm, numbers for this parameter were much lower. Therefore, we used separate Wilcoxon signed rank tests with a significance level that was lowered 11 times (as 11 anatomical locations tested) resulting in $p < 0.0045$. All ANOVA tests were followed by all possible pairwise group comparisons using paired students t-tests. ANOVA tests were also applied for the comparison between circumcised and uncircumcised individuals. Paired Wilcoxon signed rank tests were used to compare differences in stimulation between sexual self-activity and sexual activity with a partner. Kruskal-Wallis tests were applied to evaluate differences in distribution of genital sensation ratings for each of the evaluated genital locations between homosexual, heterosexual, and bisexual men. Paired Wilcoxon signed rank tests were also used to compare differences in the four assessed functional domains between the SAGASF-M questionnaires and the urological evaluation. Analysis was carried out using the statistical software package SPSS statistics Version 27 (SPSS Inc, Chicago, IL, USA).

RESULTS

Over the course of 8 months, a total of 808 valid entries were completed in the online version of the SAGASF-M questionnaire. All included participants were adults and had no history of genital surgery other than circumcision. All men were sexually active (by self or through their partner) in the last 12 months (Table 1). The median age of participants in the survey was 39 years (18-79 years). Correction for oversampling was performed by age and sexual preference based on 2021 demographical data from the National Office of Statistics (17). We could not correct for racial background as these numbers were not readily retrievable. Men who participated in the clinical evaluation had a median age of 36 years (27-65 years).

Most participants rated their penis as straight (50.5%) or slightly curved (24.8%) and average in size, both in flaccid (62.6%) and erect (67.9%) states. Scrotal anatomy was largely considered normal (80.1%) with average sized testicles (88.8-90.0%). The mean length and girth of the penis in erection was measured at 15.6 ± 2.46 cm and 11.3 ± 3.26 cm respectively (Table 2). There was 100% agreement with urologist's responses regarding anatomical variations. Perceived penile size however, corresponded in only 83% of cases. No systematic differences in rating were observed.

Uncircumcised individuals could discriminate significantly well ($p < 0.05$) between the 11 designated areas regarding genital sensation. The bottom of the glans was rated the highest contributor to "Sexual pleasure",

followed by the other regions of the glans and shaft as described in Table 3. The anus was rated the lowest. However, not all Bonferroni corrected pairwise comparisons were significant for areas other than the glans region. This ranking was similar for "Orgasm intensity" and "Orgasm effort" but fewer pairwise comparisons were significantly different. "Discomfort/Pain" was generally rated lower than any of the other sensory function indicators. The top of the glans was rated highest, followed by the area around the anus. There was no significant difference between circumcised (n of Circ = 152) and non-circumcised (n of N-Circ = 550) individuals for the overall comparison between areas B to K for "Sexual pleasure" ($F(1, 1) = 2.32$, $p = 0.128$), "Orgasm intensity" ($F(1, 1) = 0.06$, $p = 0.802$), "Orgasm effort" (n of Circ = 42, n of N-Circ = 141) ($F(1, 1) = 1.92$, $p = 0.167$) and "Discomfort/Pain" ($F(1, 1) = 0.04$, $p = 0.840$).

When evaluating only the glans areas (B, top of glans; C, bottom of glans; D, sides of glans), we found significantly lower scores in circumcised individuals for "Sexual pleasure" ($F(1, 1) = 14.9$, $p < 0.001$) and "Orgasm intensity" ($F(1, 1) = 5.29$, $p = 0.022$), but not for "Orgasm effort" (n of Circ = 117, n of N-Circ = 451) ($F(1, 1) = 1,19$, $p = 0.275$) or "Discomfort/Pain" ($F(1, 1) = 2.78$, $p = 0.096$). None of the other subdivisions of anatomic areas (e.g. shaft areas, scrotal areas, perineal areas) showed a significant difference between circumcised and uncircumcised individuals. Further comparisons were made between uncircumcised individuals and participants circumcised before or after sexarche (n of Circ shortly after birth or in childhood = 96, n of Circ in adolescence or adulthood = 56) (table 6 and figure 2). Here, "Sexual pleasure" and "Orgasm intensity" were rated significantly lower in individuals circumcised shortly after birth or during childhood compared to uncircumcised individuals ($F(1, 1) = 17.6$, $p < 0.001$ and $F(1, 1) = 7.41$, $p < 0.007$ respectively) but no significant difference was found between individuals circumcised at adolescence or adulthood and uncircumcised individuals ($F(1, 1) = 1.40$, $p < 0.237$ and $F(1, 1) = 0.14$, $p < 0.714$ respectively). "Sexual pleasure" and "Orgasm intensity" were not significantly different between individuals circumcised shortly after birth or during childhood and individuals circumcised in puberty or adulthood ($F(1, 1) = 3.11$, $p < 0.080$ and $F(1, 1) = 2.49$, $p < 0.116$ respectively). "Orgasm effort" and "Pain/Discomfort" was not significantly different between uncircumcised individuals and those circumcised shortly after birth or during childhood ($F(1, 1) = 0.33$, $p < 0.564$ and $F(1, 1) = 6.43$, $p < 0.011$ respectively) nor between uncircumcised individuals and individuals circumcised during adolescence or adulthood ($F(1, 1) = 1.32$, $p < 0.252$ and $F(1, 1) = 0.17$, $p < 0.680$ respectively). "Pain/Discomfort" was rated significantly higher in participants that were circumcised in puberty or adulthood compared to participants circumcised shortly after birth or during childhood ($F(1, 1) = 6.95$, $p < 0.009$). Again, none of the other subdivisions of anatomic areas showed a significant difference for age at circumcision.

We used the data from the unweighted sample to examine whether participant characteristics affected the answers given to the questionnaires. Overall, participants reported significantly more sexual pleasure (n of having sexual partner = 686; Z = 10.8; $p < 0.001$) and more intense orgasms (n = 686, Z = 4.52; $p < 0.001$) when stimulated by a sexual partner compared to self-stimulation. These findings were consistent in homosexual and heterosexual participants, but not in men having sexual contacts with both men and women (Table 4). Looking at the proportions of genital sensation ratings for each anatomic site between homosexual, heterosexual, and bisexual individuals, only the perineal and anal region showed significant differences. In the perineal region, homosexual individuals reported more sexual pleasure and more intense orgasms compared to heterosexual individuals ($p = 0.001$; $p = 0.016$, resp.), while bisexual individuals did not seem to defer significantly between either group. In the anal region, both homosexual and bisexual individuals reported more sexual pleasure ($p < 0.001$; $p = 0.014$, resp.) and more intense orgasm ($p < 0.001$; $p=0.020$, resp.) compared to heterosexual individuals. Between homosexual and bisexual men, no significant differences were found in ratings of the anal region.

Comparison of genital sensitivity during clinical evaluation with SAGASF-M scores is summarized in Table 5. Overall, functional ratings between the questionnaire and clinical evaluation corresponded well, showing the highest sensation ratings for “Sexual pleasure” and “Orgasm intensity”; and lowest ratings for “Orgasm effort” at the glans areas B to D. Except for the “Orgasm intensity” at the back of the scrotum (as area I; n = 24; Z = -2.17; $p = 0.030$) and perineum (as area J; n = 24; Z = -2.24; $p = 0.025$), no significant differences in genital sensation could be detected.

DISCUSSION

This study evaluated the use of the Dutch translation of the SAGASF-M questionnaire in a sample of 808 unoperated Dutch speaking, Belgian, cis-gender men, adding to the findings of previous publications on this questionnaire (16,18). More than 60% of participants reported their penile (62.6% flaccid, 69.1% erect) and scrotal (80.8%) size to be normal and urologist’s ratings matched well with those of participants (≥83%). These self-rated sizes seem to fit well in men’s general views on penile size (19). However, the exact numbers on penile size in our dataset revealed a slightly larger mean compared to the Caucasian mean of 14.3cm in erect state (20). As these numbers were self-reported, participants may have measured differently and overestimated their penile size. Given that most congenital urological conditions are treated in early childhood, only few individuals with minimal ‘anomalies’ could be found in this surgically untreated population sample. Sexual preference was originally reported higher for homosexual and bisexual

individuals compared to the Belgian mean (13.3% versus 4.2%) (17). A possible reason for this discrepancy may be that homosexual and bisexual men are more open to discussing sexual health issues than heterosexual individuals within the context of anonymity (21). This proportional difference is not present in the focus group of participants that were willing to undergo a clinical assessment, which could imply that the lifting of anonymity may cancel out any homosexual predominance.

Genital sensation scores on sexual pleasure and orgasmic intensity indicated that the bottom of the glans or frenular area were rated highest, followed by all other glans areas. However, not all Bonferroni corrected comparisons between genital areas were significant, meaning that the possibility to discriminate between genital areas regarding sexual stimulation decreases when genital regions other than the glans and shaft areas were assessed. These sensory distributions contrast with the results of the original study of Schober et al. where both the ventral glans and ventral shaft were rated equal and significantly above levels of all other areas (16). We could not indicate a specific reason for this difference in findings other than the difference in sample size (n = 81 in the original paper versus n = 808 in this study), which might have affected sensory distributions over these various tested genital regions. Anatomical and physiological papers suggested that the highest nerve density in the penis is to be found in the prepuce and dorsal glans, arising from the dorsal penile nerves which are the biggest sensory structures of the penis providing cortical input (8,22). The perineal nerves on the other hand, form a fine network on the ventral penile shaft and frenular area (23,24). These two nervous structures join together at the junction between the cavernosal bodies and the spongious body. However, the ratio in which each of these sensory nerves have a sexual stimulation function remains unclear. Looking more into the types of nerves that account for erogenous sensation, genital end bulbs (also genital corpuscles) located in the glans and not in the prepuce have been put forward as being the largest contributor to sexual pleasure compared to other receptors (free nerve endings, Meissner corpuscles, Krause's end bulbs, panician corpuscles, Rufini corpusles) (9). These are coiled nerve endings of myelinated axons involved in the sensation of light touch and are found to be most prominent at the penile frenulum and coronal ridge. A recent paper studies this site-specific histology further and postulates a gradient hypothesis, meaning that the distal ventral aspect of the penis has the highest general (and genital corpuscular) nerve density and that concentrations of nerve endings diminish towards the dorsal and proximal aspect. (25) These findings might indeed strengthen our results that the frenular and glandular areas are rated highest contributors to sexual pleasure and orgasm intensity in our sample. As the prepuce is moved back and forth in uncircumcised men, this in turn could stimulate the frenulum, corona and ventral side of the penile shaft where it emerges from. Therefore, as a recent review on the histological basis of

genital sensation states, it would be arguable that not the prepuce itself but rather the presence or absence of it has an impact on penile sexual sensation (26).

Despite discomfort and pain being generally rated as low, the glans areas together with the anal region were rated as the most painful. As these regions were rated most sensitive across the board, it does not seem surprising. In a previous report on genital sensation in women with sexual disfunction, the authors stressed the link between discomfort in the genital area and being at risk for female sexual disfunction (27). Therefore, a similar association could well exist in men. Alternatively, pain and pleasure have been described as stimuli that are closely intertwined as they can both contribute to a hormonal reward experience within a sexual context (28, 29). People seeking pleasure in pain show a rise in cortisol and endorphin levels, which argues for the pleasure inducing impact of bodily induced stress that is also seen after sport activities.

As one would expect, the overall genital sensation ratings did not differ significantly between circumcised and uncircumcised individuals. However, when focusing on anatomical subgroups, circumcised individuals rated sexual pleasure and orgasm intensity significantly lower in the glans region. When further examining these individuals based on the age at which circumcision was performed, we found that this lower rating in sexual pleasure and orgasm intensity was only significant in individuals circumcised before puberty. Secondarily, we found that pain and discomfort were rated higher in individuals circumcised during or after puberty compared to those circumcised in childhood. Vast bodies of literature on the impact of circumcision on sexual function have been reported (26, 30-32). Most of these conclude that removal of the prepuce has no impact on overall sexual function. Therefore, we took caution in interpreting these results and the authors did not claim that these statistical results may have any clinical relevance. The minority of adult individuals who are circumcised after sexarche usually have circumcision performed for specific underlying conditions such as (para)phimosis, lichen sclerosis, trauma, balanitis, or penile cancer. These underlying conditions themselves may have significant impact on sexual functioning, confounding the role of the removed prepuce (33-35). This is a finding that has also been put forward in a study by Bassio et al. (36) They compared light touch, pain and temperature sensations between circumcised and uncircumcised men using monofilaments and thermal probes. They concluded on the one hand that circumcision does not seem to impair sensation on the rest of the penis, while on the other hand finding that the prepuce is sexually not the most important zone of the male genital region. Given that the density of the general light-touch pressure receptors (Meissner corpuscles) is higher in the prepuce than the glans, it is not unexpected

that this zone has a lower pressure threshold. This however does not necessarily mean that sexual stimulation follows this distribution. In our sample, around a third of circumcised individuals had undergone this procedure during or after puberty and are reporting more pain sensation during sexual activity. This could be an indication that the circumcision was performed for an underlying condition. However, we did not inquire into the reason for circumcision in this study.

Participants who indicated having sexual intercourse with a partner reported significantly more sexual pleasure and intense orgasms when stimulated by their partner compared to self-stimulation. This showed that partnered intercourse yields a more intense genital stimulation and possibly a more qualitative sexual experience than self-stimulation. A recent paper indeed showed these same findings in a sample of over five hundred men and women using an online survey assessing their perceived sexual pleasure in various sexual activities (37). Multiple factors, including closeness to each other, building trust, feeling desired and giving pleasure to a sexual partner have been put forward to play a role in women's partnered sexual contact (38). Another study showed that men tend to defer to masturbation as a compensatory measure when partnered intercourse is not possible or not as often desired by the partner, suggesting that partnered intercourse is the preferred form of sexual contact (39). In this same study, it is stated nonetheless that masturbation and partnered sex should not be seen solely as substitutes. They do complement each other in both men and women in healthy relationships.

Both homosexual and bisexual individuals reported significantly more sexual pleasure and orgasm intensity in the perineal and anal regions. This could indicate that these groups of individuals are more likely to use these anatomical regions compared to heterosexual individuals. Generally, homosexual men tend to engage more in anal stimulation compared to heterosexual men during sexual activity. However, recent studies indicated that numbers of heterosexual men discovering the anal region as pleasurable might be increasing. (40, 41). A qualitative study on 30 young heterosexual men showed that participants could speak openly on the idea of anal stimulation during sexual activity. They did not see anal stimulation as a form of homo-erotic sexual activity but rather a form of sexual exploration. Nearly half of the individuals had actually experienced anal stimulation and the majority of them would explore it further (42). The other study showed that around 20% of heterosexual men would engage in anal sexual stimulation and that men aged 35 and above were more likely to do so (43). In our study, however, we did not ask individuals specifically what sexual role (receptive or not) they fulfill during penetrative sexual intercourse, which might impact the degree to which the anal and perineal regions contribute to the sexual act.

Several limitations must be addressed in our study. Firstly, we evaluated self-reported genital sensation in a Dutch speaking Belgian male sample consisting mainly of Caucasian, heterosexual highly educated individuals of younger age. Although we corrected our data for age and sexual preference, several other factors, including socio-cultural background, religion, medical history, amount of sexual experience, relationship quality and mental health status might affect the perceived genital sensation during sexual intercourse or self-stimulation. Secondly, the cross-sectional design in this study prohibited possible interferences about causality. Thirdly, participants were limited to providing only multiple-choice answers to predefined regions selected by the researchers. Open questions and response options like 'no sexual experience in this genital area', or the possibility to add other sexually stimulable areas of the body could have aided in the interpretation of results. Fourthly, questions regarding the sexual function as such were not asked. We did not know whether underlying problems in sexual functioning might have affected participants' answers to genital sensation in a sexual context. It is yet to be confirmed what effect a change in genital sensation might have on overall sexual functioning. Lastly, more quantitative and objective measures of genital sensation such as bio-thesiometry, Semmes-Weinstein monofilament testing, and others may be considered when interpreting the results of the SAGASF-M questionnaire as they could build a link between perceived and measurable genital sensation. This combined assessment could then be used to evaluate the impact on sexual functioning of various surgical interventions to the genital area.

Until now, we do not have a better tool to discriminate the genital region regarding sexual pleasure and contribution to orgasm other than asking specific questions on each target region. In this context, an individual's own judgement on sensation provides pivotal information regarding sexual function. The original study was designed to evaluate the use of this questionnaire in a healthy population. The questionnaire itself tries to capture differences in perceived sensation for very specific areas of the genital region. As sexual pleasure and orgasm are very personal sensory experiences with a multifactorial character, it is nearly impossible to be captured by a single evaluation tool. The authors believed that this questionnaire is not a good discriminator between different groups of individuals, but rather a tool to evaluate the effect of certain conditions or interventions within the same individual on a longitudinal level. To further analyze the construct and discriminant validity of this questionnaire, a large sample of men with different grades of underlying conditions or different types of genital surgery considering the grade of expected neuronal and vascular damage will be required.

CONCLUSION

This study extended the findings of previous reports on assessing an individual's anatomy and genital sensation. The SAGASF-M questionnaire could be a valuable tool for this purpose, providing a location specific mapping of a patient's perceived sexual function. Further prospective research with this questionnaire could aid in the design and evaluation of genital surgery.

AUTHOR CONTRIBUTION STATEMENT

W.C.: Initial manuscript, data acquisition, data analysis and interpretation

G.B.: Conceiving of presented idea, initial manuscript, data acquisition

N.L.: Critical evaluation and review of manuscript

P.B.: Conceiving of presented idea, critical evaluation and review of manuscript

A.F.S.: Conceiving of presented idea, data acquisition, critical evaluation and review of manuscript

BIBLIOGRAPHY

1. Jackson MJ, Sciberras J, Mangera A, Brett A, Watkin N, N'dow JMO, et al. Defining a patient-reported outcome measure for urethral stricture surgery. Eur Urol. 2011 Jul;60(1):60–8.

2. Rosen RC, Cappelleri JC, Gendrano 3rd N. The International Index of Erectile Function (IIEF): a state-of-the-science review. Int J Impot Res [Internet]. 2002;14(4):226–44. Available from: http://www.ncbi.nlm.nih.gov/pubmed/12152111

3. Barry MJ, Fowler FJJ, O'Leary MP, Bruskewitz RC, Holtgrewe HL, Mebust WK, et al. The American Urological Association symptom index for benign prostatic hyperplasia. The Measurement Committee of the American Urological Association. J Urol. 1992 Nov;148(5):1549–57; discussion 1564.

4. Waldinger MD, Hengeveld MW, Zwinderman AH. Paroxetine treatment of premature ejaculation: a double-blind, randomized, placebo-controlled study. Am J Psychiatry. 1994 Sep;151(9):1377–9.

5. Minto CL, Liao L-M, Woodhouse CRJ, Ransley PG, Creighton SM. The effect of clitoral surgery on sexual outcome in individuals who have intersex conditions with ambiguous genitalia: a cross-sectional study. Lancet (London, England). 2003 Apr;361(9365):1252–7.

6. Yang CC, Bradley WE. Innervation of the human glans penis. J Urol. 1999 Jan;161(1):97–102.

7. Everaert K, de Waard WIQ, Van Hoof T, Kiekens C, Mulliez T, D'herde C. Neuroanatomy and neurophysiology related to sexual dysfunction in male neurogenic patients with lesions to the spinal cord or peripheral nerves. Spinal Cord. 2010 Mar;48(3):182–91.

8. Yucel S, Baskin LS. Neuroanatomy of the male urethra and perineum. BJU Int. 2003 Oct;92(6):624–30.

9. Halata Z, Munger BL. The neuroanatomical basis for the protopathic sensibility of the human glans penis. Brain Res. 1986 Apr;371(2):205–30.

10. Sorrells ML, Snyder JL, Reiss MD, Eden C, Milos MF, Wilcox N, et al. Fine-touch pressure thresholds in the adult penis. BJU Int. 2007 Apr;99(4):864–9.

11. Sun Z, Liao Z, Zheng Q, Chen J, Lv B, Bao C, et al. A Study of Differences in Penile Dorsal Nerve Somatosensory Evoked Potential Testing Among Healthy Controls and Patients With Primary and

Secondary Premature Ejaculation. J Sex Med. 2021 Apr;18(4):732–6.

12. Paick JS, Jeong H, Park MS. Penile sensitivity in men with premature ejaculation. Int J Impot Res. 1998 Dec;10(4):247–50.

13. Assi H, Persson A, Palmquist I, Öberg M, Buchwald P, Lydrup M-L. Sexual and functional long-term outcomes following advanced pelvic cancer and reconstruction using vertical rectus abdominis myocutaneous and gluteal myocutaneous flap. Eur J Surg Oncol J Eur Soc Surg Oncol Br Assoc Surg Oncol. 2021 Apr;47(4):858–65.

14. Elfering L, van de Grift TC, Al-Tamimi M, Timmermans FW, de Haseth KB, Pigot GLS, et al. How Sensitive Is the Neophallus? Postphalloplasty Experienced and Objective Sensitivity in Transmasculine Persons. Sex Med. 2021 Oct;9(5):100413.

15. Wiggins A, Farrell MR, Tsambarlis P, Levine LA. The Penile Sensitivity Ratio: A Novel Application of Biothesiometry to Assess Changes in Penile Sensitivity. J Sex Med. 2019 Mar;16(3):447–51.

16. Schober JM, Meyer-Bahlburg HFL, Dolezal C. Self-ratings of genital anatomy, sexual sensitivity and function in men using the "Self-Assessment of Genital Anatomy and Sexual Function, Male" questionnaire. BJU Int. 2009 Apr;103(8):1096–103.

17. Statbel. Bevolkingsstructuur, leeftijdspiramide 2021 [Internet]. 2021 [cited 2022 Jan 24]. Available from: https://statbel.fgov.be/nl/themas/bevolking/structuur-van-de-bevolking#panel-12

18. Schober JM, Meyer-Bahlburg HFL, Ransley PG. Self-assessment of genital anatomy, sexual sensitivity and function in women: implications for genitoplasty. BJU Int. 2004 Sep;94(4):589–94.

19. Lever J, Frederick DA, Peplau LA. Does size matter? Men's and women's views on penis size across the lifespan. Psychol Men Masc. 2006;7(3):129–143.

20. Veale D, Miles S, Bramley S, Muir G, Hodsoll J. Am I normal? A systematic review and construction of nomograms for flaccid and erect penis length and circumference in up to 15,521 men. BJU Int. 2015 Jun;115(6):978–86.

21. Poteat VP, Heck NC, Yoshikawa H, Calzo JP. Gay-Straight Alliances as settings to discuss health topics: individual and group factors associated with substance use, mental health, and sexual health discussions. Health Educ Res. 2017 Jun 1;32(3):258-268.

22. Yang CC, Bradley WE. Peripheral distribution of the human dorsal nerve of the penis. J Urol. 1998 Jun;159(6):1912–7.

23. Kaneko S, Bradley WE. Penile electrodiagnosis: penile peripheral innervation. Urology. 1987 Sep;30(3):210–2.

24. Bradley WE, Farrell DF, Ojemann GA. Human cerebrocortical potentials evoked by stimulation of the dorsal nerve of the penis. Somatosens Mot Res. 1998;15(2):118–27.

25. Cepeda-Emiliani A, Gándara-Cortés M, Otero-Alén M, García H, Suárez-Quintanilla J, García-Caballero T, Gallego R, García-Caballero L. Immunohistological study of the density and distribution of human penile neural tissue: gradient hypothesis. Int J Impot Res. 2022 May 2. doi: 10.1038/s41443-022-00561-9.

26. Cox G, Krieger JN, Morris BJ. Histological Correlates of Penile Sexual Sensation: Does Circumcision Make a Difference? Sex Med. 2015 Jun;3(2):76–85.

27. Callens N, Bronselaer G, De Sutter P, De Cuypere G, T'Sjoen G, Hoebeke P, et al. Costs of pleasure and the benefits of pain: self-perceived genital sensation, anatomy and sexual dysfunction. Sex Health. 2016 Feb;13(1):63–72.

28. Wuyts EMD, De Neef NMD, Coppens V, Fransen EP, Schellens E, Van Der Pol M, et al. Between Pleasure and Pain: A Pilot Study on the Biological Mechanisms Associated With BDSM Interactions in Dominants and Submissives. J Sex Med. 2020 Apr;17(4):784–92.

29. Dunkley CR, Henshaw CD, Henshaw SK, Brotto LA. Physical Pain as Pleasure: A Theoretical Perspective. J Sex Res. 2020 May;57(4):421–37.

30. Morris BJ, Krieger JN. The Contrasting Evidence Concerning the Effect of Male Circumcision on Sexual Function, Sensation, and Pleasure: A Systematic Review. Sex Med. 2020 Dec;8(4):577–98.

31. Morris BJ, Moreton S, Krieger JN. Critical evaluation of arguments opposing male circumcision: A systematic review. J Evid Based Med. 2019 Nov;12(4):263–90.

32. Morris BJ, Krieger JN. Does male circumcision affect sexual function, sensitivity, or satisfaction? a systematic review. J Sex Med. 2013 Nov;10(11):2644–57.

33. Edmonds EVJ, Hunt S, Hawkins D, Dinneen M, Francis N, Bunker CB. Clinical parameters in male genital lichen sclerosus: a case series of 329 patients. J Eur Acad Dermatol Venereol. 2012 Jun;26(6):730–7.

34. Suarez-Ibarrola R, Cortes-Telles A, Miernik A. Health-Related Quality of Life and Sexual Function in Patients Treated for Penile Cancer. Urol Int. 2018;101(3):351–7.

35. Mao L, Templeton DJ, Crawford J, Imrie J, Prestage GP, Grulich AE, Donovan B, Kaldor JM, Kippax SC. Does circumcision make a difference to the sexual experience of gay men? Findings from the Health in Men (HIM) cohort. J Sex Med. 2008 Nov;5(11):2557-61.

36. Bossio JA, Pukall CF, Steele SS. Examining Penile Sensitivity in Neonatally Circumcised and Intact Men Using Quantitative Sensory Testing. J Urol. 2016 Jun;195(6):1848-53. doi: 10.1016/j.juro.2015.12.080. Epub 2015 Dec 25. Erratum in: J Urol. 2017 Mar;197(3 Pt 1):824. PMID: 26724395.

37. Park Y, MacDonald G. Single and Partnered Individuals' Sexual Satisfaction as a Function of Sexual Desire and Activities: Results Using a Sexual Satisfaction Scale Demonstrating Measurement Invariance Across Partnership Status. Arch Sex Behav. 2022 Jan;51(1):547–64.

38. Goldey KL, Posh AR, Bell SN, van Anders SM. Defining Pleasure: A Focus Group Study of Solitary and Partnered Sexual Pleasure in Queer and Heterosexual Women. Arch Sex Behav. 2016 Nov;45(8):2137–54.

39. Regnerus M, Price J, Gordon D. Masturbation and Partnered Sex: Substitutes or Complements? Arch Sex Behav. 2017 Oct;46(7):2111–21.

40. Heywood W, Smith AMA. Anal sex practices in heterosexual and male homosexual populations: a review of population-based data. Sex Health. 2012 Dec;9(6):517–26.

41. Frederick D, Gillespie BJ, Lever J, Berardi V, Garcia JR. Sexual Practices and Satisfaction among Gay and Heterosexual Men in Romantic Relationships: A Comparison Using Coarsened Exact Matching in a U.S. National Sample. J Sex Res. 2021;58(5):545–59.

42. Wignall L, Scoats R, Anderson E, Morales L. A qualitative study of heterosexual men's attitudes toward and practices of receiving anal stimulation. Cult Health Sex. 2020 Jun;22(6):675–89.

43. Phillips TR, Constantinou H, Fairley CK, Bradshaw CS, Maddaford K, Chen MY, et al. Oral, Vaginal and Anal Sexual Practices among Heterosexual Males and Females Attending a Sexual Health Clinic: A Cross-Sectional Survey in Melbourne, Australia. Int J Environ Res Public Health. 2021 Dec;18(23).

FIGURES

Figure 1: Genital areas indicated by dotted lines (A-K).

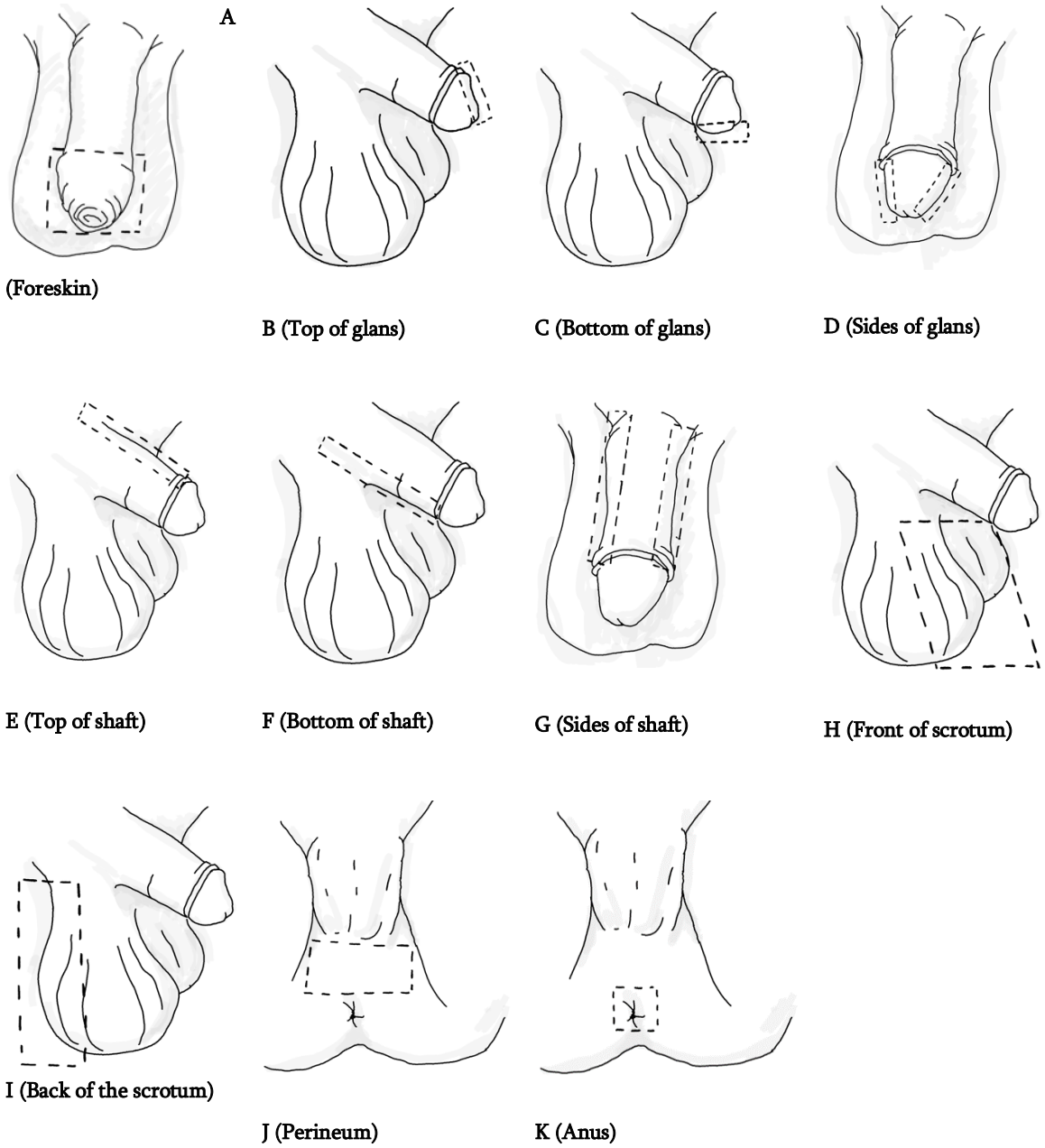


Figure 2.1: Violin and boxplot of sexual pleasure ratings for different anatomical locations in uncircumcised individuals, individuals circumcised before sexarche (shortly after birth or during childhood) and individuals after sexarche (during adolescence or adulthood). Top of glans (L1) – Anus (L10). Yellow lines: 25% and 75% quartile, black lines: median.

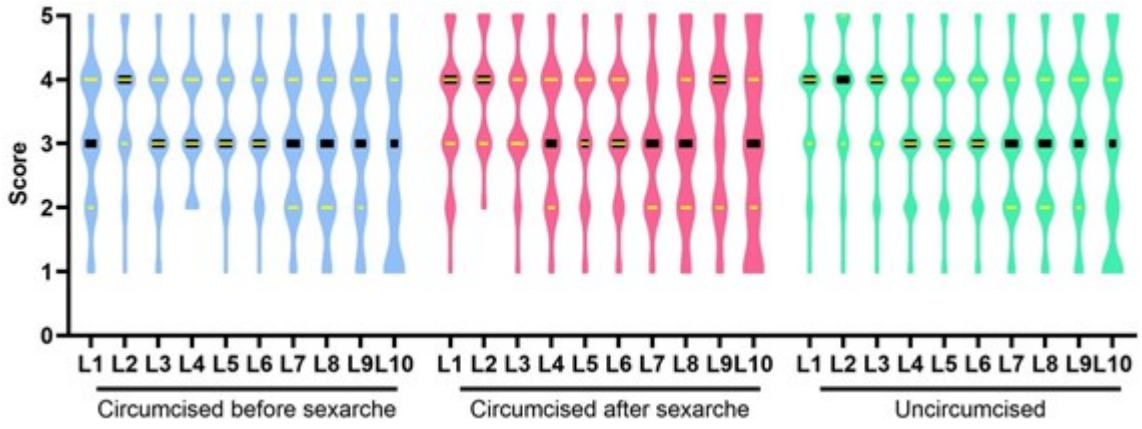
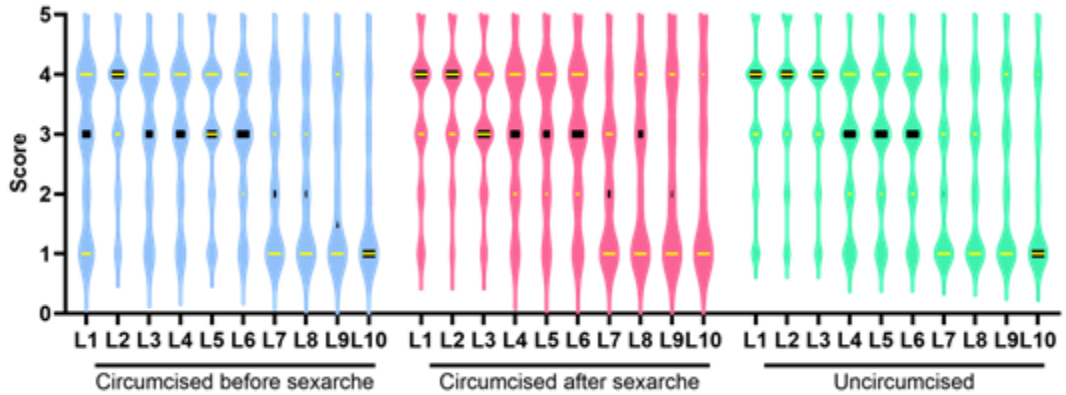


Figure 2.2: Violin and boxplot of orgasm intensity ratings for different anatomical locations in uncircumcised individuals, individuals circumcised before sexarche (shortly after birth or during childhood) and individuals after sexarche (during adolescence or adulthood). Top of glans (L1) – Anus (L10). Yellow lines: 25% and 75% quartile, black lines: median.



TABLES

Table 1: Demographic characteristics of study group. *Weighting performed by sequential weighting method based on age and sexual preference.

	UNWEIGHTED	WEIGHTED*	UNWEIGHTED
	Total (n=808)	Total (n=803)	Clinical evaluation (n=24)
Median age in years (range)	39 (18-79)	36 (18-79)	36 (27-65)
Sexual preference %)			
Men	13.1	4.3	4.2
Women	81.1	90.0	95.8
Both men and women or other	5.8	5.8	0.0
Gender of current sexual partner (%)			
Male	12.9	4.5	4.2
Female	72.6	80.3	91.7
Both	2.6	2.6	0.0
No sexual partner	11.9	12.6	4.2
Education (%)			
No education or primary school level	0.8	0.3	25.0
Lower secondary	5.3	0.7	4.2
Higher secondary	24.4	24.4	16.7
Higher education short type	19.7	19.8	8.3
Higher education long type or University	49.8	49.1	45.8

Has a child (%)	43.2	46.2	39.1
Median number of children (range)	2 (1-7)	1 (1-7)	1 (1-4)
Racial background (%)			
Caucasian	99.0	98.9	91.7
African	0.6	0.7	0.0
Asian	0.0	0.0	0.0
Arabic	0.2	0.3	4.2
Other (not further specified)	0.2	0.1	4.2
Circumcised (%)	21.7	21.7	20.8
At birth	1.7	1.9	4.2
As a child (1-11 yo)	11.1	11.5	12.5
As an adolescent (12-18 yo)	2.0	1.4	0.0
As an adult (>18 yo)	6.9	6.9	4.2

Table 2.1: Different answers of SAGASF-M questionnaire regarding penile anatomy. Weighted cases based on age and sexual preference.

Penile anatomy	**(n=803)**
Hypospadias (%)	
Opening at tip of glans or above	97.9
Opening at underside of glans	1.1
Opening where glans meets shaft	0.4

Opening at underside of shaft	0.3
Opening in scrotum	0.3
Epispadias (%)	
Normal opening at tip of glans or below	99.8
Opening at the upper side of the glans	0.1
Opening up until midshaft	0.1
Up/down deviation during erection (%)	
Up against body	0.4
Severe upward	5.4
Moderate upward	2.6
Slight upward	26.7
Straight	50.5
Slight downward	12.2
Moderate downward	2.1
Severe downward	0.1
Sideways deviation during erection (%)	
Severe curve to left	0.6
Slight curve to left	18.4
Straight	73.6
Slight curve to right	6.9
Severe curve to right	0.6

Having erections (%)	99.9
Erections hard enough for penetration	95.9
Erections long enough for penetration	96.1
Penile size in cm (SD)	
Mean flaccid penile length	9.4 (2.46)
Mean flaccid penile circumference	8.8 (2.95)
Mean erect penile length (n=670)	15.5 (2.48)
Mean erect penile circumference (n=613)	11.3 (3.26)
Self-perception of penile size, flaccid (%)	
Very small	1.1
Small	31.1
Average	62.6
Large	5.1
Very large	0.1
Self-perception of penile size, erect (%)	
Very small	0.4
Small	11.3
Average	69.1
Large	18,9
Very large	0.4

Table 2.2: Different answers of SAGASF-M questionnaire regarding scrotal/testicular anatomy. Weighted cases based on age and sexual preference.

Scrotal anatomy	**(n=803)**
Scrotal size (%)	
Absent	0.3
Flat scrotum	0.5
Small sac without rugation	4.0
Full sac, non rugated	13.0
Full sac, rugated	80.8
Bifid scrotum	1.4
Testicular size Left (%)	
Very small	0.3
Small	5.3
Average	88.6
Larger than average	5.8
Testicular size right (%)	
Very small	0.8
Small	4.2
Average	89,6
Larger than average	5.4

Table 3: Repeated measures ANOVA on discrimination between genital areas for non-circumcised participants (n=550, lowering of numbers due to case weighting). *1=none, 5=intense; °1=very strong, 5=very little; §Significant Bonferroni corrected pair comparisons. # Tested using separate Wilcoxon tests with a p-value < 0.0045 to be statistically significant (0.05/11 different locations). This was performed to maintain the maximum possible number of participants for the comparison. Weighted cases based on age and sexual preference.

Domain and area	Mean (SD)	Areas sig. Different §	Areas not sig. different
Sexual pleasure*			
C Bottom of glans	3.9 (0.93)	A, B, D, E, F, G, H, I, J, K	/
B Top of glans	3.7 (0.91)	A, C, D, E, F, G, H, I, J, K	/
D Sides of glans	3.6 (0.90)	A, B, C, E, F, G, H, I, J, K	/
F Bottom of shaft	3.3 (0.95)	A, B, C, D, E, H, I, K	G, J
G Sides of shaft	3.2 (0.96)	A, B, C, D, H, I, K	E, F, J
E Top of shaft	3.2 (0.97)	B, C, D, F, H, K	A, G, I, J
J Perineum	3.2 (1.22)	B, C, D, H, K	A, E, F, G, I
H Front of scrotum	3.0 (1.04)	B, C, D, E, F, G, J, K	A, I
A Foreskin	3.0 (1.09)	B, C, D, F, G, K	E, H, I, J
I Back of scrotum	3.0 (1.10)	B, C, D, F, G, K	A, E, H, J
K Around anus	2.7 (1.39)	A, B, C, D, E, F, G, H, I, J	/
Orgasm intensity*			

C Bottom of glans	3.6 (1.18)	A, B, D, E, F, G, H, I, J, K	/
D Sides of glans	3.3 (1.17)	A, C, E, F, G, H, I, J, K	B
B Top of glans	3.3 (1.21)	A, C, E, F, G, H, I, J, K	D
F Bottom of shaft	3.0 (1.20)	A, B, C, D, H, I, J, K	E, G
G Sides of shaft	2.9 (1.20)	A, B, C, D, H, I, J, K	E, F
E Top of shaft	2.9 (1.22)	A, B, C, D, H, I, J, K	F, G
A Foreskin	2.5 (1.38)	B, C, D, E, F, G, H, I, K	J
J Perineum	2.3 (1.41)	A, B, C, D, E, F, G, K	H, I
H Front of scrotum	2.2 (1.29)	A, B, C, D, E, F, G	I, J, K
I Back of scrotum	2.2 (1.31)	A, B, C, D, E, F, G	H, J, K
K Around anus	2.0 (1.39)	A, B, C, D, E, F, G, J	H, I
Orgasm effort°#			
C Bottom of glans	3.2 (0.80) n= 565	A, B, D, E, F, G, H, I, J, K	/
B Top of glans	3.1 (0.79) n= 545	A, C, E, F, G, H, I, J	D, K
D Sides of glans	3.1 (0.77) n= 544	A, C, E, F, G, H, I, J	B, K
F Bottom of shaft	3.0 (0.83) n= 512	B, C, D, E, H, I	A, G, J, K
A Foreskin	3.0 (0.84) n= 387	B, C, D, H, I	E, F, G, J, K
J Perineum	3.0 (0.91) n= 330	B, C, D, H, I	A, E, F, G, K
K Around anus	3.0 (1.02) n= 256	B, C, H, I	A, D, E, F, G, J
G Sides of shaft	2.9 (0.81) n= 511	B, C, D, E, H, I	A, F, J, K
E Top of shaft	2.9 (0.84) n= 499	B, C, D, F, G, H	A, G, I, J, K

I Back of scrotum	2.8 (0.88) n= 332	A, B, C, D, F, G, J, K	E, H
H Front of scrotum	2.8 (0.90) n= 336	A, B, C, D, E, F, G, J, K	I
Discomfort/pain*			
B Top of glans	1.3 (0.62)	A, E, F, G, H, I, J	C, D, K
K Around anus	1.3 (0.81)	A, E, F, G, H, I, J	B, C, D
D Sides of glans	1.2 (0.59)	A, E, F, G, J	B, C, H, I, K
C Bottom of glans	1.2 (0.61)	A, E, F, G, H, I, J	B, D, K
F Bottom of shaft	1.1 (0.32)	B, C, D, H, I, K	A, E, G, J
G Sides of shaft	1.1 (0.34)	B, C, D, H, I, K	A, E, F, J
A Foreskin	1.1 (0.39)	B, C, D, K	E, F, G, H, I, J
I Back of scrotum	1.1 (0.47)	B, C, E, F, G, K	A, D, H, J
J Perineum	1.1 (0.48)	B, C, D, K	A, E, F, G, H, I, J
H Front of scrotum	1.1 (0.49)	B, E, F, G, K	A, C, D, I, J
E Top of shaft	1.0 (0.29)	B, C, D, H, I, K	A, F, G, J

Table 4: Overall difference in penile sensitivity when stimulated by partner or self in the last 12 months compared for gender of sexual partner using Wilcoxon signed rank tests. *1=none, 5=intense; °1=very strong, 5=very little.

	Overall		**Homosexual**		**Heterosexual**		**Bisexual or other**	
	Median (IQR)	Sig.	Median (IQR)	Sig.	Median (IQR)	Sig.	Median (IQR)	Sig.
Sexual pleasure*	**n=686**	***p* < 0.001**	**n=103**	***p* = 0.002**	**n=571**	***p* < 0.001**	n=21	*p* = 0.527

Partner	**4 (4-5)**		**4 (4-5)**		**4 (4-5)**		4 (4-5)	
Self	**4 (4-4)**		**4 (4-5)**		**4 (4-4)**		4 (4-4.5)	
Orgasm intensity*	**n=686**		**n=103**		**n=571**		n=21	
Partner	**4 (4-5)**	***p* < 0.001**	**4 (4-5)**	***p* = 0.006**	**4 (4-5)**	***p* < 0.001**	4 (4-5)	*p* = 0.180
Self	**4 (4-4)**		**4 (4-5)**		**4 (3-4)**		4 (4-4)	
Orgasm effort°	n=686		n=103		n=571		n=21	
Partner	3 (3-4)	*p* = 0.652	3 (3-4)	*p* = 0.245	3 (3-4)	*p* = 0.991	3 (3-4)	*p* = 1.000
Self	3 (3-4)		3 (3-4)		3 (3-4)		3 (3-4)	
Discomfort/pain*	**n=664**		**n=103**		**n=554**		n=21	
Partner	**1 (1-1)**	***p* < 0.001**	**1 (1-1)**	***p* = 0.001**	**1 (1-1)**	***p* = 0.002**	1 (1-1)	*p* = 0.317
Self	**1 (1-1)**		**1 (1-1)**		**1 (1-1)**		1 (1-1)	

Table 5: Wilcoxon matched pair signed rank test for comparisons of genital sensation ratings between SAGASF-M questionnaire and during urological examination by medians (interquartile range) (n=24). For comparison of foreskin sensation (n=19). *1=none, 5=intense; °1=very strong, 5=very little.

	Sexual pleasure*	**Orgasm intensity***	**Orgasm effort°**	**Discomfort/pain***

	SAGASF-M	Urol exam	SAGASF-M	Urol exam	SAGASF-M	Urol exam	SAGASF-M	Urol exam
A Foreskin (n=19)	4 (3-5)	4 (3-5)	4 (4-5)	4 (3-5)	4 (3-5)	4 (3-5)	1 (1-1)	1 (1-1)
B Top of glans	4 (4-5)	4 (3-5)	4.5 (4-5)	4.5 (3.25-5)	4.5 (3-5)	5 (3-5)	1 (1-1)	1 (1-1)
C Bottom of glans	4.5 (4-5)	4 (4-5)	4.5 (4-5)	4 (3.25-5)	4 (4-5)	5 (3.25-5)	1 (1-1)	1 (1-1)
D Sides of glans	5 (4-5)	5 (4-5)	5 (4-5)	5 (4-5)	4 (4-5)	4 (4-5)	1 (1-1)	1 (1-1)
E Top of shaft	4 (3-4)	4 (3-4)	4 (3-5)	4 (2.25-4.75)	4 (3-4.75)	4 (3-5)	1 (1-1)	1 (1-1)
F Bottom of shaft	4 (4-5)	4 (3.25-4)	4 (3.25-5)	4 (3-4.75)	4 (3.25-5)	4 (3-4)	1 (1-1)	1 (1-1)
G Sides of shaft	4 (3-4)	4 (3-4)	4 (3-4.75)	4 (3-4.75)	4 (3-4)	3 (3.25-4)	1 (1-1)	1 (1-1)
H Front of scrotum	4 (2.25-4)	3 (2.25-4)	3 (2.25-4)	3 (3-4)	3 (2.25-4)	3 (3-4)	1 (1-1)	1 (1-1)
I Back of scrotum	3 (2-4)	3 (2-3.75)	**3 (2-3.75)**	**2 (1-3)**	3 (2.25-3.75)	3 (2-3.75)	1 (1-1)	1 (1-1)
J Perineum	2.5 (2-4)	2 (1-4)	**2 (1.25-3)**	**1.5 (1-3)**	2 (1.25-3.75)	2 (1-3)	1 (1-1)	1 (1-1)
K Anus	1 (1-3)	1 (1-3)	1 (1-2)	1 (1-1.75)	1 (1-2)	1 (1-2)	1 (1-1)	1 (1-1)

Table 6: Genital sensation ratings for different anatomical locations in uncircumcised individuals, individuals circumcised before sexarche (shortly after birth or during childhood) and individuals after sexarche (during adolescence or adulthood). Median (interquartile range). Numbers in bold are significantly different.

Sexual Pleasure (SP), Orgasm Intensity (OI), Orgasm Effort (OE), Discomfort/Pain (DP). *1=none, 5=intense; °1=very strong, 5=very little.

Anatomical	Uncircumcised (n=626)				Circumcised before sexarche (n=108)				Circumcised after sexarche (n=67)			
location	SP*	OI*	OE°	DP*	SP*	OI*	OE°	DP*	SP*	OI*	OE°	DP*
Foreskin	3 (2-4)	3 (1-4)	3 (1-4)	1 (1-1)	-	-	-	-	-	-	-	-

Top of glans	**4 (3-4)**	**4 (3-4)**	4 (3-4)	1 (1-1)	**3 (2-4)**	**3 (1-4)**	3 (1-4)	1 (1-1)	4 (3-4)	4 (3-4)	4 (3-4)	1 (1-1)
Bottom of glans	**4 (3-5)**	**4 (3-4)**	4 (3-4)	1 (1-1)	**4 (3-4)**	**4 (3-4)**	4 (3-4)	1 (1-1)	4 (3-4)	4 (3-4)	4 (3-4)	1 (1-1)
Sides of glans	**4 (3-4)**	**4 (3-4)**	4 (3-4)	1 (1-1)	**3 (3-4)**	**3 (2-4)**	3 (2-4)	1 (1-1)	4 (3-4)	3 (3-4)	3 (3-4)	1 (1-1)
Top of shaft	3 (2.43-4)	3 (2-4)	3 (2-4)	1 (1-1)	3 (3-4)	3 (2-4)	3 (2-4)	1 (1-1)	3 (2.07-4)	3 (2-4)	3 (2-4)	1 (1-1)
Bottom of shaft	3 (3-4)	3 (2-4)	3 (2-4)	1 (1-1)	3 (3-4)	3 (3-4)	3 (3-4)	1 (1-1)	3 (2.61-4)	3 (2-4)	3 (2-4)	1 (1-1)
Sides of shaft	3 (3-4)	3 (2-4)	3 (2-4)	1 (1-1)	3 (3-4)	3 (2-4)	3 (2-4)	1 (1-1)	3 (3-4)	3 (2-4)	3 (2-4)	1 (1-1)
Front of scrotum	3 (2-4)	2 (1-3)	2 (1-3)	1 (1-1)	3 (2-4)	2 (1-3)	2 (1-3)	1 (1-1)	3 (2-4)	2 (1-3)	2 (1-3)	1 (1-1)
Back of scrotum	3 (2-4)	2 (1-3	2 (1-3)	1 (1-1)	3 (2-4)	2 (1-3)	2 (1-3)	1 (1-1)	3 (2-4)	3 (1-4)	3 (1-4)	1 (1-1)
Perineum	3 (2-4)	2 (1-4)	2 (1-4)	1 (1-1)	3 (2-4)	1 (1-4)	1 (1-4)	1 (1-1)	4 (2-4)	2 (1-4)	2 (1-4)	1 (1-1)
Anus	3 (1-4)	1 (1-3)	1 (1-3)	1 (1-1)	2 (1-4)	1 (1-3)	1 (1-3)	1 (1-1)	3 (1-4)	1.31 (1-4)	1.31 (1-4)	1 (1-1)