EXAMINING SEXUAL CORRELATES OF NEONATAL CIRCUMCISION

IN ADULT MEN

by

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Abstract

Circumcision—the surgical removal of some/all of the male prepuce (foreskin)—is among the oldest and most common surgical procedures globally. Research on circumcision—and the recent North American policy endorsing it—focuses on health outcomes; sexual correlates of circumcision remain largely unexplored. A review of the circumcision literature was conducted (Chapter 2), and four studies investigated the sexual correlates of neonatal circumcision. Chapter 3 employed quantitative sensory testing (detection/pain thresholds using punctate/thermal stimuli) to examine penile sensitivity in healthy adult men (circumcised, intact). Findings indicate minimal differences across circumcision status. Chapter 4, which compared sexual functioning across circumcision status, found no significant differences between circumcised and intact men with respect to genital response (via laser Doppler imaging: LDI), subjective experiences of sexual arousal, or sexual/urological history variables. Chapter 5 explored men’s attitudes towards their circumcision status and the implications of these attitudes on body image and sexual functioning. A proportion of circumcised men who completed this online survey indicated high distress about their circumcision status. Furthermore, negative attitudes towards one’s circumcision status—as opposed to circumcised status per se—was related to worse body image and sexual functioning. Chapter 6 assessed the impact of a man’s circumcision status on their female and male sexual partners. In this online study, circumcision status did not impact partner’s sexual functioning, but gender differences emerged with respect to attitudes towards one’s partner’s circumcision status (women preferred circumcised partners, men preferred intact). Overall, however, women and men were satisfied with their partner’s circumcision status and did not wish for it to change. Taken together, this research program indicates that minimal physiological differences exist between circumcised and intact men (i.e., sensitivity, sexual response, the experience of sexual arousal). However, attitudes towards one’s circumcision status—as opposed to circumcision status alone—was an important aspect of men’s and their sexual partners’ sex lives. In particular, dissatisfaction with one’s circumcision status is associated
with worse body image and sexual functioning in men. Here, we provide a multidimensional perspective of the sexual correlates of circumcision with implications for public policy and individual stakeholders (e.g., medical professionals, parents, men).
Co-Authorship

I. Co-Authorship Declaration

In all instances, the data analysis, interpretation, and manuscript preparation were performed by the author of this dissertation (Jennifer A. Bossio). The co-authors listed were involved in conception and design (Caroline F. Pukall), revisions, and final approval of the manuscripts (Caroline F. Pukall, Stephen Steele, Katie Bartley). I certify that I have obtained permission from all co-authors to include the below published materials in my thesis.

II. Declaration of Previous Publication

This dissertation includes five original papers, two of which have been published in peer-reviewed journals. I certify that I have obtained written permission from copyright owners to include the below published materials in my thesis (Appendix A). I certify that the below material describes work completed during my registration as a graduate student at Queen’s University.

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Wow. So this is what it feels like to have written a PhD? Over the course of the past few years I have learned a great deal about myself, life, perseverance, and also penises. But the most important lesson that I learned was the importance of the people you surround yourself with, and how they truly make all the difference. It is with this in mind that I would like to first and foremost thank Caroline Pukall, my PhD Supervisor-extraordinaire. Caroline, I am forever grateful that you accepted me into your lab with open arms. You taught me so much about research, supervision, but also about those easily over-looked things like the importance of kindness, creativity, and remembering that research is not about answering questions, but it’s about all of the new questions that arise as a product of your work. This PhD would not have happened without you.

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going through the exact same thing (and that we could bitch about it later). Knowing that you guys all get it... that is something I will be forever grateful for. I love you guys!

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Lastly, thank you to Lucifer (Lucy), for snuggling on my lap and being fucking adorable the entire time. And now my dissertation contains a swear word, too. I am done.
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Chapter 1

General Introduction

The word “circumcision” comes from the Latin term *circumcidere*, meaning, “to cut around”. Male circumcision refers to the surgical removal of some, or all, of the prepuce (i.e., the foreskin), which is a continual area of skin from the shaft of the penis that—when flaccid—typically covers the glans penis and urethral meatus, and—when erect—retracts to expose the glans penis (Halata & Munger, 1986). Said to have originated around 10,000 BC (Gollacher, 1991), circumcision is among the oldest surgical procedures known. Currently, it is the most commonly performed surgical procedure, with approximately 30% of the global male population over the age of 15 having undergone the procedure (WHO, 2007).

Circumcision is performed for a variety of religious, cultural, social, and medical reasons. Members of the Muslim and Jewish religions typically undergo circumcision in infancy as a religious rite of passage (WHO, 2007). Numerous cultures worldwide have adopted the practice of circumcision for non-religious reasons. For example, the practice of circumcision dates back thousands of years among the Aztecs in the Americas (Schendel, Alvaraz Amezquita, & Bustamante Vasconcelos, 1968), Aboriginal Australians (Gollacher, 1991), and sub-Saharan Africans (WHO, 2007), who all typically practiced circumcision as a rite of passage into adulthood. More recently, men in South Korea have adopted this practice, with current estimates of up to 100% of males in the last 20 years undergoing circumcision in their teenage years to mark the transition into adulthood (Kim & Pang, 2007).

In the 1830s, circumcision gained popularity in European cultures as a method to curb men’s masturbatory desire (Spratling, 1895). Currently, however, the rationale for circumcision in many parts of the world (including North America and Africa) has shifted to a medical explanation. The medicalization of circumcision dates back to the 1970s, when circumcision was hypothesized to protect against syphilis
and cure polio (Gollaher, 1991). High historical rates of circumcision in North America can also be attributed to parents electing the procedure for their infant sons to protection against phimosis (i.e., the inability to retract the foreskin past the glans penis, which is expected in children up to the age of 3 years; Cuckow, Rix, & Mouriquand, 1994) and the belief that circumcision improves penile hygiene (O’Farrell, Quigley, & Fox, 2005). More recently, research has emerged to demonstrate numerous protective health benefits of circumcision, such as protection against urinary tract infections (UTIs) in infancy (Shaikh, Morone, Bost, & Farrell, 2008), sexually transmitted infections (STIs; Weiss, Thomas, Munabi, Hayes, 2006), and human immunodeficiency virus (HIV; Auvert, Taljaard, Lagarde, Sognqwi-Tambekou, Sitta & Puren, 2005; Bailey, Moses, Parker, Agot, Maclean, Krieger, et al., 2007; Gray, Kigozi, Serwadda, Makumbi, Waty, Nalugodaet, et al., 2007). Protection against STIs for men’s sexual partners is also a documented health benefit to circumcision (Sobngwi-Tambekou, Taljaard, Nieuwoudt, Lissouba, Puren & Auvert, 2009), although this research has only focused on heterosexual couples; it is unclear whether the same protective benefits are incurred by men who have sex with men (MSM), as sexual practices and risks of STI transmission can differ between heterosexual and MSM contexts (e.g., Kolin et al., 2006). Despite a focus on the medical benefits of circumcision in North America today, a strong cultural element to the procedure still exists. For example, the most important determinant in parents’ decision to circumcise their newborn son is not knowledge about the health benefits of the procedure, but the circumcision status of the father (Binner, Mastrobattista, Day, Swaim, & Monga, 2002; Rediger & Muller, 2013).

Despite its ancient roots, the practice of circumcision has been the focus of a great deal of public debate, particularly in North America. Public policy statements about circumcision issued by government health agencies have reflected this changing attitude toward the procedure. Over recent decades, the American Academy of Pediatrics (AAP; in the United States), and the Canadian Paediatric Society (CPS) have alternated their stance either in favour of, or in opposition to routine neonatal circumcision. Most recently, the AAP released a policy statement in favour of routine neonatal circumcision, stating,
“systematic evaluation of English-language peer-reviewed literature from 1995 through 2010 indicates that preventive health benefits of elective circumcision of male newborns outweigh the risks of the procedure” (Task Force on Circumcision, 2012, pg. 756). Following the release of this statement, rates of circumcision are expected to rise in the United States (Center for Disease Control, 2011) and possibly Canada (Discharge Abstract Database, 2009; National Ambulatory Care Reporting System, 2010). It should be noted, however, that although the AAP’s policy statement was informed by the leading research on circumcision, that body of research focuses almost exclusively on the health outcomes of circumcision; the sexual correlates of circumcision have received exceedingly little empirical attention.

A limited body of research has emerged over recent decades to empirically test the impact of circumcision on men’s sexual lives. Driven by the largely untested hypothesis that the removal of the highly innervated foreskin, and the permanent exposure of the glans penis, may result in a reduction in overall penile sensitivity—and consequently impairments to sexual functioning (e.g., Taylor, Lockwood, & Taylor, 1996), research has focused heavily on circumcision and sexual functioning. Research findings have revealed mixed results (see Bossio, Pukall, & Steele, 2014), which may be—at least in part—attributable to methodological shortcomings prevalent in this body of literature. For example, studies exploring the impact of circumcision on sexual functioning typically employ a pre-post study design (whereby adult men elect to undergo circumcision), or they rely on self-report measures, which are limited by a reliance on self-selected, clinical samples (e.g., men with pre-existing complaints of sexual dysfunction). In addition, they fail to account for participant biases (e.g., consideration of, or controlling for expectations that circumcision will improve sexual functioning), and exceedingly few studies employ psychophysical or psychophysiological measures of penile sensitivity or sexual response. Furthermore, many studies exploring circumcision and sexual correlates are performed outside of North America, but cultural or social variables are not considered before applying said findings to North American populations. Sexual response represents a complex interplay of physiological as well as attitudinal and contextual factors. Therefore, it is imperative to explore the men’s attitudes, as well as the attitudes of
their sexual partners towards one’s circumcision status in conjunction with psychophysical or psychophysiological outcomes associated with circumcision.

The aim of this research program was to explore the sexual correlates associated with neonatal circumcision, as it is typically performed in North America. These findings hold implications for public policy, which should work towards an inclusive approach to circumcision outcomes, as opposed to the current emphasis on health outcomes. Individual stakeholders are also expected to benefit from this research program, such as medical professionals, parents of male infants, and men themselves. In order to address these issues, the following objectives were developed:

1. To examine penile sensitivity across men who have been neonatally circumcised, and men who have never been circumcised (intact men).

2. Explore functional outcomes associated with circumcision, specifically by evaluating genital response, subjective sexual arousal, and sexual outcomes (i.e., urological history, sexual history, sexual functioning, attitudes towards one’s circumcision status) across healthy men who were circumcised neonatally, or who are intact.

3. Examine men’s attitudes towards their own circumcision status, and the impact of those attitudes on sexual correlates, specifically, body image and self-reported sexual functioning.

4. Examine the impact of circumcision status on the female and male sexual partners of men, including attitudes towards a partner’s circumcision status, preferences for a circumcision status, beliefs held about circumcision, as well as self-reported sexual functioning.
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Discharge Abstract Database, 2009; National ambulatory care reporting system, 2010


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Chapter 2

A review of the current state of the male circumcision literature

Introduction

Circumcision, or the surgical procedure involving the removal of some, or all, of the penile prepuce (foreskin), is a highly contentious topic. In 2012, the American Association of Pediatrics (AAP) Task Force on Circumcision released a report stating “[a] systematic evaluation of English-language peer-reviewed literature from 1995 through 2010 indicates that preventive health benefits of elective circumcision of male newborns outweigh the risks of the procedure” (Blank et al., 2012). However, a critical review of the empirical research comprising the AAP statement highlights significant gaps within the literature on circumcision.

The current state of the literature regarding circumcision is narrowly focused. At present, the largest proportion of the research focuses on the medical benefits of circumcision. The finding that has gained the most attention – a reduction in HIV transmission rates among circumcised men (Auvert, Taljaard, Lagarde, Sobngwi-Tambekou, Sitta, & Puren, 2005; Bailey et al., 2007; Gray et al., 2007) – was not based on research performed on North American populations. Beyond the topic of HIV transmission rates and medical outcomes of circumcision, there is a troubling lack of empirical research on sexual health correlates of circumcision, such as its potential effects on sexual functioning and penile sensation. Very little is known about the effects of circumcision on men’s sexual partners, men’s body image, satisfaction with circumcision status, or factors that contribute to the decision to circumcise. Additionally, most research fails to address a number of factors likely to mediate outcomes within the circumcision literature such as age at circumcision, reason for circumcision, cultural factors, and self-report versus objective outcome measures. A more comprehensive picture of factors that comprise the circumcision
debate is required, as public policy should be based on an inclusive understanding of the outcomes associated with circumcision.

**Aims**

This paper is intended to draw attention to gaps in the foundational research of the circumcision debate. The ultimate aim of this review is to inform and educate policy makers, health care professionals, and individual stakeholders regarding the decision to perform routine neonatal circumcision in North America.

**Method**

For this review, articles were searched on the PubMed and Google Scholar databases. Papers matching one or more of the following keywords were evaluated for relevance: health, sexual health, sexual functioning, sexual dysfunction, penile sensitivity, and included the term circumcision, circumcised, uncircumcised, or intact. Additional papers were identified by searching the bibliographies of relevant articles that had been retrieved. Article abstracts were used to evaluate the relevance of each paper for the inclusion in this review. The full text of every article was retrieved and evaluated in full, unless this process was not possible because the article was in a language other than English and no translation was available.

**Health Correlates**

Neonatal circumcision in North America is considered a relatively safe practice; however, as with any surgical procedure, it is not without risk. Literature documenting the risks and benefits associated with neonatal circumcision is often influenced by author biases (Christakis, Harvey, Zerr, Feudtner, Wright, & Connell, 2000), as well as methodological shortcomings. For example, there is no agreed upon definition of “complications” as they refer to adverse outcomes of the procedure. Given that adverse outcomes are rarely documented outside a hospital setting, statistics on absolute rates of complications following the procedure do not exist. The best estimates of complications following neonatal
circumcision range from 0.19 to 0.60% (Gee & Ansell, 1976; Wiswell & Geschke, 1989), with the most common complications being bleeding, infection, or an imperfect amount of the foreskin removed (Christakis et al., 2000; Wiswell & Geschke, 1989), while rates of complications in adult circumcision appear higher (2.4%; Senel, Demirelli, & Peckan, 2011, to 17.7%; Bailey, Egesah, & Rosenberg, 2008). A widely accepted stance on circumcision is that – similar to any minor surgery – it is associated with relatively low but not negligible risk.

With technological advances allowing for minimized surgical risks with circumcision, there has been a shift in the circumcision research towards observational/cohort and RCTs that have demonstrated a reduction in the risk of STI acquisition and transmission in circumcised as compared to intact men. Evidence exists for lower rates of HIV transmission (Auvert et al., 2005; Bailey et al., 2005; Gray et al., 2007), ulcerative STIs (syphilis, genital herpes simplex, chancroid, lymphogranuloma venereum infection; Van Howe, 2007; Weiss, Thomas, Munabi, & Hayes, 2006; but also see Xu, Markowitz, Sternberg, & Aral, 2007), and HPV (Auvert et al., 2009; Castellsague, Bosch, & Munoz, 2002; Giuliano et al., 2009; Hernandez et al., 2008; Nielson, Schiaffino, Dunne, Salemi, & Giuliano, 2009; Tobian et al., 2009; but also see Reynolds et al., 2004) in circumcised as compared to intact men. Other health benefits of circumcision include lower rates of male infant UTIs (Morris & Wiswell, 2013; Schoen, Colby, & Ray, 2000; Singh-Frewal, Acedessi, & Craig, 2005; Wiswell & Hachey, 1993), penile cancer (Maden et al., 1993; Tseng, Morgenstern, Mack, & Peters, 2001; but also see Daling et al., 2005; Frisch, Friis, Kjaer, & Melbye, 1995), and inflammatory dermatoses (e.g., balanoposthitis; Fergusson, Lawton, & Shannon, 1988). It should be noted that research findings are mixed, and evaluation of the data presented in the literature has been drawn into question; for example, a recent meta-analysis by van Howe (2013, pp 35) concludes, “the prevention of sexually transmitted infections cannot rationally be interpreted as a benefit of circumcision”.

Despite mounting evidence supporting the protective effects of circumcision against some aversive medical conditions, there are a number of issues regarding the methodology of these studies that
must be explored further before conclusions are drawn for North American populations (see Boyle & Hill, 2012 for a critical review). The majority of the research documenting the protective effects of circumcision against STI transmission is done in geographical regions other than North America. In particular, the research on HIV transmission and circumcision status—which arguably has been the most influential in terms of policy decision-making—was conducted in Africa (Auvert et al., 2005; Bailey et al., 2005; Gray et al., 2007). This issue is problematic for a North American population for a number of reasons. For example, adult men were circumcised as part of clinical trials, yet, the vast majority of circumcisions within North American populations occur as a routine procedure in neonates. The question of whether circumcision performed in adulthood confers the same benefits against HIV transmission as the procedure performed in infancy remains untested. It has even been proposed that adult circumcision may result in behavioural changes (as the result of creating a “false sense of security” surrounding the protective benefits of circumcision) that may increase the risk of HIV transmission (see Sidler, Smith, & Rode, 2008).

Differences in the mode of transmission of HIV across populations represents another example of a problem that should be addressed before findings from existing RCTs are applied to North American populations. In African populations, HIV transmission typically occurs during heterosexual penile-vaginal intercourse (UN Joint Programme on HIV/AIDS, 2009); this pattern is not consistent with the main mode of HIV infection in North American populations, which typically happens in men who have unprotected sex with men through penile-anal intercourse (UN Joint Programme on HIV/AIDS, 2009). Research suggests that HIV transmission operates through different mechanisms during penetrative vaginal and anal sex. For example, in men who have sex with men (MSM), it is the receptive partner who is at higher risk for HIV transmission (Buchbinder, Douglas, McKirman, Judson, Katz, & MacQueen, 1996; Buchbinder et al., 2005; Koblin et al., 2006). Studies have suggested that circumcision offers protection against HIV transmission to MSM who primarily engage in insertive anal intercourse (Millett, Flores, Marks, Reed, & Herbst, 2008; Pando, Balan, Dolezal, Marone, Barreda, Carballo-Dieguez, &
Avila, 2013; Templeton et al., 2009; Templeton, Millett, & Grulich, 2010). Furthermore, an analysis of 118 countries found that circumcised men are significantly less likely to transmit HIV than intact men in countries where HIV transmission occurs mainly through penile-vaginal but not penile-anal intercourse (Drain, Halperin, Hughes, Klausner, & Bailey, 2006). Although this idea has not been formally tested, one can presume that protective differences in the type of sexual intercourse a couple engages in (i.e., vaginal versus anal) can also apply to heterosexual couples, which represents another avenue of research that is currently lacking. Studies explicitly comparing differential HIV transmission risks in penile-vaginal and penile-anal intercourse are needed before drawing conclusions for North American or MSM populations. Additionally, circumcision status and sexual practices of MSM as well as heterosexual couples should be formally investigated, as these factors are important in the debate about HIV transmission and circumcision status.

Research points to the potential efficacy of adult circumcision as a mass “immunization” against STIs (especially HIV) in very high-risk areas (Lukobo & Bailey, 2007; Szabo & Short, 2000; UNAIDS, 2012). This hypothesis, however, has not been tested in North American populations, nor has it been directly tested with neonatal circumcision, or among MSM populations. Furthermore, circumcision as an “immunization” against STI acquisition may not represent the most effective intervention in North America, where demographic and cultural aspects are likely to influence STI prevention strategies. Education about safe sex practices, penile hygiene, and condom adherence offers a less costly intervention alternative to circumcision, which is associated with considerable financial cost (van Howe, 2004) and the possibility of health complications (Christakis et al., 2000; Senel et al., 2011; Williams & Kapila, 1997). Although behavioural interventions are reliant on adherence, the protective benefits of condom use against HIV transmission (60-80%; Pinkerton & Abramson, 1997; Weller & Davis, 2002) remain higher than circumcision (51-60%; Auvert et al., 2005; Bailey et al., 2005; Gray et al., 2007) after controlling for condom adherence rates.
Given the considerable methodological shortcomings of the research, as well as significantly different demographic characteristics of African versus North American populations, the generalizability and reliability of the research that has formed the basis of the AAP decision to support neonatal circumcision is perhaps not as strong as many believe. In fact, the majority of the research is likely not transferrable to a North American population. Please see Table 2.1 for a summary of the papers reviewed in this section.
Table 2.1

<table>
<thead>
<tr>
<th>Study; Location</th>
<th>Sample size; Age range</th>
<th>Circumcision status</th>
<th>Circumcision information</th>
<th>Study Design</th>
<th>Outcome Measures</th>
<th>Results</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auvert et al., 2009; South Africa</td>
<td>$N = 1,264$ Age range $= 18 – 24$ y</td>
<td>Intact $n = 627$</td>
<td>Circ $n = 637$</td>
<td>Age at circumcision $= 18 – 24$ y</td>
<td>RCT</td>
<td>High-Risk HPV via swab samples</td>
<td>HPV: C&lt;I (14.8 vs 22.3%); protection of 66%</td>
</tr>
<tr>
<td>Auvert et al., 2005; South Africa</td>
<td>$N = 2,375$ Age range $= 18 – 24$ y</td>
<td>$n = 1,102$</td>
<td>1,127</td>
<td>Age at circumcision $= 18 – 24$ y</td>
<td>RCT</td>
<td>HIV acquisition via blood test</td>
<td>HIV: C&lt;I (1.8 vs 4.4%); protection of 60%</td>
</tr>
<tr>
<td>Bailey et al., 2005; Africa</td>
<td>$N = 2,544$ Age range $= 18 – 24$ y</td>
<td>$n = 1,279$</td>
<td>1,255</td>
<td>Age at circumcision $= 18 – 24$ y</td>
<td>RCT</td>
<td>HIV acquisition via blood test</td>
<td>HIV: C&lt;I (1.8 vs 3.7%); protection of 60%</td>
</tr>
<tr>
<td>Buchbinder et al., 2005; United States</td>
<td>$N = 3,257$ Age range $= \leq 35 – &gt; 35$</td>
<td>$n = 401$</td>
<td>2,856</td>
<td>Age at circumcision $= \text{Unknown}$</td>
<td>Prospective cohort study from HIV Network for Prevention Trials (HIVNET) Vaccine Preparedness Study (VPS)</td>
<td>HIV and STIs via self-report</td>
<td>HIV: C&lt;I</td>
</tr>
<tr>
<td>Castellsague et al., 2002; Various (Brazil, Colombia, Philippines, Spain, Thailand)</td>
<td>$N = 1,139$ Age range $= &lt; 57$ y</td>
<td>$n = 847$</td>
<td>292</td>
<td>Age at circumcision $= \text{Unknown}$</td>
<td>HPV via swab samples</td>
<td>HPV: C&lt;I (5.5 vs 19.6%)</td>
<td>Circumcision is associated with a reduced risk of penile HPV</td>
</tr>
<tr>
<td>Study</td>
<td>N</td>
<td>Age range</td>
<td>Age at circumcision</td>
<td>Reason</td>
<td>Study Design</td>
<td>Case-Control</td>
<td>Case</td>
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<tr>
<td>Daling et al., 2005;</td>
<td>808</td>
<td>18 – 74 y</td>
<td>Childhood (0 – 9 y), “later” (10 y – adult)</td>
<td>Unknown</td>
<td>Population-based case-control study</td>
<td>Penile cancer via self-report and blood samples</td>
<td>Penile cancer: C=I; Circumcised after 9 y &gt; Circumcised before 9 y</td>
</tr>
<tr>
<td>United States</td>
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<tr>
<td>Drain et al., 2006;</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>Ecological study via review of population-based statistics</td>
<td>HIV, herpes via country-specific age-standardized rates per 100 adults; Circumcision via country-specific prevalence rates</td>
<td>HIV in countries with primarily heterosexual HIV transmission: C=I</td>
</tr>
<tr>
<td>Various (118 developing countries)</td>
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<tr>
<td>Fergusson et al., 1988;</td>
<td>551</td>
<td>0 – 8 y</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Longitudinal study</td>
<td>UTIs via mother’s report; supplemental information obtained from medical records</td>
<td>Penile problems in infancy: C&gt;I (5.5 vs 1.1 per 100 children)</td>
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<tr>
<td>New Zealand</td>
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<tr>
<td>Frisch et al., 1995;</td>
<td>1,516</td>
<td>22 – 95 y</td>
<td>Unknown</td>
<td>Unknown</td>
<td>National survey</td>
<td>Penile cancer via review of data from Danish Cancer Registry</td>
<td>Penile cancer: Incidence decreased in Denmark from 1943 to 1990</td>
</tr>
<tr>
<td>Europe</td>
<td></td>
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<td></td>
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<tr>
<td>Giuliano et al., 2009;</td>
<td>988</td>
<td>18 – 70 y</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Men recruited from ongoing study of HPV in Men (HIM)</td>
<td>HPV via swab samples</td>
<td>HPV: C&lt;I</td>
</tr>
<tr>
<td>Various (Brazil, Mexico, United States)</td>
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<tr>
<td>Study</td>
<td>Country</td>
<td>Sample Size</td>
<td>Age Range</td>
<td>Age at Circumcision</td>
<td>Study Type</td>
<td>Reason for Circumcision</td>
<td>Study Details</td>
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<tr>
<td>Gray et al., 2007;</td>
<td>Africa</td>
<td>N = 1,973</td>
<td>15 – 49 y</td>
<td>15 – 49 y</td>
<td>RCT</td>
<td>Age at circumcision</td>
<td>HIV acquisition via blood test</td>
</tr>
<tr>
<td>Hernandez et al., 2008;</td>
<td>United States</td>
<td>N = 379</td>
<td>Age range = Unknown (M = 29 y)</td>
<td>80</td>
<td>Survey</td>
<td>Age range</td>
<td>HPV via swab samples (in various anatomical regions of the genitals)</td>
</tr>
<tr>
<td>Maden et al., 1993;</td>
<td>Various (Canada, United States)</td>
<td>N = 465</td>
<td>Age range = &lt;74 y</td>
<td>230</td>
<td>Population-based case-controlled study</td>
<td>Age at circumcision = Neonatal or Adult</td>
<td>STIs and penile cancer via biopsies, blood samples</td>
</tr>
<tr>
<td>Millett et al., 2008;</td>
<td>Various (Asia, Australia, Canada, Europe, United States)</td>
<td>N = 18 studies</td>
<td>Age range = Unknown</td>
<td>--</td>
<td>Meta-analysis</td>
<td>Age at circumcision = Unknown</td>
<td>Results (i.e., effect sizes, odds ratios) from reviewed papers were recorded or calculated</td>
</tr>
<tr>
<td>Morris &amp; Wiswell, 2013;</td>
<td>Various (Asia, Australia, Europe, North America)</td>
<td>N = 22 studies</td>
<td>Age range = 0 – 1 y; 1 – 16 y; 16+ y</td>
<td>--</td>
<td>Systematic review and meta-analysis</td>
<td>Age at circumcision = Unknown</td>
<td>Results (i.e., estimated lifetime prevalence relative risk) from reviewed papers were recorded or calculated</td>
</tr>
<tr>
<td>Nielson et al. 2009;</td>
<td>United States</td>
<td>N = 463</td>
<td>Age range = 18 – 40 y</td>
<td>74</td>
<td>Men recruited from ongoing study of HPV in Men</td>
<td>Age at circumcision = Unknown</td>
<td>HPV via swab samples (in various anatomical regions of the genitals)</td>
</tr>
<tr>
<td>Study Authors</td>
<td>Country</td>
<td>N</td>
<td>Age range</td>
<td>Age at circumcision</td>
<td>Design Type</td>
<td>STI and HIV acquisition methods</td>
<td>STI (C vs I)</td>
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</tbody>
</table>
| Pando et al., 2013     | South America            | 500   | 20 – 39 y       | Unknown              | Cross-sectional study| HIV and STIs via biological samples | HBV: C=I  
HCV: C=I  
HPV: C=I  
High-risk HPV: C<I  
T. pallidum: C=I  
HIV: C=I  
HIV in men who reported they did not practice receptive anal intercourse: C<I (0 vs 14.8%) |            | Circumcision was not associated with STI acquisition; however, in men who reported a preference for the insertive role in anal intercourse, circumcision was associated with a reduced risk of HIV |
| Reynolds et al., 2004  | India                    | 2,298 | <20 – ≥30 y     | Unknown              | Prospective study of HIV-negative men recruited from STI clinic | STIs via laboratory confirmation, physical examination, and behavioural risk factors | Gonorrhea: C=I (3.7 vs 5.2%)  
Herpes: C=I (11.2 vs 14%)  
HIV: C<1 (1.0 vs 7.8%)  
Syphilis: C=I (5.6 vs 7.2%) |            | Circumcision is associated with reduced risk of HIV, but it is not associated with rates of herpes, gonorrhea, or syphilis |
| Schoen et al., 2000    | United States            | 14,893| 0 – 1 y         | Neonatal             | Cohort study         | UTI via electronic and outpatient medical records | UTI: C<1 (14 vs 86%) |            | Circumcision is associated with reduced risk of UTIs in the first year of life |
| Singh-Grewal et al., 2005 | Various (Australia, Canada, Turkey, United States) | 12 studies | 0 – Adult       | Unknown              | Systematic review | Results (i.e., effect sizes, odds ratios) from reviewed papers were recorded or calculated | UTI: C<1 |            | Circumcision is associated with reduced risk of UTIs |
| Templeton et al., 2009 | Australia                | 1,426 | 18 – 75 y       | Unknown              | Men recruited from ongoing study of HPV in Men (HIM) | HIV via blood test; Sex practices (e.g., primarily practice insertive role in intercourse) via self-report | HIV: C=I (3.0 vs 3.5%)  
HIV in MSM who reported a preference for the insertive role in anal intercourse: C<1 (0.7 vs 3.2%) |            | Circumcision was not associated with HIV acquisition; however, in men who reported a preference for the insertive role in anal intercourse, circumcision was associated with a reduced risk of HIV acquisition |
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>N</th>
<th>Age at circumcision</th>
<th>Age range</th>
<th>Age range</th>
<th>Reason</th>
<th>Study Design</th>
<th>Test method</th>
<th>Herpes: C&lt;I (7.8 vs 10.3%)</th>
<th>HPV: C&lt;I (18.0 vs 27.9%)</th>
<th>Syphilis: C=I (2.4 vs 2.1%)</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobian et al., 2009;</td>
<td>Africa</td>
<td>1,395</td>
<td>1,307</td>
<td>15 – 49 y</td>
<td>15 – 49 y</td>
<td>Part of study enrollment</td>
<td>RCT</td>
<td>Herpes via blood samples; HPV and syphilis via swab samples</td>
<td></td>
<td></td>
<td></td>
<td>Circumcision is associated with reduced risk of herpes and HPV, but it is not associated with rates of syphilis</td>
</tr>
<tr>
<td>Tseng et al., 2001;</td>
<td>United States</td>
<td>110</td>
<td>90</td>
<td></td>
<td></td>
<td>Neonatal or over 1 y</td>
<td>Population-based case-control study</td>
<td>STIs via self-report</td>
<td>Carcinoma: C&lt;I; Phimosis &gt; No phimosis</td>
<td>Carcinoma in situ: C=I</td>
<td></td>
<td>Phimosis appears to mediate the effect of circumcision on risk of invasive penile cancer</td>
</tr>
<tr>
<td>Van Howe, 2007;</td>
<td>Various (Africa, Asia, Australia, Canada, Europe, India, United States)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Unknown</td>
<td>Systematic review and meta-analysis</td>
<td>Results (i.e., effect sizes, odds ratios) from reviewed papers were recorded or calculated</td>
<td>Chancroid: C=I</td>
<td>Chlamydia: C=I</td>
<td>Genital ulcerative disease: C&lt;I</td>
<td>Genital ulcerative disease, but it is not associated with reduced risk of chancroid, chlamydia, or gonorrhea</td>
</tr>
<tr>
<td>Weiss et al., 2006;</td>
<td>Various (Africa, Asia, Australia, Europe, India, South Africa, United States)</td>
<td>27,319</td>
<td>80,279</td>
<td></td>
<td></td>
<td>Varied by study</td>
<td>Systematic review and meta-analysis</td>
<td>Results (i.e., effect sizes, odds ratios) from reviewed papers were recorded or calculated</td>
<td>Chancroid: C&lt;I</td>
<td>Herpes: C&lt;I</td>
<td>Syphilis: C&lt;I</td>
<td>Circumcision is associated with reduced risk of chancroid, herpes, and syphilis</td>
</tr>
<tr>
<td>Wiswell &amp; Hachey, 1993;</td>
<td>United States</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Neonatal</td>
<td>Cohort study</td>
<td>UTI via hospital records</td>
<td>UTI: C&lt;I (0.14 vs 1.4%)</td>
<td></td>
<td></td>
<td>Circumcision is associated with reduced risk of UTIs in the first year of life</td>
</tr>
<tr>
<td>Xu et al., 2007;</td>
<td>United States</td>
<td>1,296</td>
<td>4,877</td>
<td></td>
<td></td>
<td>Unknown; authors assume neonatal</td>
<td>National survey</td>
<td>HSV-2 antibodies via blood test</td>
<td>Herpes: C=I (11.6 vs 13.7%)</td>
<td></td>
<td></td>
<td>Circumcision is not associated with reduced risk of herpes virus</td>
</tr>
</tbody>
</table>

**Notes:**
- **N:** Sample size
- **Age range:** Age range of participants
- **Reason:** Reason for circumcision
- **Study Design:** Design of the study
- **Test method:** Methods used to test for different diseases
- **Conclusion:** Conclusion based on the study findings
Sexual Functioning

Sexual functioning is intricately tied to quality of life for men and women (Lindau & Gavrilova, 2010; Pukall & Bossio, 2014; Thompson, Charo, Vahia, Depp, Allison, & Jeste, 2011; Yeh, Lorenz, Wickrama, Conger, & Elder, 2006). Popular conjecture holds that the circumcised penis is less sensitive than its non-altered complement. One might expect lower penile sensitivity to negatively impact sexual functioning, yet – counter-intuitively – circumcision is often performed in adult men with the intent to ameliorate sexual dysfunction and thus improve sexual functioning (e.g., Zhang, Yu, Bai, & Wang, 2012). Despite widespread beliefs about the effects of circumcision on the penis and sexual functioning, empirical studies investigating the objective measures of these effects are lacking. The lack of strong empirical findings related to circumcision on men’s sexual functioning represent a significant and problematic gap in the debate about neonatal circumcision in North America.

Research exploring sexual functioning across circumcision status has produced mixed results. A number of studies have employed pre-/post-measures of sexual functioning in men who were sexually active prior to undergoing circumcision in adulthood. Documented improvements in self-reported sexual functioning following adult circumcision include better erectile functioning (Cortés-González, Arratia-Maqueo, Martínez-Montelongo, Gómez-Guerra, 2009; Senel et al., 2011), greater ease of orgasm (Krieger et al., 2008) less pain during intercourse (Dias, Freitas, Amorim, Espiridião, Xambre, & Ferraz, 2013; Masood, Patel, Himpan, Palmer, Mufti, & Sherif, 2005), increased overall satisfaction with sexual functioning and improvement in the sexual problem that precipitated their circumcision (Senel et al., 2011). Studies reporting differences in ejaculatory latency times (ELTs) – an indirect measure of sexual functioning and penile sensitivity – have typically noted longer ELTs in circumcised men (Money & Davidson, 1983; Şenkul, İşer, Şen, Karademir, Saracoglu, & Erden, 2004; but see also Kim & Pang, 2007; Waldinger, Quinn, Dilleen, Mundayat, Schweitzer, & Boolell, 2005). However, some regard this outcome as positive (i.e., prolonged intercourse leads to greater enjoyment for the male partner; Senol,
Sen, Karademir, Sen, & Saraçoglu, 2008), while others regard this as sexually dysfunctional (Money & Davison, 1983; Shen, Chen, Zhu, Wan, & Chen, 2004).

Adverse self-reported outcomes associated with foreskin removal in adulthood include impaired erectile functioning (Cuceloglu, Hosrik, Ak, & Bozkurt, 2012; Dias et al., 2013; Fink, Carson, & DeVellis, 2002; Hammond, 1999; Shen et al., 2004), orgasm difficulties (Dias et al., 2013; Frisch, Lindholm, & Grønbæk, 2011), decreased masturbatory functioning (loss in pleasure and increase in difficulty; Kim & Pang, 2007), increase in penile pain (Hammond, 1999; Money & Davison, 1983), an increased number of complaints about a loss of penile sensitivity with age (Laumann, Masi, & Zuckerman, 1998), and lower subjective ratings of penile sensitivity (Fink et al., 2002). However, other studies have found no significant differences in self-reported sexual functioning following adult circumcision (Collins, Upshaw, Rutchik, Ohannessian, Ortenberg, & Albertsen, 2002; Coursey et al., 2001; Hosseini, Khazaeli, & Atharikia, 2008; Kigozi et al., 2008). Research comparing sexual functioning among men circumcised as neonates and intact men, or comparing men circumcised as neonates to men circumcised as adults is sorely lacking or – in most cases – completely nonexistent.

From a methodological standpoint, it is a strength of the aforementioned studies to include a pre- and post-measure of sexual functioning in men who undergo circumcision in adulthood. This study design allows intact men to act as their own controls after the circumcision procedure. However, there are also important problems with using men who undergo circumcision as adults to draw conclusions about the impact of the procedure on sexual functioning. In North America, the majority of circumcisions occur in neonates, and the effects of undergoing circumcision as a neonate versus as an adult are unknown for factors such as pain perception, penile sensitivity, and sexual functioning. In addition, many of the populations in the above studies consisted of non-random samples of men who had undergone circumcision to correct medical or sexual issues involving their genitals. Such reasons included phimosis, dermatological issues (e.g., inflammation or genital warts; Cortés-González et al., 2009; Fink et al., 2002), removal of excess skin (Fink et al., 2002), other benign disease (Coursey et al., 2001; Masood et
al., 2005), or sexual dysfunction (e.g., premature ejaculation, now called early ejaculation; Zhang et al., 2012). Sexual dysfunction and low sexual satisfaction are likely to be inflated in a population where urological conditions are over-represented, particularly if circumcision does not correct the pre-existing condition. As well, the samples are self-selected; that is, they consist of men who have made the decision to undergo circumcision as an adult. As such, self-reported outcomes are likely to be heavily biased by the men’s own decisions to have the procedure. When policy statements about neonatal circumcision take sexual functioning into account, they primarily cite papers such as these; however, the populations that comprise the current research in this area are not comparable to the typically healthy, neonatally circumcised male in North America.

Very few studies have compared sexual functioning across groups of men who were circumcised as infants with those circumcised as adults, and even fewer studies have looked at sexual functioning in samples of men who were circumcised as neonates, as is typical in North America. Most report no effect of age at circumcision and sexual functioning (Aydur, Gungor, Ceyhan, Taiimaz, & Baser, 2007; Frisch et al., 2011; Hosseini et al., 2008; Hosseini & Mohseni, 2011); however, age at circumcision is treated as a categorical variable instead of a continuous variable, and these age categories are not consistent across studies. For example, Hosseini and Mohseni (2011) examined circumcision in men who had the procedure before compared to after the age of 18, while Aydur et al. (2007) combined the neonatal (under 1 month) and infant (up to 2 years) circumcision groups. One study found that males circumcised over the age of 7 years were more likely to experience premature ejaculation (PE) in adulthood (Cuceloglu et al., 2012); however, this study also combined neonatal and infant circumcision, and they defined the infant group as those being between the ages of 0-3 years, which is inconsistent with the Aydur et al. (2007) study.

Many other studies investigating circumcision and sexual functioning simply do not control for age at circumcision. Of the studies that do not report age at circumcision, the removal of the foreskin does not appear to have an effect on ejaculatory functioning (Tarhan, Can, Akdeniz, Akarken, Cakmak, &
Zorlu, 2013; Waldinger, McIntosh, & Schweitzer, 2009; but see Tang & Khoo, 2011). Two large-scale self-report surveys on Australian populations found no difference in self-reported sexual functioning across circumcision status (Ferris et al., 2010; Richters, Smith, de Visser, Grulich, & Rissel, 2006). Richters et al. (2006) reported that circumcised men were less likely than intact men to report pain during sex and trouble maintaining an erection. These findings are consistent with a recent systematic review conducted by Morris and Krieger (2013) that explored sexual functioning, sensitivity, and sexual satisfaction in men as a function of their circumcision status. The review reports on 36 studies ranked on the Scottish Intercollegiate Guidelines Network grading system with a total sample size of 40,472 men (19,542 intact and 20,931 circumcised). The authors reported that the “higher quality” studies revealed no significant differences in sexual function (e.g., sexual sensation, erectile function, PE, ejaculatory latency, and sexual pleasure) as a function of circumcision status. In contrast, 10 of the 13 studies deemed “lower quality” by the employed rating scale showed sexual functioning impairment based on circumcision status in one or more of the same domains. The authors do not report the results of this review collapsed across study quality. The conclusion drawn by the authors – that circumcision has no impact on sexual functioning, sensitivity, or sexual satisfaction – does not necessarily align with the information presented in their review, which is mixed. However, it is important to note that this paper is a review of the literature and not a meta-analysis, thus no statistical analyses of the data have been performed; instead the paper present the authors’ interpretation of trends.

To our knowledge, only one study to date has employed objective physiological measures of sexual arousal to examine sexual functioning and circumcision status (Payne, Thaler, Kukkonen, Carrier, & Binik, 2007). This study exposed men to two 10 min videos (one erotic and one neutral video) in a randomized order. Men’s genital responses were assessed using a thermal imaging camera, which provided an indirect measure of blood flow and, thus, sexual arousal. Significant changes in penile temperature were observed across groups in response to erotic stimuli: intact men had a significantly lower penile temperature than circumcised men at baseline, and showed a larger increase in penile
temperature with sexual arousal. Although it is unclear whether this variation translates to functional differences in sexual arousal/functioning, this paper illustrates an important avenue of research that needs to be addressed.

Mixed findings about circumcision and sexual functioning may be due to methodological issues within the research. Age at circumcision is a factor that has yet to be systematically tested, especially with respect to potential differences between neonatal circumcision (as is typical in North America) and adult circumcision. Few studies report on North American populations. Instead, conclusions have largely been based on samples drawn from Europe (Frisch et al., 2011; Waldinger et al., 2009), South Korea (Kim & Pang, 2007), Africa (Kigozi et al., 2008; Krieger et al., 2008), and Australia (Ferris et al., 2010; Richters et al., 2006) where cultural differences may account for some findings (e.g., age at circumcision, reasons for or beliefs about the procedure). These differences—which have yet to be systematically evaluated—represent an area that requires further research. Furthermore, the majority of these studies rely exclusively on self-report measures of sexual functioning, which can be subject to participant biases, particularly among self-selected populations. Please see Table 2.2 for a summary of the papers reviewed in this section.
### Table 2.2

**Sexual functioning and circumcision sexual functioning and circumcision**

<table>
<thead>
<tr>
<th>Study; Location</th>
<th>Sample</th>
<th>Circumcision status</th>
<th>Circumcision information</th>
<th>Study design</th>
<th>Outcome measures</th>
<th>Results</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aydur et al., 2007; Turkey</td>
<td>$N = 107$</td>
<td>$0$</td>
<td>Age at circumcision = infancy (0 – 2 y); preschool (3 – 5 y); childhood (6 – 12 y)</td>
<td>Survey</td>
<td>GRISS</td>
<td>Sexual functioning: Infancy = Preschool = Childhood</td>
<td>Age at circumcision was not associated with sexual function</td>
</tr>
<tr>
<td>Collins et al., 2002; United States</td>
<td>$N = 15$</td>
<td>--</td>
<td>Age at circumcision = 36.9 ± 12.0 y</td>
<td>Pre-post survey (3+ mo follow-up)</td>
<td>BMSFI</td>
<td>Sexual functioning: C=I</td>
<td>Adult circumcision did not adversely impact sexual functioning</td>
</tr>
<tr>
<td>Cortés-González et al., 2009; Mexico</td>
<td>$N = 22$</td>
<td>--</td>
<td>Age at circumcision = 21 – 53 y</td>
<td>Pre-post survey (3 mo follow-up)</td>
<td>BMSFQ; CSFQ; CMASH Sexual Functioning Questionnaire; IIEF5</td>
<td>Erectile function: C&gt;I Perception of sexual events: C&gt;I PE: C&lt;I</td>
<td>Adult circumcision did not adversely impact sexual satisfaction; might improve sexual satisfaction by addressing a penile issue</td>
</tr>
<tr>
<td>Coursey et al., 2001; United States</td>
<td>$N = 48$</td>
<td>--</td>
<td>Age at circumcision = 49.8 ± 3.2 y</td>
<td>Pre-post survey (3+ mo follow-up)</td>
<td>Questions about satisfaction with penile appearance, sexual functioning</td>
<td>Satisfaction with erection: C=I Sexual functioning: C=I</td>
<td>Adult circumcision did not adversely impact sexual functioning</td>
</tr>
<tr>
<td>Study</td>
<td>$N$</td>
<td>Age range</td>
<td>Age at circumcision</td>
<td>Reason</td>
<td>Methodology</td>
<td>Instruments</td>
<td>Findings</td>
</tr>
<tr>
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<tr>
<td>Cuceloglu et al., 2012; Turkey</td>
<td>80</td>
<td>20 – 40 y</td>
<td>$0 – &gt;11$ y</td>
<td>Religious (82.5%); doctor recommendation (17.5%)</td>
<td>Comparison study of circumcised men with and without PE</td>
<td>GRISS; PE subscale</td>
<td>Sexual satisfaction: circumcised at $\geq 7$ y $&gt;$ circumcised at $&lt;7$ y PE: circumcised at $\geq 7$ y $&gt;$ circumcised at $&lt;7$ y</td>
</tr>
<tr>
<td>Dias et al., 2013; Portugal</td>
<td>62</td>
<td>19 – 74 y</td>
<td>$19 – 74$ y</td>
<td>Medical (e.g., phimosis)</td>
<td>Pre-post survey (3+ mo follow-up)</td>
<td>BSFQ; BMSFI; IIEF; additional questions about general sexual experiences</td>
<td>Delayed orgasm: C$&lt;$I Erectile dysfunction: C$&gt;$I Pain during intercourse: C$&lt;$I</td>
</tr>
<tr>
<td>Ferris et al., 2010; Australia</td>
<td>4,290</td>
<td>16 – 64 y</td>
<td>Unknown</td>
<td>Unknown</td>
<td>National survey</td>
<td>Questions assessing demographics, relationship issues, sexual behaviours, sexual functioning, sexual attitudes</td>
<td>Sexual functioning: C=I Worries about body image during sex: C$&lt;$I</td>
</tr>
<tr>
<td>Fink et al., 2002; United States</td>
<td>43</td>
<td>Unknown</td>
<td>$18+$ y</td>
<td>Medical (e.g., phimosis)</td>
<td>Survey; retrospective reports</td>
<td>Items adapted from BMSFQ, CSFQ, CMASH Sexual Functioning Questionnaire, IIEF5, NHSLS</td>
<td>Erectile function: C$&lt;$I Penile sensitivity: C$&lt;$I Satisfaction with circumcision: C$&gt;$I</td>
</tr>
<tr>
<td>Frisch et al., 2011; Europe</td>
<td>5,552</td>
<td>16 – $\geq$60 y</td>
<td>Unknown</td>
<td>Unknown</td>
<td>National survey from men and their female partners</td>
<td>Questionnaire about general sexual experiences, sexual functioning</td>
<td>Male’s orgasm difficulties: C$&gt;$I Women’s dyspareunia: C$&gt;$I Women’s orgasm difficulties: C$&gt;$I Women’s sexual needs fulfillment: C$&lt;$I Women’s sexual functioning: C$&lt;$I</td>
</tr>
<tr>
<td>Study Authors and Year</td>
<td>Country</td>
<td>N</td>
<td>Age Range</td>
<td>Age at Circumcision</td>
<td>Reason</td>
<td>Study Design</td>
<td>Other Measures</td>
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<tr>
<td>Hammond, 1999; United States</td>
<td>N = 313</td>
<td>19 – &gt;60 y</td>
<td>Age at circumcision = 0 – &gt;18 y</td>
<td>Reason: Unknown</td>
<td>Survey</td>
<td>Questionnaire designed by National Organization to Halt the Abuse and Routine Mutilation of Males (NOHARMM)</td>
<td>Sexual dysfunction was attributed to self-reported sensory deficits in the preputial remnant and glans</td>
</tr>
<tr>
<td>Hosseini et al., 2008; Iran</td>
<td>N = 84</td>
<td>Unknown (M = 34.2 – 36.5 y)</td>
<td>Age at circumcision = Neonatal (n = 64); unknown (n = 20)</td>
<td>Reason: Unknown</td>
<td>Comparison study of circumcised men with and without PE</td>
<td>Length of penis, mucosal cuff, and penile skin; IELT</td>
<td>Penile measurements: PE=no PE IELT: PE&lt;no PE</td>
</tr>
<tr>
<td>Hosseini &amp; Mohseni, 2011; Iran</td>
<td>N = 125</td>
<td>Unknown (M = 29.9 – 31.2 y)</td>
<td>Age at circumcision = less than 18 y or older than 18 y</td>
<td>Reason: Unknown</td>
<td>Survey; retrospective reports</td>
<td>BMSFI; IIEF; additional questions about sexual satisfaction, sexual activity, erectile functioning</td>
<td>Erectile functioning: C=I Sexual activity: C=I Sexual functioning: C=I Sexual satisfaction: C=I</td>
</tr>
<tr>
<td>Kigozi et al., 2008; Africa</td>
<td>N = 4,996</td>
<td>15 – 49 y</td>
<td>Age at circumcision = 15 – 49 y</td>
<td>Reason: Part of study enrollment</td>
<td>RCT</td>
<td>Items adapted from IIEF</td>
<td>Sexual satisfaction: C=I Sexual functioning: C=I</td>
</tr>
<tr>
<td>Kim &amp; Pang, 2007; Asia</td>
<td>N = 373</td>
<td>30 – 57</td>
<td>Age at circumcision = ≥20 y</td>
<td>Reason: Unknown</td>
<td>Survey; retrospective reports</td>
<td>BMSFI; additional questions about sexual functioning</td>
<td>ELT: C=I Masturbatory difficulty: C&gt; I Masturbatory pleasure: C&gt; I Sexual functioning: C=I</td>
</tr>
<tr>
<td>Krieger et al., 2008; Africa</td>
<td>N = 2,784</td>
<td>18 – 24 y</td>
<td>Age at circumcision = 18 – 24 y</td>
<td>Reason: Part of study enrollment</td>
<td>RCT</td>
<td>Non-standardized questionnaires assessing sexual function, sexual satisfaction, pleasure</td>
<td>Sexual behaviour: C=I Sexual satisfaction: C=I C men: Increased penile sensitivity and ease of orgasm</td>
</tr>
<tr>
<td>Study (Year, Country)</td>
<td>N</td>
<td>Age range</td>
<td>Age at circumcision</td>
<td>Reason</td>
<td>Study Design</td>
<td>Questions</td>
<td>Sexual Dysfunction</td>
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<tr>
<td>Laumann et al., 1998; United States</td>
<td>1,369</td>
<td>18 – 59 y</td>
<td>Unknown</td>
<td>Unknown</td>
<td>National survey</td>
<td>Questions about sexual dysfunction, sexual practices</td>
<td>Sexual dysfunction: C&lt;I Size of sexual practice repertoire: C&gt;1</td>
</tr>
<tr>
<td>Masood et al., 2005; Europe</td>
<td>88</td>
<td>18 – 60 y</td>
<td>Adult</td>
<td>Benign disease</td>
<td>Survey; retrospective reports</td>
<td>IIEF5; additional questions about sexual functioning, penile appearance</td>
<td>Improved penile sensation during intercourse: C&gt;1 Pain during intercourse: C&lt;I Sexual functioning: C=I Satisfaction with circumcision: 61%</td>
</tr>
<tr>
<td>Morris &amp; Krieger, 2013; Various</td>
<td>40,473</td>
<td>Varied by study</td>
<td>Varied by study</td>
<td>Varied by study</td>
<td>Review</td>
<td>Varied by study (sexual function; sexual sensitivity; sexual sensation; satisfaction)</td>
<td>Circumcision did not adversely impact sexual functioning, sensitivity, sensation, or satisfaction in high-quality studies</td>
</tr>
<tr>
<td>Payne et al., 2007; Canada</td>
<td>40</td>
<td>18 – 45 y</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Experimental</td>
<td>Touch and pain thresholds (penile shaft, glans penis, forearm); sexual arousal (thermal imaging)</td>
<td>Touch threshold (penis): C=I Touch threshold (forearm): C&lt;I Pain threshold (penis): C=I Pain threshold (forearm): C=I Baseline penile temperature: C&gt;1 Increase in penile temperature: C&lt;I</td>
</tr>
<tr>
<td>Richters et al., 2006; Australia</td>
<td>10,173</td>
<td>16 – 59 y</td>
<td>Unknown (authors assume neonatal)</td>
<td>Unknown</td>
<td>National survey</td>
<td>Questions assessing sexual difficulties, sexual attitudes</td>
<td>Erectile difficulties: C&lt;I Pain during intercourse: C&lt;I</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>N</td>
<td>Age range</td>
<td>Age at circumcision</td>
<td>Follow-up</td>
<td>Survey/Measurements</td>
<td>Ejaculation</td>
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<tr>
<td>Senel et al., 2012;</td>
<td>Turkey</td>
<td>186</td>
<td>18 – ≥24 y</td>
<td>18 – ≥24 y</td>
<td>Pre-post</td>
<td>BMSFI; Satisfaction with circumcision</td>
<td>C=I</td>
</tr>
<tr>
<td>Şenkul et al., Turkey</td>
<td>2004;</td>
<td>42</td>
<td>19 – 28 y</td>
<td>19 – 28 y</td>
<td>Pre-post</td>
<td>BMSFI; ELT</td>
<td>C&gt;I</td>
</tr>
<tr>
<td>Senol et al., Turkey</td>
<td>2008;</td>
<td>43</td>
<td>18 – 27 y</td>
<td>18 – 27 y</td>
<td>Pre-post</td>
<td>BMSFI; IELT; PEP</td>
<td>ELT: C&gt;1</td>
</tr>
<tr>
<td>Shen et al., China</td>
<td>2004;</td>
<td>95</td>
<td>Unknown</td>
<td>Adult</td>
<td>Pre-post</td>
<td>Questionnaire</td>
<td>Difficult insertion: C&gt;1</td>
</tr>
<tr>
<td>Tang &amp; Khoo, Asia</td>
<td>2011;</td>
<td>193</td>
<td>Unknown</td>
<td>Adult</td>
<td>Cross-sectional study</td>
<td>Prevalence of PE</td>
<td>PE: C&gt;I</td>
</tr>
<tr>
<td>Tarhan et al., Turkey</td>
<td>2013;</td>
<td>160</td>
<td>&lt;65 y</td>
<td>Unknown</td>
<td>Comparison study</td>
<td>Circumcision scar thickness; mucosal cuff length; IELT</td>
<td>Penile measurements: PE=no PE</td>
</tr>
<tr>
<td>Study</td>
<td>Sample Size</td>
<td>Age Range</td>
<td>Age at Circumcision</td>
<td>Reason</td>
<td>Assessment</td>
<td>Sexual Functioning</td>
<td>Notes</td>
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<tr>
<td>Waldinger et al., 2009; Various (Netherlands, Spain, Turkey, United Kingdom, United States)</td>
<td>N = 471</td>
<td>18 – &gt;51 y</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Survey</td>
<td>IELT; IIEF</td>
<td>Circumcision was not associated with sexual functioning</td>
</tr>
<tr>
<td>Waldinger et al., 2006; Various (Netherlands, Spain, Turkey, United Kingdom, United States)</td>
<td>N = 491</td>
<td>18 – ≥51 y</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Survey</td>
<td>IELT</td>
<td>Circumcision did not adversely impact sexual functioning</td>
</tr>
<tr>
<td>Zhang et al., 2012; China</td>
<td>N = 46</td>
<td>18 – 35 y</td>
<td>18 – 35 y</td>
<td>PE</td>
<td>Pre-post</td>
<td>BMSFI; IELT</td>
<td>Circumcision did not adversely impact sexual function in men</td>
</tr>
</tbody>
</table>
Objective Measures of Penile Sensitivity

The hypothesized role of circumcision in male sexual functioning may be attributable to differences in penile sensitivity resulting from the removal of the foreskin and the sensory receptors contained within. Indeed, research has reliably documented lower penile sensitivity in men who present with sexual dysfunction (e.g., erectile dysfunction; Bleustein, Arezzo, Eckholdt, & Melman, 2002; or premature ejaculation; Salonia et al., 2009) compared to healthy controls using objective measures of sensitivity such as pressure, vibration, or hot/cold thresholds. Additionally, medical diagnoses resulting in neuropathy are linked to sexual dysfunction as a result of lowered penile sensitivity (e.g., diabetes mellitus; Hecht, Neundörfer, Kiesewetter, & Hilz, 2001; Rowland, Greenleaf, Mas, Myers, & Davidson, 1989). Interestingly, a recent review reported no significant differences in penile sensitivity as a function of circumcision status (Morris & Krieger, 2013); however, this analysis failed to separate studies employing self-report (subjective) measures from objective measures of penile sensitivity.

Bleustein and colleagues (2005) compared neurological sensation of 62 intact men and 63 men who were circumcised as neonates. This sample was recruited from a urology department and thus is not comprised of a healthy sample (i.e., 96 men were referred with complaints of sexual dysfunction). This study employed objective measures to assess the spectrum of small to large axon fibers in the penis including vibration threshold (as assessed by a bio-thesiometer), fine-touch threshold (Semmes-Weinstein monofilaments), spatial perception (tactile circumferential discriminator), and hot and cold thermal threshold (Thermal Sensitivity Tester). In the sample of sexually functional men, intact men had significantly worse vibration and better fine-touch pressure sensitivity compared to circumcised men. Intact men had worse vibration sensitivity in the sexually dysfunctional group. All significance was lost when controlling for age, diabetes, and hypertension, which may be due to the fact that intact men were significantly older than circumcised men. Additionally, it is important to note that only a single site, the dorsal midline of the penis, was tested in this study. For intact men this location was tested once with the foreskin in its natural position over the glans, and a second time with the foreskin retracted.
Sorrells and colleagues (2007) assessed fine-touch pressure thresholds using Semmes-Weinstein monofilaments in 159 healthy men (91 intact, 68 circumcised; age at circumcision was not stated). Although only one measure of sensitivity was employed, this study assessed many sites (19 in intact men, 11 in circumcised men). In this sample, the glans of the circumcised penis was significantly less sensitive than the glans of the intact penis. The fine-touch pressure threshold of the most sensitive part of the circumcised penis (the ventral circumcision scar) was higher (less sensitive) than 8 different locations on the intact foreskin. The authors conclude that the most sensitive parts of the penis are contained within the foreskin and are thus removed during circumcision.

Payne and colleagues (2007) assessed 20 circumcised men and 20 intact men on touch and pain thresholds using Semmes-Weinstein monofilaments on the glans penis, the penile shaft, and the volar surface of the forearm, as a control site. No difference in penile sensitivity was observed between circumcised and intact men; however, circumcised men were more sensitive to touch on the forearm than intact men, indicating that perhaps there may be long-term changes in sensory processing. This pattern is consistent with findings reported by Taddio, Katz, Ilersich, and Koren (1997), who observed greater pain responses to immunization injections in infants who underwent circumcision (with and without topical anesthesia) compared to those who did not undergo circumcision. Although studies in humans and animals suggest that neonatal and early infant pain experiences can induce long-term alterations in somatosensory and pain processing (Schwaller & Fitzgerald, 2014; Wollgarten-Hadamek, Hohmeister, Demirakça, Zohsel, Flor, & Hermann, 2009), this question remains to be systematically investigated in men who have undergone circumcision.

Senol et al. (2008) employed a pre-/post-study design by measuring penile pudendal evoked potentials (PEP) in a sample of 43 men who were willing to undergo circumcision for (unspecified) non-medical reasons. PEP was assessed by placing a cathode at the base of the penis and an anode on an unspecified spot on the distal side of the penile shaft. At a minimum of 12 weeks following surgery, the mean PEP latency increased by a mean of 2.75 ms, which was statistically significant. Yang, Zhang, and Guo (2008) also employed a pre-/post-circumcision study design with a control group of 73 intact men
and 96 patients who underwent circumcision for the reason of “simple redundant prepuce”. Vibrotactile sensation thresholds were assessed on the glans penis and a control site (the finger). The control group and the circumcision group did not have significantly different vibrotactile thresholds prior to surgery. However, a within-subject analysis revealed that at 1, 2, and 3 months post-operative follow-up, the men who underwent circumcision experienced a significant lowering of sensitivity in the penile glans over time. For both studies, short follow up times after surgery may have impacted findings, as acute changes from surgery and scar remodeling are known to take up to 12 months to resolve (McNamara & Loiselle, 1997).

Podnar (2012) assessed penile sensitivity by manual (massaging the glans penis) and neurophysiological (direct EMG stimulation of the nerve) elicitation of the penilo-cavernosus reflex in circumcised men \((n = 30; \text{age at circumcision not specified})\), men with permanently retracted foreskins \((n = 15)\), and a control group of intact men \((n = 29)\). Similar to the sample reported by Bleustein et al. (2002), this group was also recruited from a urology clinic for minor sexual dysfunction, and thus do not represent a healthy sample. Elicitation of a normal penilo-cavernosus reflex via manual (but not neurophysiological) stimulation was significantly more difficult in the group of men who were circumcised and with permanently retracted foreskin as compared to the control group who had foreskin covering the glans. The authors hypothesize that this difference is due to the desensitization of the exposed glans in men whose glans penis are not covered by foreskin.

Similar to research investigating sexual functioning as it relates to circumcision status, many of the same methodological concerns hold for studies looking at penile sensitivity. For example, only one study that objectively measured penile sensitivity (i.e., Rowland et al., 1989) reported recruiting men who were circumcised neonatally. The age of the participant at time of testing also appears to play a role in sensitivity (e.g., Rowland et al. 1989), although few studies control for this important factor. Among studies that employ a within-subject design looking at pre-/post-measures of circumcision, findings are likely to be conflated with pre-existing medical conditions precipitating adult circumcision, or authors failing to allow for full healing times. The most significant issue with respect to penile sensitivity and
circumcision status is the lack of research employing objective measures of penile sensitivity. Among the studies that do employ quantitative measures of penile sensitivity, there is no consensus on reliable measures of dynamic sensations over the penis (Bleustein et al., 2005). Indeed, methods vary across studies, as does the resulting neurosensory receptors that are targeted (e.g., fine-touch pressure threshold as measured by Semmes-Weinstein monofilaments assess large diameter myelinated axons, while thermal thresholds assess small diameter axons). Similarly, there is little consensus on the location on the penis that should be tested. Further research should systematically compare testing sites, as Sorrells et al. (2007) showed that sensitivity does appear to vary considerably depending on the region tested. Different testing sites, among other methodological inconsistencies across studies may account for the mixed results in the literature.

**Other Areas Requiring Additional Research**

Up to this point, the current paper has summarized the existing empirical research in the circumcision debate, and has called attention to the gaps in this research. The majority of research to date has focused on health correlates of circumcision, as well as the effect of foreskin removal on men’s sexual functioning and, to a far lesser extent, on penile sensitivity. However, there remain areas of circumcision research that still need to be addressed. These are discussed briefly below:

**Sexual partners of men.** It is naïve to assume that potential differences in health correlates, sexual functioning, penile sensitivity, and anatomical features associated with circumcision do not extend beyond the individual. In fact, emerging evidence suggests that circumcision status has a significant impact on men’s sexual partners; however, research on this topic is sorely lacking. Female sexual partners of circumcised men appear to obtain protective health benefits over female partners of intact men against STIs such as bacterial vaginosis (Center for Disease Control and Prevention, 2010; Cherpes, Hillier, Meyn, Busch, & Krohn, 2008; Gray et al., 2009; but see also Zenilman, Fresia, Berger, & McCormack, 1999), chlamydia (Castellsagué et al., 2005; Sobngwi-Tambekou, Taljaard, Nieuwoudt, Lissouba, Puren, & Auvert, 2009), herpes (Cherpes, Meyn, Krohn, & Hillier, 2003), and HPV (Wawer et al., 2011; but see also Tobian et al., 2011). MSM also appear to achieve some protective benefits against HIV from having
sex with circumcised compared to intact partners (Boyle & Hill, 2012), but this effect appears to be mediated by the type of sex they have (i.e., receptive vs. insertive sex is associated with different risks; Koblin et al., 2006; Sidler et al., 2008; UN Joint Programme on HIV/AIDS, 2009). It is important to note that research on health correlates of sexual partners of circumcised versus intact men has produced mixed results, fails to take into account age at circumcision, and are mostly correlational or post-hoc in nature.

Very few studies have reported on the effects of circumcision on sexual functioning of men’s sexual partners. It has been hypothesized that the structural differences across circumcision status account for notable differences in the partner’s sexual experiences (e.g., mobile foreskin leads to less friction during penetrative intercourse). Indeed, the research seems to support this hypothesis for women, such that intercourse with intact partners is associated with better lubrication (particularly with longer length of intercourse (Cuceloglu et al., 2012; O’Hara & O’Hara, 1999), fewer orgasm difficulties, lower complains of vaginal pain (Cuceloglu et al., 2012) or discomfort, and greater ease of orgasm during penile-vaginal intercourse (O’Hara & O’Hara, 1999). However, these studies either do not account for age at circumcision, or conflate neonatal and infant circumcision. Kigozi and colleagues (2009), who interviewed women in Uganda before and after their partners underwent circumcision, found no significant changes in women’s self-reported sexual functioning after controlling for age, religion, and educational status. In total, 2.9% of the sample reported worse sexual satisfaction, 57.3% reported no change, and 39.8% reported an improvement in sexual functioning. A study by Mao and colleagues (2008) is the only study we are aware of that reports on sexual functioning in MSM as a function of circumcision status. The authors reported that of their sample of 1,426 Australian men, those circumcised after infancy were more likely than intact men to practice any receptive anal sex. Thus, some differences in sexual practices may result as a function of age at circumcision status among MSM.

Additional research is needed to explore factors that have been evidenced to differentially impact the sexual partners of men based on circumcision status. Research controlling for age at circumcision is in need of attention. Past sexual experience or familiarity with a particular circumcision status is also likely to play a role in individual’s perceptions of sexual functioning as a function of circumcision status.
Importantly, there remains a significant dearth of research examining the role of circumcision status in sexual functioning among MSM. The sparse research on this topic highlights a significant variation in the experience of men’s sexual partners based on the circumcision status of those men, but more empirically rigorous research is needed to further understand the potential impact of circumcision status on male and female partners of men.

**Circumcision and body image/satisfaction.** The removal of the foreskin with circumcision results in structural changes to the penis that typically result in differences in penile appearance. Thus, one can assume that men’s perceptions of their body image – with respect to their genitals or potentially overall – may be impacted by circumcision status. There are no studies directly examining genital image/satisfaction with validated measures in men who are circumcised or intact despite the high preponderance of anti-circumcision websites and publications citing that circumcision is harmful to one’s psychosexual development (e.g., Boyle, Goldman, Svobada, & Fernandez, 2002). Studies that are more exploratory do exist in this area, however, and their results indicate that further study of this issue is needed. In one study, Schlossberger, Turner, and Irwin (1992) assessed perceptions about circumcision status and general body image in teenaged boys (aged 11-14). The authors reported that teenaged boys who were circumcised reported significantly higher satisfaction with their circumcision status than intact boys, but no differences in general body image were found. It should be noted, however, that only 68% of this sample was able to correctly identify their own circumcision status (as later confirmed by a physical examination). Additionally, in the study by Ferris et al. (2010), circumcised men were less likely than intact men to worry about their body image during sex. The growing number of anti-circumcision groups (and especially online communities) often reference psychological distress as a result of circumcision status; perception about one’s own circumcision status, and presumably genital body image, may also play a role in the experience of this distress. However, almost no empirical research exists on the topic. Clearly, this lack represents another critical gap in the literature.

**Circumcision and decision-making.** At the very crux of the circumcision debate is the reason for circumcision. As highlighted above, one prevailing reason for circumcision in adult men appears to be
to correct urological/sexual conditions. Some studies suggest that female partners of men prefer the appearance of the circumcised penis (Figueroa & Cooper, 2010; Masood et al., 2005; Williamson & Williamson, 1988), which may play a role in the decision-making process, although empirical studies of adult men’s reasons to undergo circumcision in adulthood have not been explicitly tested. Reasons for neonatal circumcision have received even less attention, perhaps due to the controversial nature of the topic. The most common reasons for neonatal circumcision seem to be social or cultural norm (Waldeck, 2003; Walton, Ostbye, & Campbell, 1997), father’s circumcision status (Binner, Mastrobattista, Day, Swaim, & Monga, 2013; Rediger & Muller, 2013; Walton et al., 1997; Xu & Goldman, 2008), and hygiene (Rediger & Muller, 2013; Xu & Goldman, 2008). With respect to how the decision is made, it appears that the recommendation of medical professionals holds less weight in parent’s decision to circumcise than one might expect (Binner et al., 2002; Oh et al., 2002; Tiemstra, 1999; Walton et al., 1997). A recent study with a Canadian population has shown that the circumcision status of the child’s father appeared to be the best predictor of willingness to circumcise their sons, and influenced parent’s perception of the necessity and safety of the procedure (Rediger & Muller, 2013). This leads us to question what pathway parents are following when making the decision to circumcise their sons. This question holds critical importance to the dissemination of knowledge about circumcision with respect to medical and sexual health and functioning.

**Concluding Remarks**

The recent public statement by the AAP (Blank et al., 2012) in favour of neonatal circumcision may be premature, as further research is needed before conclusions can be drawn with respect to North American populations. Circumcision as an immunization against HIV transmission may be warranted in high-risk populations where less expensive and less invasive procedures (e.g., condom use, safe sex practices) are proving insufficient in the reduction of HIV infection rates. However, a more inclusive picture of circumcision and its long-term effects as they apply to North American populations is needed before medical bodies continue to make generalizations that can be expected to drastically alter the rates
of circumcision in the US (Centers for Disease Control and Prevention, 2010) and Canada (Centers for Disease Control and Prevention, n.d.; Canadian Institute for Health Information; 2010).

This review highlights specific areas of research and methodological considerations that require attention in order to inform policy. First, a shift towards more rigorous and consistent methodology in future research is warranted. That is, researchers should use objective methods in conjunction with validated self-report measures, and they should include samples of men with no history of sexual dysfunction who were circumcised as neonates in order to minimize potential confounds. Second, empirically rigorous studies of the physiological effects of neonatal circumcision on penile sensitivity and sexual functioning are needed. Research should employ well-established measures of sensitivity (e.g., tests for touch and pain thresholds for pressure, heat, vibration) on different regions of the penis and—if present—foreskin. Sexual arousal should be assessed via blood flow (e.g., thermography, laser Doppler imaging) across healthy men who have been circumcised as neonates and those who have never been circumcised. Third, important psychosocial factors associated with circumcision (e.g., impact on sexual partners and on the men themselves, and factors impacting decision makers) need to be addressed. High quality research about the sexual correlates of circumcision should be included in the decision on recommendations made by professional associations.

This paper intends to draw attention to the current gaps in the literature, specifically the need for research focusing on the long-term effects of circumcision performed on neonates, objective measures of sexual functioning and satisfaction, the impact of circumcision status on female and especially male sexual partners of men, the impact of circumcision on the men who undergo the procedure, and factors that influence the decision to circumcise or not. Dissemination of this knowledge will help parents of infant boys make well-informed decisions when considering the circumcision status of their children, and give health care providers valuable information about long-term effects of circumcision on the urological and sexual health and functioning of men and their sexual partners.
References


peroxide-producing lactobacilli, black race, and positive herpes simplex virus type 2 serology. *Sexually Transmitted Diseases, 35*, 78-83.


Chapter 3

Does neonatal circumcision impact penile sensitivity in adult men? Examining penile sensitivity in circumcised and intact men using quantitative sensory testing

Introduction

Circumcision involves the surgical removal of some or all of the penile prepuce (i.e., foreskin). Estimates of circumcision indicate that nearly one-third of the global male population has undergone circumcision (World Health Organization (WHO), 2008), although rates vary geographically as a function of normative medical, social, or religious practices. Recently, the American Academy of Pediatrics (AAP) and the Center for Disease Control (CDC) have released public policy statements (Blank et al., 2012; CDC, 2014) supporting neonatal circumcision, citing that the “benefits outweigh the risks”. Despite the fact that male circumcision is among the oldest and most widely performed medical procedures worldwide (WHO, 2008), public endorsement of neonatal circumcision in the United States has relaunched the circumcision debate (i.e., whether or not to circumcise) into the public eye. Changes to public policy are primarily influenced by an expansive body of research highlighting potential health benefits of the procedure to men and their sexual partners. However, the focus on health may be problematic, as the findings of the many studies cited by the recent policy statement are not necessarily applicable to the North American populations for which the resulting policy statements are intended (see Bossio, Pukall, & Steele, 2014; Earp, in press). Furthermore, public policy fails to adequately consider the impact of circumcision on men’s penile sensitivity and sexual functioning. The current study aims to address the notable gap in the circumcision literature by exploring penile sensitivity in two groups of adult men: those who were neonatally circumcised, and those who are intact.
It is a commonly held belief that circumcision reduces penile sensitivity (e.g., Boyle, Goldman, Svoboda, & Fernandez, 2002; Immerman & Mackey, 1997); however, this hypothesis has received very little empirical attention. Scholars have proposed that the permanently exposed glans penis resulting from circumcision causes keratinization of the glans penis epithelium, which ultimately leads to a reduction in sensitivity (Cold & Taylor, 1999; Immerman & Mackey, 1997; McCoombe & Short, 2006; Morris, 2007). To date, only a single study has experimentally compared keratinization of the glans penis in circumcised and intact cadavers; no differences were found (Szabo & Short, 2000). Few studies have explored the impact of circumcision on penile sensitivity using quantitative measures, or histological correlates of penile sexual sensation.

Two studies explored penile sensitivity via the measurement of fine-touch punctate pressure (i.e., tactile) thresholds (using filaments) across circumcision status in samples of men with no clinically significant sexual dysfunction (Payne, Thaler, Kukkonen, Carrier, & Binik, 2007; Sorrells et al., 2007). Sorrells et al. (2007) mapped tactile sensitivity of the penis by testing 19 sites—8 of which were on the foreskin—whereas Payne et al. (2007) tested two penile sites (not including the foreskin) and one control site on the forearm. The two studies produced different patterns of results: Sorrells’ reported higher thresholds (i.e., lower sensitivity) at the site of the glans penis of circumcised as compared to intact men; however, Payne’s obtained no evidence for differences in penile sensitivity across circumcision status. Interestingly, after comparing thresholds of the most sensitive site on the circumcised penis (i.e., the circumcision scar on the ventral surface of the shaft) to all locations on the foreskin, Sorrells also found that the foreskin was more sensitive, and thus concluded that the most sensitive region of the penis was removed during circumcision (Payne did not test sensitivity at the foreskin). On the other hand, Payne observed lower tactile thresholds (i.e., higher sensitivity) on the control site (i.e., the forearm) in circumcised men as compared to intact men, leading the authors to suggest an overall heightening of sensitivity to touch following a potentially painful surgery shortly after birth. Although the two studies discussed above are not the only ones to explore circumcision and penile sensitivity, they are unique in limiting their sample to men with no history of sexual dysfunction; this restriction is a methodological
strength, as changes in penile sensitivity have been reliably documented in men with sexual dysfunction as compared to healthy controls (Bleustein, Arezzo, Eckholdt, & Melman, 2002; Rowland, 1998).

The majority of research exploring penile sensitivity as it relates circumcision status has utilized clinical samples, which introduces a number of possible confounds and thus should be interpreted with caution (see Bossio et al., 2014 for a discussion). Bleustein and colleagues (Bleustein, Fogarty, Eckholdt, Arezzo, & Melman, 2005) assessed penile sensitivity in circumcised and intact men using a range of stimuli (vibrotactile, tactile, spatial, and thermal), but found that the groups were not significantly different on any measure after controlling for age, diabetes, and hypertension – factors known to impact penile sensitivity (Araujo, Mohr, & McKinlay, 2004; de Tejada & Goldstein, 1988; Giuliano, Leriche, Jaudinot, & de Gendre, 2004; Johannes et al., 2000). Pre-post study designs have been employed by two studies conducted by Senol and colleagues (Senol, Sen, Karademir, Sen, & Saraçoğlu, 2008) and Yang and colleagues (2008) to assess changes in men’s penile sensitivity after undergoing circumcision as adults using pudendal evoked potentials and vibrotactile thresholds, respectively. Both studies documented significant decreases in penile sensitivity following circumcision; however, these findings should be interpreted with caution because—although the within-subject design is typically regarded as a methodological strength—it is not necessarily ideal with respect to circumcision. For example, adult men who choose to undergo circumcision typically do so for the treatment of medical conditions (e.g., phimosis, STIs; Cortés-González, Arratia-Maqueo, Martínez-Montelongo & Gómez-Guerra, 2009) or sexual dysfunction (e.g., Zhang, Yu, Bai, & Wang, 2012). Additionally, in the case of the studies by Senol et al. (2008) and Yang et al. (2008), men were given approximately 12 weeks to heal before post-surgery sensitivity testing was administered; however, scar remodelling is known to take up to 12 months to resolve (McNamara & Loiselle, 1997). Furthermore, it remains unknown whether adult circumcision and neonatal circumcision result in comparable long-term changes in sensitivity.

Podnar (2012) undertook a novel approach to exploring the hypothesis that long-term exposure of the glans penis via circumcision impacts penile sensitivity. In order to control for the possible confound of the surgical removal of foreskin at an early age, Podnar compared the penilo-cavernous reflex across a
group of men who were circumcised, intact, or had permanent retraction of the foreskin (i.e., had an exposed glans penis not due to circumcision). Podnar documented longer times required to manually elicit the penilo-cavernousus reflex in men whose glans penis are permanently exposed (either due to circumcision or foreskin retraction) compared to intact men whose foreskins cover the glans penis. Podnar concluded that long-term exposure of the glans may lead to its desensitization.

With respect to the innervation of penile tissues, Cox, Krieger, and Morris (2015) produced a recent review of the research examining histological correlates relevant to penile sensitivity and pleasure. The authors concluded that the removal of the foreskin via circumcision appears to have no adverse effects on men’s sexual pleasure (Cox et al., 2015). However, many of the histological studies reviewed by the authors simply report on the types and density of nerve fibers in the penis or the foreskin; few studies included measures of sexual functioning or sensation that allow conclusions about the sexual lives of men. Furthermore, it is difficult to determine whether the conclusions drawn by Cox et al. (2015) represent accurate inferences, or if these conclusions are—in some way—based on the results of methodological differences across studies, such as age at circumcision (an important factor), the sites of the penis examined, or measurement errors (e.g., the authors note confusion in the literature in the classification of different nerve types). Malkoc and colleagues (2012) assessed free nerve ending (FNE) density in the foreskin removed from adult men who opted to undergo circumcision, as well as men’s ejaculatory latency times prior to the procedure. The authors found higher FNE density in foreskin tissue closer to the glans penis, but FNE density did not correlate with ejaculatory functioning. Malkoc et al. (2012) did not, however, assess changes in penile sensitivity following circumcision, nor did they analyze tissue taken from the glans penis, where desensitization is expected to take place.

Overall, the exploration of penile sensitivity and circumcision using clinical samples—similar to research with healthy samples—has produced mixed results. It is possible that heterogeneity across population samples with respect to clinical presentation and reason for circumcision may contribute to this lack of consistency. Differences across quantitative measures used in study protocols, as well as a lack of study replications may also explain some of the variation in findings. Additionally, only two
studies—to our knowledge—controlled for factors known to impact penile sensitivity, such as age (Bleustein et al., 2005; Payne et al., 2007). Methodological inconsistencies and shortcomings need to be addressed before conclusions can be drawn about the impact of circumcision on adult penile sensitivity. The current study builds on existing research concerning sexual correlates of male circumcision by exploring quantitative measures of penile sensitivity across groups of sexually healthy men who were circumcised as neonates and those who had never undergone circumcision (i.e., intact). We tested the following hypotheses: (i) Circumcised men will have higher genital tactile and pain thresholds (i.e., lower penile sensitivity) as compared to intact men; (ii) Differences in genital sensitivity between groups will be most pronounced at the glans penis; (iii) Sensory thresholds obtained at the foreskin of intact men will be lower (i.e., more sensitive) than other sites tested (Sorrells et al., 2007).

**Method**

The experiment was reviewed and approved by Queen’s University Health Sciences Research Ethics Board (HSREB); see Appendix B.

**Participants**

Potential participants were recruited through radio advertisements, posters placed in approved sites on Queen's University campus and in the surrounding community, and online advertisements on social media sites (e.g., Facebook, Twitter). Please see Appendix C for list of advertisements used. Interested participants were encouraged to contact the Sexual Health Research Laboratory either by phone or email in order to partake in a brief telephone screening interview to assess eligibility (see Appendix D). If eligible, participants were invited to the laboratory for a single testing session, where they provided consent (Appendix E), underwent an interview (Appendix F), responded to questionnaires (Appendix G), and participated in a quantitative sensory testing session. Participants then underwent psychophysiological assessment of genital and subjective sexual arousal, but these results are reported in a different paper (Chapter 4). Study procedures lasted 2.5-3h, and participants were debriefed (Appendix H) and compensated $75 CAN for their time. The same female researcher performed all testing
procedures to ensure consistency, and a trained female research assistant was present throughout the entire testing session.

Eligible participants consisted of adult men between the ages of 18-40 years. The age range in this sample was limited to relatively young men to control for age, which has been shown to be a confound in research examining circumcision status and penile sensitivity (Bleustein et al., 2005). Exclusion criteria consisted of the following: (1) unable to read and write English fluently; (2) active STIs; (3) history of or current sexual dysfunction (e.g., erectile dysfunction, premature ejaculation); (4) anatomical abnormalities of the genitals (either congenital or acquired); (5) regular smoking (Shabsigh, Fishman, Schum, & Dunn, 1991); (7) diagnosed cardiovascular condition; (8) taking medication that may interfere with blood flow (e.g., anti-hypertensives, anticoagulants) or with sexual functioning (e.g., anti-depressants, hormones; Serretti, & Chiesa, 2009, but see also Lykins, Robinson, LeBlanc, & Cantor, 2014); (9) non-identification as a cis-gendered (i.e., biologically born) male (e.g., transgendered or intersex); (10) self-reported lack of arousal in response to heterosexual erotic audio-visual stimuli.

**Psychological Measures**

Information regarding socio-demographics, relationship and sexual history was collected during a semi-structured interview (see Appendix F). Additional information was collected in a survey presented on a computer hosted on the Checkbox website (Checkbox Survey, Inc., Watertown, MA) and stored on a secure server housed within the Psychology Department at Queen’s University. The International Index of Erectile Function (IIEF; Rosen, Riley, Wagner, Osterloh, Kirkpatrick, & Mishra, 1997), a validated measure of erectile functioning, was administered on a computer.

**Quantitative Sensory Tests**

Quantitative sensory testing (QST) refers to a series of non-invasive psychophysical tests that allow for the assessment of peripheral nerve functioning. During QST procedures, participants undressed from the waist down and seated themselves on a medical examination table seated in a semi-reclined position. A curtain hanging from the ceiling was suspended in front of the participant, resting at their
chest, as to obstruct their view of the testing sites, equipment, and experimenters. The testing room was maintained at a comfortable, ambient temperature range of 22 to 26°C for consistency.

The QST procedures tested four sites for each participant: (1) a control site, located on the volar surface of the forearm, 4 inches below the wrist (which allowed the participant to habituate to testing procedures prior to genital testing as in Payne et al., 2007); (2) the middle of the glans penis, dorsal side (with foreskin retracted, if present); (3) anterior midline penile shaft, approximately equidistance from the coronal ridge and base of the shaft (below the circumcision scar, if applicable); and (4) anterior proximal to midline penile shaft (in line with the midline location, to the experimenter’s right). An additional testing site was included for intact men on the outer prepuce (i.e., over the center of the glans penis) with the foreskin in its natural, un-retracted position (see Figure 3.1 for a diagram of testing sites). All genital sites were tested in a pre-determined randomized order that was matched within-subject pairs.

a. Testing site on the midline shaft and area proximal to the midline shaft  
b. Testing site on the glans penis  
c. Testing site on the foreskin (intact men only)

Figure 3.1. Image of penile testing sites.

Tactile (i.e., touch) and pain thresholds were obtained for each testing site using four QST protocols, consistent with the standardized, comprehensive QST protocol proposed by Rolke and
Tactile threshold refers to the smallest intensity of stimulus required for the participant to perceive the presence of a touch sensation (considered in this study as a “yes” response to a question regarding whether the participant felt the stimulus), whereas pain threshold refers to the smallest intensity of stimulus required to produce a sensation of pain (described to participants as greater than 0 on a pain scale of 0 (no pain at all) to 10 (most pain I have ever felt)). Tactile threshold for each site was assessed first, followed by pain threshold, warmth detection threshold, and heat pain threshold.

**Tactile threshold.** Punctate tactile detection and pain thresholds assess A-beta fiber (large diameter myelinated axon) function, and punctate tactile stimuli have been used previously to map penile sensitivity (Sorrells et al., 2007). Modified von Frey filaments were used to assess tactile and pain thresholds (Pukall, Binik, Khalifé, Amsel, & Abbott, 2002). Made of a sterile monofilament suture material (Prolene, Ethicon Inc.; Surgilene, Davis and Geck), each filament is gripped by the experimenter with haemostatic forceps and placed perpendicularly to the skin of each testing site for approximately 1.5 seconds (Pukall et al., 2002). The experimenter applied enough pressure to bend the filament to form a semi-circle. A full set of filaments included 17 disposable filaments that were calibrated to exert different amounts of pressure (with a log force value ranging from 18 (where \(10^{1.18}/10 = 1.51\text{mg}\), or \((1.18 \log 10)/10 = 1.51\text{mg}\)) to 5.07 (11,748.98 mg)). A detailed explanation of the calibration process can be found in Pukall et al. (2002).

Tactile thresholds were assessed using a 2-down 1-up staircase method (Fechner, 1860/1966; Cornsweet, 1962). In this protocol, two positive responses (i.e., “Yes, I feel it”) to the same filament applied twice are required for a “reversal” (i.e., the application of the next lower stimulus value), and one negative response to filament application (i.e., “No, I don’t feel it”) is required for the next “reversal” (i.e., the application of the next higher stimulus value (please refer to Pukall et al., 2002)). This procedure produces a higher than chance level criterion of 71% for participant response, which is a significant improvement over the 50% criterion obtained from the typical 1-down 1-up staircase method, in which one positive/one negative response is required to move to the next lower/higher stimulus value. In the current protocol, every third filament was initially applied in increasing intensity until the participant...
correctly identified the presence of a stimulus on two consecutive trials. Participant responses (“yes”/“no”) were entered into a computer program by a trained research assistant; this program then prompted the application of each subsequent filament in accordance with the 2-down 1-up staircase method. Once six reversals were obtained, the program prompted the experimenter to test the next site. Tactile thresholds were calculated by averaging the gram values associated with the filaments over the last 4 reversals. Randomly interspersed blank trials (in which an empty pair of forceps was held near—but not touching—the testing site) comprised 20% of all trials to control for any potential response biases (Pukall et al., 2002; Yarnitsky & Pud, 2004).

Pain thresholds were assessed beginning with the filament that approximated the participant’s tactile threshold for each testing site. Consecutively higher filaments were applied for approximately 1.5 seconds with a minimum interstimulus interval of 5-10 seconds until pain was reported. When pain was reported, participants were asked to rate the associated pain intensity and pain unpleasantness on two Likert-type scales from 0 (no pain at all; not at all unpleasant) to 10 (most pain ever felt; most unpleasant ever).

**Thermal thresholds.** Warmth detection and heat pain thresholds assess C-fiber and A-delta fiber function (via small diameter axons). A Thermal Sensory Analyzer (TSA; Medoc Advanced Medical Systems, North Carolina, USA) was used to assess warmth detection and heat pain thresholds (a valid and reliable measurement of penile thermal sensation; Yarnitsky, Spreecher, & Vardi, 1996). The TSA consists of a small thermoelectric probe (i.e., a thermode, 5 mm x 5 mm), which changes in temperature by the Peltier effect (temperature change occurs as a current passes through a junction of dissimilar metals, and direction of temperature change is dictated by direction of the current). The thermode was calibrated to a resting temperature of 31°C (Rolke et al., 2006), which is slightly cooler than typical body temperature, and it was programmed to reach a maximum of 48°C for the purpose of this study (heat-induced pain typically occurs at 45°C; Yarnitsky & Pud, 2004). The thermode was heated at 0.5°C per second (Kenshalo, Holmes, & Wood, 1968).
Warmth detection thresholds were obtained first for each testing site, followed by heat pain thresholds. At the onset of each trial, the experimenter placed the probe on the site for a 15 second adaptation period. The research assistant then prompted participants to feel for (a) a change in the probe’s temperature (warmth sensation) or (b) the perception of heat pain by counting down from 3. The thermode was heated until the participants indicated that they perceived a temperature change by pressing a hand-held button, which immediately prompted the computer to cool the probe to its resting temperature, and the experimenter removed the thermode from the site. Once baseline temperature of the thermode was reached (approximately 1 min), the next trial began. Testing procedures were repeated three times at each site and averaged in order to calculate the warmth detection threshold at each site. Heat pain thresholds were calculated by averaging participant’s heat pain thresholds over only two trials, due to technological issues with the TSA.

Procedure

Participants were invited to the Sexual Health Research Laboratory, after they were deemed eligible via the eligibility screening interview. First, participants took part in an interview, followed by questionnaires that were completed on a computer (the results of which are discussed in Chapter 4). Next, participants were brought to the QST testing room, asked to undress from the waist down (in private), and sit on the medical examination table with a paper sheet covering their lap. The experimenter performed the QST testing procedures on all participants, beginning with the modified von Frey filaments (touch, then pain), followed by the Thermal Analyzer (detection, then pain). Application of QST protocols were performed on the forearm first, followed by the 4 or 5 testing sites in a pre-determined, randomized order. At the end of the testing procedures, participants were asked to dress in private, and then they took part in sexual psychophysiological assessment of their genitals using the LDI (reported in Chapter 4). At the end of the experimental procedures consisting of the interview, QST procedures, and LDI procedures (see Chapter 4), participants were thanked, debriefed, and compensated 75 CAD for their time. Study procedures lasted approximately 3 hours.
Results

Sample Characteristics

Data from sixty-two men (30 circumcised, 32 intact: ranging in age from 18 to 37 years old ($M = 24.2, SD = 5.1$) were included in the current study. The majority of the sample reported being Canadian-born ($n = 50, 80.6\%$), religiously unaffiliated ($n = 50, 80.6\%$), and educated (all participants indicated that they had been or were currently engaged in post-secondary education). With respect to occupational status, most participants reported that they were either currently a student ($n = 37, 59.7\%$) or employed full-time ($n = 20, 32.3\%$). The large percentage of participants reporting an annual income under $20,000 per year ($n = 35, 56.5\%$) appears to reflect the large proportion of student participants. Nearly half of the participants reported that they were dating one participant regularly ($n = 27, 43.5\%$), while many others reported that they were single and not currently dating ($n = 22, 37.1\%$). Average relationship length was 24 months, ranging from approximately one month to 14 years ($SD = 30.8$ months). See Table 3.1 for a full breakdown of the demographic variables. Group comparisons performed via either $t$-tests (continuous variables) or chi-squared tests (categorical variables) revealed no significant differences between circumcised and intact men for any of the demographic variables assessed.
Table 3.1

Participant demographic information

<table>
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<th>Characteristic</th>
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<th>Intact (n = 32)</th>
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<td>4 (6.4)</td>
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<tr>
<td>Other</td>
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<td>4 (12.5)</td>
<td>6 (10.0)</td>
<td></td>
</tr>
<tr>
<td>Education (n (%))</td>
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<td></td>
<td></td>
<td>.66</td>
</tr>
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<td>14 (45.2)</td>
<td>28 (45.9)</td>
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<td>8 (26.7)</td>
<td>7 (22.6)</td>
<td>15 (24.6)</td>
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<tr>
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<td>5 (16.1)</td>
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<tr>
<td>Graduate / professional complete</td>
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<td>5 (16.1)</td>
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<td>Occupation (n (%))</td>
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<td>.31</td>
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<tr>
<td>Employed Full-Time</td>
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<td>12 (37.5)</td>
<td>20 (32.3)</td>
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<tr>
<td>Employed Part-Time</td>
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<td>3 (9.4)</td>
<td>5 (8.1)</td>
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<td>Jewish</td>
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<tr>
<td>Other</td>
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<td>1 (3.1)</td>
<td>4 (6.5)</td>
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<tr>
<td>Relationship Status</td>
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<td>.97</td>
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<tr>
<td>Single, not dating</td>
<td>10 (33.3)</td>
<td>13 (40.6)</td>
<td>23 (37.1)</td>
<td></td>
</tr>
<tr>
<td>Casual sex (one or more partners)</td>
<td>3 (10.0)</td>
<td>0 (0)</td>
<td>3 (4.8)</td>
<td></td>
</tr>
<tr>
<td>Dating, monogamous</td>
<td>13 (43.3)</td>
<td>14 (43.7)</td>
<td>27 (43.5)</td>
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</tr>
<tr>
<td>Dating, non-monogamous</td>
<td>0 (0)</td>
<td>1 (3.1)</td>
<td>1 (1.6)</td>
<td></td>
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<tr>
<td>Married</td>
<td>3 (10.0)</td>
<td>4 (12.5)</td>
<td>7 (11.3)</td>
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</tr>
<tr>
<td>Separated</td>
<td>1 (3.3)</td>
<td>0 (0)</td>
<td>1 (1.6)</td>
<td></td>
</tr>
<tr>
<td>Length of Relationship (months)</td>
<td>19.4 (20.2)</td>
<td>29.3 (37.9)</td>
<td>24.0 (30.5)</td>
<td>.22</td>
</tr>
</tbody>
</table>

*Note. Not all values add up to 100% due to missing data*
Data Considerations

A reliability check of the QST data was performed in which participant responses to the blank tactile trials were assessed. Participants were required to correctly deny the perception of a stimulus application during a blank trial administration a minimum of 75% of the time. One participant was excluded from the analyses for not meeting this criterion (he correctly indicated that he perceived no sensation on only 53.3% of the blank trials).

Due to constraints (i.e., the maximum intensity of stimuli available), some participants’ tactile pain or heat pain thresholds were not reached during some trials. These trials were assigned a threshold value of the highest stimulus level used in the study (11.75 g in the case of pain elicited with the filaments \(n = 84, 30\%\) of trials), and 48°C in the case of heat pain \(n = 50, 20\%\) of trials); no group differences were observed in the number of trials in which a maximum was reached. As a result, analyses reported in this study represent a lower-bound estimate of punctate and heat pain thresholds, and thus a conservative estimate of men’s sensitivity.

Differences between circumcised and intact men were analyzed using repeated-measures ANOVAs. The dependent variable was participant threshold (i.e., tactile threshold (grams), pain threshold (grams), warmth detection threshold (°Celsius), or heat pain threshold (°Celsius)). The within-subjects variable was testing site (i.e., forearm, glans penis, midline shaft, proximal to midline shaft), and the between-subjects variable was circumcision status (circumcised, intact). To correct for heterogeneous variance when indicated by a significant Mauchley’s test of sphericity, corrected Greenhouse-Geisser values are presented. Participant age was controlled for in corresponding ANCOVAs (Bleustein et al., 2005); results are not reported here, as age did not account for a significant amount of variance in any model. All analyses were repeated using non-parametric equivalents; these results are not reported, as findings were identical to the parametric tests reported below.

Lastly, foreskin sensitivity thresholds were calculated in the sample of intact men to test the hypothesis that the foreskin is the most sensitive part of the male genitalia (Sorrells et al., 2007). Between-subject analyses were conducted to account for the fact that only one group (intact men) had a
foreskin. Independent sample $t$-tests were performed, comparing mean sensory thresholds obtained for the foreskin (of intact men) to alternative testing sites (i.e., forearm, glans penis, midline shaft, proximal to midline shaft) in both circumcised and intact men combined. Corrected values are reported when group variances were significantly different, as indicated by Levene’s Test.

**Tactile Thresholds Measured by the Modified von Frey filaments**

We tested the hypothesis that differences in penile tactile and pain sensitivity exist between circumcised and intact men, and we compared tactile and pain thresholds of the foreskin (intact men only) to the other genital (glans penis, shaft) and non-genital (forearm) testing sites collapsed across circumcised and intact men.

**Tactile thresholds.** Tactile thresholds were log transformed to account for a positive skew in the data. The between-subject main effect was not significant, $F(1,60) = 1.45, p = .23$. A test of within-subject effects revealed no significant interaction between circumcision status and site of testing for punctate tactile thresholds, $F(2.37, 141.94) = 1.88, p = .15$. A main effect of testing site was observed, $F(2.37, 141.94) = 8.25, p < .001, \eta^2_p = .12$. Follow-up pairwise comparisons revealed that the site with lowest tactile thresholds (i.e., the most sensitive to touch) was the forearm, which was significantly more sensitive than the glans and proximal to the midline shaft ($ps \leq .01$), but not the midline shaft ($p = .08$; see Figure 3.1). Tactile thresholds at the midline shaft were significantly lower than thresholds proximal to the midline shaft ($p = .01$), but no other penile sites tested significantly differed from one another (see Table 3.2).
Figure 3.2. Sensation and pain thresholds for punctate stimuli and thermal stimuli across testing sites (collapsed across circumcision status)

Note. * p < .05; ** p < .01; *** p < .001. For Figures a-d, y-axis values are raw values (grams or degrees Celsius). For Figures a and d, analyses were performed on log transformed values. Error bars represent standard error. α = Significant findings with forearm as comparison group. β = Significant findings with foreskin as comparison group. Φ = Significant findings with glans as comparison group.

Tactile thresholds obtained at the foreskin in the sample of intact men were compared to the tactile thresholds obtained between-subjects at other sites tested. The mean tactile threshold for the foreskin was not significantly different from the mean threshold of the forearm, t(92) = 0.49, p = .63. The
tactile threshold observed for the foreskin was significantly lower (i.e., the foreskin was more sensitive to touch) as compared to the glans penis, \( t(92) = 4.37, p < .001 \), the midline shaft, \( t(78.97) = 2.33, p = .02 \), and the area proximal to the midline shaft, \( t(92) = 4.32, p < .001 \) (see Figure 3.2).

Table 3.2

Repeated-measures ANOVA for quantitative sensory testing of sensation and pain thresholds

<table>
<thead>
<tr>
<th></th>
<th>Forearm (M, SD)</th>
<th>Glans penis (M, SD)</th>
<th>Midline shaft (M, SD)</th>
<th>Proximal to midline shaft (M, SD)</th>
<th>Foreskin (M, SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tactile thresholds</strong> (grams)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumcised</td>
<td>0.18 (0.16)</td>
<td>0.26 (0.23)</td>
<td>0.31 (0.45)</td>
<td>0.35 (0.52)</td>
<td>--</td>
</tr>
<tr>
<td>Intact</td>
<td>0.14 (0.12)</td>
<td>0.28 (0.26)</td>
<td>0.29 (0.24)</td>
<td>0.38 (0.28)</td>
<td>0.13 (0.11)</td>
</tr>
<tr>
<td><strong>Pain thresholds</strong> (grams)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumcised</td>
<td>8.08 (4.97)</td>
<td>5.78 (4.06)</td>
<td>6.77 (4.54)</td>
<td>7.72 (4.32)</td>
<td>--</td>
</tr>
<tr>
<td>Intact</td>
<td>9.25 (3.85)</td>
<td>6.26 (3.72)</td>
<td>8.34 (4.32)</td>
<td>9.12 (3.65)</td>
<td>7.34 (4.39)</td>
</tr>
<tr>
<td><strong>Warmth detection thresholds (°C)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumcised</td>
<td>40.08 (4.03)</td>
<td>40.58 (3.68)</td>
<td>39.50 (2.09)</td>
<td>40.00 (2.96)</td>
<td>--</td>
</tr>
<tr>
<td>Intact</td>
<td>39.92 (3.98)</td>
<td>41.03 (3.82)</td>
<td>40.71 (2.83)</td>
<td>40.54 (3.28)</td>
<td>38.82 (3.71)</td>
</tr>
<tr>
<td><strong>Heat pain thresholds (°C)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumcised</td>
<td>47.28 (0.78)</td>
<td>45.51 (2.93)</td>
<td>45.18 (2.35)</td>
<td>46.30 (1.82)</td>
<td>--</td>
</tr>
<tr>
<td>Intact</td>
<td>46.75 (1.51)</td>
<td>45.61 (2.94)</td>
<td>45.95 (2.12)</td>
<td>45.85 (2.40)</td>
<td>44.90 (3.48)</td>
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</tbody>
</table>

Pain thresholds. The between-subject effect of circumcision status was not significant \( (F(1, 60) = 1.78, p = .19) \). A test of within-subject effects revealed no significant interaction between circumcision status and site of testing for pain thresholds, \( F(3, 180) = 0.44, p = .72 \). A significant main effect of testing site was observed, \( F(3, 180) = 11.05, p < .001, \eta_p^2 = .16 \). Pairwise comparisons were performed as a follow-up to the observed main effect, revealing that the average pain threshold obtained at the forearm was significantly higher (i.e., the forearm was less sensitive to pain) than the glans penis \( (p < .001) \) and the midline shaft \( (p = .02) \). The average pain threshold obtained at the forearm and on the area proximal to the midline shaft was not significantly different. The average pain threshold observed for the glans penis was significantly lower (i.e., the glans penis was more sensitive to pain) than the midline shaft \( (p < .001) \) and the area proximal to the midline shaft \( (p < .001) \). The midline shaft and the area proximal to the
midline shaft were not significantly different from one another ($p = .08$). Thus, the most sensitive site tested, with respect to pain thresholds, was the glans penis, followed by the midline shaft, and the least sensitive sites to pain were located proximally to the midline shaft and on the forearm (see Figure 3.2).

In a comparison of pain thresholds obtained at the foreskin as compared to the other sites tested, independent sample $t$-tests revealed no significant differences. Mean pain threshold for the foreskin was not significantly different from the mean pain threshold of the forearm, $t(90) = 1.38$, $p = .17$, the glans penis, $t(90) = -1.46$, $p = .15$, the midline shaft, $t(90) = 0.26$, $p = .79$, and the area proximal to the midline shaft, $t(90) = 1.22$, $p = .23$ (see Figure 3.2).

**Additional analyses for pain thresholds.** Additional analyses were performed to assess group differences based on circumcision status for ancillary data collected during the pain threshold trials. First, we compared the number of circumcised and intact men who reached the punctate pain ceiling (and were thus assigned a pain threshold of 11.75g). A Chi-squared test revealed no significant between-groups differences based on circumcision status for the forearm, glans penis, midline shaft, or the area proximal to the midline shaft; see Table 3.3.
Next, pain intensity and unpleasantness ratings were examined. Participants who did not reach their pain threshold were not included in this analysis, as they were not prompted to indicate a rating.

Paired $t$-tests were conducted for each testing site with circumcision status as the grouping variable and pain intensity and unpleasantness ratings as the dependent variables. Pain intensity ratings did not differ significantly across circumcision status for the forearm, $t(26) = -1.01, p = .33$, the glans penis, $t(57) = -1.47, p = .15$, the midline shaft, $t(39) = -0.55, p = .59$, or the area proximal to the midline shaft, $t(34) = 1.28, p = .21$. Pain unpleasantness ratings did not differ significantly across circumcision status for the forearm, $t(26) = 0.41, p = .69$, the glans penis, $t(57) = -0.06, p = .96$, the midline shaft, $t(39) = 0.43, p = .67$, or the area proximal to the midline shaft, $t(34) = 0.97, p = .34$.

**Thermal Thresholds as Measured by the Thermal Sensory Analyzer**

We explored the hypothesis that differences in warmth detection and heat pain thresholds exist between men who had been circumcised as neonates compared to intact men. Warmth detection and pain
thresholds of the foreskin were additionally subjected to between-subject comparisons against the thresholds obtained at the other genital (glans penis, midline shaft, area proximal to the midline shaft) and non-genital (forearm) testing sites.

**Warmth detection thresholds.** The between-subject main effect of circumcision status was not significant \((F(1,59) = 1.02, p = .32)\). A test of within-subjects effects revealed no significant interaction between testing site and circumcision status, \(F(3, 177) = 0.47, p = .71\), or main effect of testing site, \(F(3, 177) = 0.77, p = .51\) (see Figure 3.2). Warmth detection thresholds for all sites tested were then compared to the thresholds obtained for the foreskin in a between-subject analysis. Mean warmth detection threshold over the foreskin was not significantly different from the threshold at the forearm, \(t(88) = 1.34, p = .18\), the midline shaft, \(t(88) = 1.72, p = .09\), or the area proximal to the midline shaft, \(t(88) = 1.85, p = .07\). The glans penis, however, had significantly higher warmth detection thresholds (i.e., the glans penis was less sensitive to warmth) as compared to the foreskin, \(t(88) = 2.38, p = .02\) (see Figure 3.2).

**Heat pain thresholds.** Heat pain thresholds were negatively skewed, and so a reflected log transformation was performed on the data to normalize it (Osborne, 2002). The between-subject main effect of circumcision status was not significant \((F(1, 59) = 0.02, p = .88)\). A test of within-subject effects revealed no significant interaction between circumcision status and site of testing for heat pain thresholds, \(F(2.53, 149.48) = 1.60, p = .20\). A significant main effect of testing site was observed, \(F(2.53, 149.48) = 7.87, p < .001, \eta^2_p = .12\). Follow-up pairwise comparisons on the transformed data revealed that forearm heat pain thresholds were significantly higher (i.e., the forearm was less sensitive to heat pain) as compared to all genital sites tested (all \(p < .001\)). Heat pain thresholds obtained at the midline shaft were significantly lower (i.e., more sensitive to heat pain) than the area proximal to the midline (see Figure 3.2).

A between-subjects test of foreskin sensitivity compared to other testing sites was conducted by comparing heat pain thresholds for all participants against the thresholds obtained from men with a foreskin. Independent samples \(t\)-tests indicated that the average heat pain threshold for the foreskin was not significantly different compared to the forearm, \(t(60) = -0.43, p = .67\), the glans penis, \(t(60) = 1.02, p = .32\).
Additional analyses for heat pain data. We compared the number of circumcised men to the number of intact men who reached their heat pain threshold (and were thus assigned a heat pain threshold of 48°C) using Chi-squared cross-tabulations. The number of men who reached the heat pain ceiling did not differ significantly based on circumcision status for the forearm, glans penis, midline shaft, or the area proximal to the midline shaft; see Table 3.3.

Discussion

The aim of this study was to ascertain whether neonatal circumcision impacts penile sensitivity in adult men using QST. Three hypotheses were tested: (i) Circumcised men will have higher genital sensory thresholds (i.e., lower penile sensitivity) as compared to intact men; (ii) Differences in genital sensitivity between groups will be most pronounced at the glans penis; and (iii) Sensory thresholds obtained at the foreskin will be lower (i.e., the foreskin will be more sensitive) than other sites tested. Data obtained from the current sample of sexually healthy men who were either circumcised neonatally or who were intact indicated no significant between-groups differences in penile sensitivity at any site tested, including the glans penis. Furthermore, across QST measures, we did not obtain sufficient evidence to support the notion that the foreskin of adult intact men is the most sensitive region of the penis to all forms of stimuli; however, the foreskin was significantly more sensitive to touch as compared to all the other genital sites tested, and it was significantly more sensitive to warmth than the glans penis. When compared to the forearm, though, there were no significant differences for any stimuli applied to the foreskin.

Penile Sensitivity: How do the Two Groups Fare in Terms of Tactile, Pain, and Thermal Thresholds?

In the present study, we found no evidence of between-group differences in penile sensitivity to tactile stimuli on any site tested (i.e., the forearm, glans penis, midline shaft, and proximal to the midline shaft, $t(52.18) = 0.63, p = .53$, or the area proximal to the midline shaft, $t(60) = -1.19, p = .24$ (see Figure 3.2).
shaft), supporting the pattern of results reported by Payne and colleagues (2007). However, our results—and those of Payne et al. (2007)—differ from those of Sorrells and colleagues (2007) who found that the glans penis in circumcised men was less sensitive to touch than in intact men. Fine touch punctate pressure stimuli activate A-beta, large diameter myelinated nerve fibers; as such, it would be expected that the pattern of results would be consistent among the studies. The inconsistency may be due to methodological differences in, for example, the types of stimuli used to elicit punctate tactile sensation, the methods of obtaining or calculating thresholds, and the exact sites tested. With respect to the latter point, perhaps most relevant is the finding that the nerve fibers in the penis activated by fine touch stimuli do not constitute the majority of nerve fibers in this area: in fact, 80% to 90% of all axon terminals in the human glans penis consist of small myelinated or unmyelinated C-fiber free nerve endings (Halata & Munger, 1986), which are activated by punctate pain (Curatolo, Petersen-Felix, Gerber, & Arendt-Nielsen, 2000) as well as thermal stimuli (Bleustein et al., 2003). It is possible, therefore, that minute changes in the location tested on the glans between studies may have led to the inconsistencies in tactile threshold results.

With respect to punctate pain stimuli, the results from both the present study as well as that conducted by Payne et al. (2007) indicated no significant between-groups differences. These results may be at least partially explained by the upper limit of the filaments used in both studies. In the present study, some men were assigned the highest filament value as their pain threshold (see Table 3.3 for a full breakdown) when they did not perceive pain in response to the last filament application. It is possible that differences would have emerged if each participant’s true pain threshold value were obtained: future studies could consider utilizing methods that have a larger range of pain threshold stimuli in order to assess this research question more fully. Alternatively, perhaps the lack of significant differences in punctate pain thresholds indicate that circumcision does not affect the preponderance of free nerve endings in the areas tested in the present study.

Thermal detection and heat pain thresholds were also assessed, as the innervation of the human penis is vastly comprised of C-fiber nerve endings, which are polymodal and thus respond to a range of
stimuli including nociception and thermal stimuli (Craig, 2003). We found no between-group differences in warmth detection thresholds on any (genital or non-genital) site tested. This finding is consistent with those reported by Bleustein and colleagues (2005), who assessed warmth detection thresholds in men with and without complaints of sexual dysfunction: no threshold differences were found based on circumcision status for either group of men. Unmyelinated, slow conducting C-fibers—which are activated by thermal stimuli—have been implicated in erotic sensation (Jönsson, Backlund Wasling, Wagnbeck, Dimitriadis, Georgiadis, Olausson, & Croy, 2015). A-beta fibers (fine-touch thresholds; Payne et al., 2007; Sorrells et al., 2007) are less responsive to stimuli when a man is sexually aroused (Payne et al. 2007), and are thus unlikely related to sexual functioning or erotic sensation (Cox et al., 2015). Therefore, with respect to sexual functioning, the findings suggest that the C-fibers—which are more like to be implicated in men’s experience of sexual sensation than those fibers assessed by previous studies (Payne et al., 2007; Sorrells et al., 2007)—are not significantly impacted by the removal of the foreskin.

The pattern with respect to heat pain thresholds mimicked the non-significant between-group differences reported above. Again, these findings may be due, at least in part, to the number of men who were assigned the maximum threshold of 48°C (see Table 3.3 for a breakdown). The relatively high number of men who failed to reach their pain threshold is curious given that the typical heat pain threshold is approximately 45°C (Yarnitsky, & Pud, 1995), which is below the maximum temperature used in this study. When heat pain sensitivity was examined between genital and non-genital sites, results revealed that the heat pain threshold of the forearm was significantly higher (i.e., the forearm was significantly less sensitive) than most genital testing sites (glans penis, midline shaft, proximal to the midline shaft – but not the foreskin). This pattern of findings indicates that, overall, the penis seems to be more sensitive to heat pain than the forearm. Considering the hypothesized role of temperature-sensitive FNEs in the sexual reward system (Cox et al., 2015), future research should focus on the relationship between penile sensitivity to warmth detection/heat pain, and the possible implications of these stimuli in men’s sensation of erotic stimuli. For example, how do men interpret temperature stimuli? Do they, perhaps, interpret the thermal stimuli as more erotic than touch stimuli?
The Glans Penis and the Keratinization Hypothesis

Given that we found no significant between-groups differences in the sensitivity of the glans penis across the varied stimuli employed in the current study, these results suggest that the keratinization hypothesis is not supported: it is unlikely that circumcision decreases penile sensitivity by the keratinization of the permanently exposed glans penis via an increase of cell layers (Cold & Taylor, 1999; Immerman & Mackey, 1997; McCoombe & Short, 2006; Morris, 2007). Of course, the present study focused on measures of sensitivity—which allow us to infer what is happening with the underlying tissues—and not on the direct examination of the tissue properties of the glans penis. Ideally, research directly examining the tissue properties of the glans penis (via biopsy, for example) in intact and circumcised men is required to directly test this hypothesis. Szabo and Short (2000) performed histological observations of the penile epithelium of seven circumcised and six intact cadavers; they found an equal amount of keratinization of the glans penis in both groups of men, although replication of this research with a larger (and perhaps living) sample is warranted. Furthermore, future research should aim to create a sensory map of the penis—similar to that developed by Sorrells et al. (2007)—to chart sensitivity to touch, pain, and temperature, for example, as a guide for changes in penile sensitivity associated with medical and other conditions (e.g., diabetes, injury, sexual dysfunction, penile surgeries).

The Foreskin: How Sensitive is it?

An alternative explanation for a loss of sensitivity in the circumcised penis has been proposed in place of the keratinization hypothesis, stating that circumcised penises are less sensitive than intact penises because circumcision removes the most sensitive part of the penis—the foreskin. Thus, Sorrells et al. (2007) proposed that differences (not similarities, e.g., the glans penis) in the anatomy of the circumcised and intact penis (i.e., the presence/absence of the highly innervated foreskin) should be the focus of attention in psychophysical studies assessing penile sensitivity across circumcision status. Indeed, past studies examining penile sensitivity often exclude the foreskin as a testing site and instead focus on the shaft or glans penis (e.g., Bleustein et al., 2002; Bleustein et al., 2005; Payne et al., 2007).
We compared tactile, pain, warmth detection, and heat pain thresholds obtained at the foreskin to those obtained at the other sites tested; analyses revealed mixed results.

Similar to the findings of Sorrells et al. (2007), we found that the foreskin was the most sensitive site as compared to other parts of the penis with respect to tactile thresholds. Fine-touch pressure testing is typically used to assess the presence and functioning of Meissner corpuscles, which are rapidly adapting unmyelinated nerve endings found in sensitive skin such as the finger tips (Cauna & Ross, 1960) and foreskin (Taylor et al., 1996). As such, the finding of lower thresholds (i.e., higher sensitivity) to punctate stimuli applied to the foreskin as compared to the other penile sites assessed is expected, given the high prevalence of fine-touch pressure receptors in the preputial mucosa (Taylor et al., 1996). How this higher sensitivity in a contrived situation (i.e., examining responses to a specific stimulus applied in a highly controlled manner) translates into perception—especially during sexual activity—is currently unknown.

Despite the fact that Cox et al. (2015) concluded that Meissner corpuscles are likely not related to sexual functioning (based on a review of the histological research on penile sexual sensation), perceptions of pleasure during sexual activity involves much more than a limited part of one’s physiology. Further research is needed to examine whether perception of sexual pleasure (and other factors related to sexual function) differ between men who are intact or circumcised.

The peripheral nerve fibers that respond to punctate pain (e.g., the C-fiber free nerve endings—which comprise the majority of free nerve endings in the penis) were also assessed via QST on the foreskin, yet no differences emerged between the sensitivity of the foreskin and the other genital sites. This finding may be due to the low number of intact individuals who did not reach pain threshold (10/32) as assessed via the filaments. As this study was the first to explore differences between pain thresholds among various penile locations (including the foreskin), further investigation is needed. It should be noted, however, that participants’ self-reported pain intensity and unpleasantness ratings did not differ across circumcision status. Thus, it appears that the subjective experience of this painful stimulus does not differ between circumcised and intact men; these data provide some suggestion that perceptual
differences in pain threshold stimuli do not differ depending on the presence or absence of a foreskin. However, differences in ratings (and thresholds) to stimuli above pain threshold were not assessed.

With respect to warmth detection, the foreskin was more sensitive than the glans penis, but not the midline shaft or an area proximal to the midline shaft. Using a different stimulus modality (warmth sensation, as opposed to fine-touch punctate pressure), we partially replicated the findings reported by Sorrells et al. (2007), in that the foreskin was more sensitive than the glans penis, but—unlike Sorrells—not two sites located on the penile shaft. The epithelial tissue at the foreskin is more similar to the tissue covering the shaft than the glans penis (Halata & Munger, 1986); therefore, the finding of similar thresholds at the foreskin and shaft is not surprising. Evidence that foreskin tissue is structurally different from that of the glans penis has been demonstrated by Halata and Munger (1986), and the differences in warmth detection thresholds at these two sites indicate that the tissues may be functionally different as well. However, direct studies assessing the histology of different tissues in the penis in conjunction with men’s sensory experiences need to be conducted in order to fully understand the implications of these potential functional differences. Notably, the findings from the current study indicated that foreskin heat pain thresholds did not differ significantly from those obtained from any other genital site; removal of the highly-innervated foreskin via circumcision does not appear to remove the most sensitive part of the penis.

**Sensitivity of the Foreskin vs. the Non-genital Control Site**

Sensory thresholds at the foreskin did not significantly differ from thresholds obtained at the forearm for any sensory test performed, including tactile, pain, warmth detection, or heat pain. The lack of significant differences in sensitivity between the foreskin and the forearm demonstrates an interesting pattern given that thresholds at the other genital sites were significantly different from that found on the forearm. With respect to tactile sensation thresholds, all genital sites tested were less sensitive than the forearm except for the foreskin. In contrast, the glans and midline shaft (but not the area proximal to the midline shaft or the foreskin) were more sensitive than the forearm to pain. Forearm sensitivity to warmth detection did not differ significantly from any genital site, whereas all genital sites were more sensitive to
heat pain than the forearm, except for the foreskin. Comparison of sensitivity thresholds at the foreskin to thresholds at other sites on the penis, as well as a non-genital control site on the forearm does not provide sufficient evidence to support the assertion by Sorrells et al. (2008) that the foreskin is the most sensitive site of the penis. It should be noted, though, that unlike Sorrells et al., (2008), we did not assess sensitivity at the circumcision scar in the circumcised sample; future research should include the scar as a testing site, as it is possible that higher sensitivity may be observed at the scar tissue in circumcised men.

Limitations and Future Directions

The current study builds on the literature exploring the impact of neonatal circumcision on penile sensitivity by assessing psychophysical measures of individuals’ sensation and pain thresholds. Although this study provides no evidence to support the hypothesis that circumcision decreases penile sensitivity, future research should continue to expand on this question by utilizing histological methodology. For example, biopsies of penile tissue of different regions of the penis in healthy adult men, particularly of the glans penis and foreskin, could be used to directly test the keratinization hypothesis (Immerman & Mackey, 1997; McCoombe & Short, 2006; Morris, 2007) and shed light on changes that occur at the epithelial layer of the penis following circumcision. Histological studies could provide valuable information about differences between neonatal and adult circumcision that may make provide a link between research demonstrating protective benefits of circumcision in African cultures (where circumcision is performed in adults) and the applicability of such research to North American cultures (where circumcision is typically performed on neonates).

Because the link between sensory testing and sexual arousal remains untested, we cannot draw conclusions about the implications of these findings to men’s perceptions of sexual pleasure or sexual function. Although the role of thermal sensation via C-fibers (over fine-touch sensation) has been implicated in erotic sensation (Jönnas et al., 2015) and sexual reward (Cox et al., 2015), men’s perception of thermal stimuli at the genitals (i.e., whether it is interpreted as erotic, noxious, etc.) has not yet been empirically tested. Future research is needed to directly assess the link between QST measures and implications to erotic sensation and sexual functioning in men. Furthermore, research should extend
beyond physiological correlates by considering a biopsychosocial approach to explore the impact of circumcision on men’s sexual lives. Important variables to consider in a holistic approach to understanding circumcision include sensory thresholds, patterns of physiological sexual response, as well as psychological variables including self-reported experience of sexual pleasure, or beliefs about their circumcision status and the role it plays in their (solo or partnered) sexual lives.

Although findings from the current study imply that penile sensitivity does not differ between neonatally circumcised and intact men, it is unclear whether differences in penile anatomy may be noticeable to the men themselves and their sexual partners. It has been hypothesized that sexual techniques employed during penetrative intercourse differ as a function of circumcision status; for example, circumcised men may use deeper thrusts and may be more likely to withdraw their penis during intercourse (O’Hara & O’Hara, 1999). Additionally, the mobile sheath of the foreskin has been hypothesized to reduce friction for female partners during penetrative intercourse (O’Hara & O’Hara; Warren, 2010), and some studies have demonstrated clear gender differences in the preference for circumcised or intact male partners (such that women prefer circumcised men, and men who have sex with men prefer intact men; Bossio, Pukall, & Bartley, 2015). Future research should employ psychophysiological measures to better address the impact of circumcision (or the lack thereof) on men’s sexual partners.

**Conclusion**

It has been hypothesized that the surgical removal of the highly innervated foreskin via circumcision results in a drastic reduction in penile sensitivity, which ultimately leads to sexual dysfunction and negative psychosocial outcomes (Boyle et al., 2002). We directly assessed the assumption that circumcision leads to a reduction in penile sensitivity by testing tactile detection, thermal sensation, and pain thresholds at multiple sites on the penis, and comparing these thresholds between two healthy samples of men – one group of (neonatally) circumcised men, and one group of intact men. This study provides no evidence that neonatal circumcision decreases penile sensitivity, no evidence that the
exposed glans penis in circumcised men becomes less sensitive over time, and insufficient evidence to suggest that the foreskin is the most sensitive part of the penis.

Results from this study are consistent with previous research (Payne et al., 2007, Sorrells et al., 2007), and imply that, if differences in sexual functioning or sexual dysfunction are related to circumcision status, these differences are not likely the result of changes in penile sensitivity resulting from neonatal circumcision. Future research should continue to explore the impact of neonatal circumcision on the sexual lives of men and their partners through histological studies of penile tissues (especially at the glans penis and the foreskin), the connection between penile sensitivity and sexual functioning/responses, and psychosocial correlates of circumcision and long-term outcomes. Findings from this study can be used to inform individual stakeholders, public policy makers, medical health care professionals, and parents regarding the minimal long-term implications of neonatal circumcision on penile sensitivity.
References


Chapter 4

Imaging penile blood flow and assessing sexual response in circumcised and intact men

Introduction

Circumcision is one of the most widely performed surgical procedures worldwide: estimates suggest that 30% of the global male population has undergone the procedure (WHO, 2007). Anatomical changes to the male genitalia as a result of circumcision have been hypothesized to reduce penile sensitivity, which, in turn, are believed to increase rates of sexual dysfunction among circumcised men (e.g., Boyle, 2015). It has been proposed that circumcision leads to changes in men’s sexual functioning via the loss of nerve endings due to the removal of the highly innervated foreskin (Taylor, Lockwood, & Taylor, 1996) or due to the keratinization of the permanently exposed glans penis (Barreto, Caballero & Cubilla, 1997; Cold & Taylor, 1999; Immerman & Mackey, 1997). Despite the fact that reduced penile sensitivity and subsequent sexual dysfunction is a widely touted consequence of circumcision among anti-circumcision activists, many members of the public, and some members of the medical community (e.g., see Boyle, 2015), empirical evidence to support this claim is lacking.

Presently, the vast majority of research on circumcision concerns health outcomes (e.g., Blank et al., 2012) or surgical methods for the procedure (e.g., Cao, Liu, Hu, Wang, Yuan, Dong, & Wei, 2015). Despite the fact that sexual functioning and satisfaction are important factors in overall quality of life as well as general health (Helgason, Adolfsson, Dickman, Fredrikson, Arver, & Steineck, 1996; Lindau & Gavrilova, 2010; WHO 2006), the lack of high quality research in this area is surprising. What research does exist regarding circumcision status and male sexual dysfunction relies almost exclusively on self-report, such as participant response to questionnaires assessing sexual functioning. Two national surveys have included questions (not from validated questionnaires) assessing rates of sexual dysfunction across circumcision status. Frisch and colleagues (Frisch, Lindholm, & Grønbæk, 2011) found higher rates of
orgasm difficulties in circumcised (vs. intact) men in their representative Danish sample. Laumann and colleagues (Laumann, Masi & Zuckerman, 1997), in contrast, found slightly more sexual dysfunction in intact men—particularly older intact men—as compared to circumcised men in their representative American sample. These differences may be attributable to cultural factors; for example, neonatal circumcision is common in North America, but is rare in Europe (less than 5% of the Danish sample was circumcised, and even fewer were circumcised as neonates), thus it is possible that the disparate findings among these studies may be due—at least in part—to attitudinal factors towards circumcision (e.g., whether it is common among peers or not) as opposed to circumcision status itself. Alternatively, it is possible that findings may have differed if participants completed questionnaires that have been validated for distinguishing sexual dysfunction in men, as opposed to single-item measures, which could be more vulnerable to response biases.

Even when circumcision research utilizes validated measures of sexual functioning, though, mixed results have emerged. The International Index of Erectile functioning (IIEF; Rosen, Riley, Wagner, Osterloh, Kirkpatrick, & Mishra, 1997), which is considered the “gold standard” measure of sexual functioning in men, has been used to compare sexual functioning across circumcision status. Most commonly, research employing this measure will utilize a pre-post study design, whereby men elect to undergo circumcision as adults, and sexual functioning is assessed before and after the procedure. Some studies report no difference in IIEF scores following circumcision (Yang, Lin, Zhang, & Guo, 2014; Masood et al., 2005), some studies report improvements in sexual satisfaction (Gao et al., 2014; Fink, Carson, & DeVellis, 2002) and erectile functioning (Cortés-González, Arratia-Maqueo, Martínez-Montelongo, & Gómez-Guerra, 2009), and still other studies indicate a worsening of erectile functioning (Fink et al., 2002; Dian et al., 2013). It should be noted, though, that reliance on self-report measures is especially problematic in the circumcision literature, because men recruited for these pre-post studies tend to be a self-selected sample who often choose to undergo circumcision as adults in order to correct a pre-existing condition, be it related to sexual health (e.g., HIV prevention; Auvert, Taljaard, Lagarde, Sobngwi-Tambekou, Sitta, & Puren, 2005), sexual functioning (e.g., early ejaculation; Zhang, Yu, Bai, &
Wang, 2012) or satisfaction with penile appearance (e.g., appearance of foreskin; Masood, Patel, Himpson, Palmer, Mufti, & Sheriff, 2005). In order to reduce the potential methodological confounds introduced by a pre-post study design, Hosseini and Mohseni (2011) explored sexual functioning via a survey, whereby men who were already circumcised either before or after the age of 18 completed the IIEF; no between-group differences were observed. Payne and colleagues (2007) compared IIEF scores of circumcised and intact men who partook in a sexual psychophysiology study and they, too, found no significant between-group differences on the IIEF, despite some observed between-group differences in genital sexual response (see below).

Intravaginal ejaculatory latency time (IELT) is another dependent measure of sexual functioning frequently used in circumcision research. IELT is a stopwatch measure of the time it takes a participant to ejaculate after insertion into his female partner’s vagina, and is typically self-reported (Waldinger, Quinn, Dilleen, Mundayat, Schweitzer, & Boolell, 2005). Similar to studies using IIEF scores as an index of sexual functioning, studies that employ the use of the IELT to assess men’s sexual functioning before and after undergoing adult circumcision have also produced mixed results. Some studies report an increase in IELT following circumcision (Gao et al., 2014; Şenkul, İşer, Şen, Karademir, Saraçoğlu, & Erden, 2004), while other studies have observed shorter IELTs (Yang et al., 2008). In a large-scale survey study across 5 different cultural populations, Waldinger and colleagues (Waldinger, McIntosh, & Schweitzer, 2009) found no group differences in IELTs between circumcised and intact men. Tian and colleagues (Tian, Liu, Wang, Wazir, Yue, & Wang, 2013) performed a meta-analysis on circumcision status and male sexual functioning; they found no significant difference in IELTs between circumcised and intact men across 10 studies. It is likely that the inconsistent findings regarding men’s sexual functioning across circumcision status may be due—at least in part—to methodological inconsistencies across studies, confounds introduced by reliance on a pre-post study design, as well as self-report measures.

Only a single study in the realm of sexual psychophysiology compared sexual response between men who were circumcised neonatally (as is the typical practice in North America) and men who were intact. Payne and colleagues (2007) assessed genital sexual arousal in circumcised and intact men using
thermal imaging, an indirect measure of genital blood flow shown to be a valid and reliable psychophysiological measure of male sexual arousal (Kukkonen, Binik, Amsel, & Carrier, 2007). Payne et al. (2007) reported that intact men had significantly lower penile temperature than circumcised men at baseline, and although both groups achieved similar levels of arousal in response to erotic films, intact men experienced a greater increase in penile temperature. No between-group differences in subjectively reported sexual arousal were observed. Thus, Payne et al. (2007) were the first to evidence between-group differences in sexual response across circumcision status using psychophysiological—but not subjective—measures of sexual arousal in a sexually healthy sample of men; however, the authors were unable to draw conclusions about the potential functional outcomes associated with such differences.

The current study aims to directly address the question of whether neonatal circumcision impacts genital and subjective sexual response in a group of healthy, sexually functional adult men who were either circumcised neonatally, or who were never circumcised (intact). This study design is intended to improve upon previous research methods by reducing heterogeneity of the sample population (e.g., excluding men with pre-existing sexual dysfunction, limiting the circumcised sample to men who underwent the procedure as neonates), and combining objective measures of sexual response with subjective measures of men’s perception of their sexual response. Additionally, limiting the circumcised sample to men who underwent the procedure neonatally will reduce confounds associated with adult circumcision, such as psychosocial variables (e.g., expectations for the procedure), as well as physiological confounds, such as allowing time for the circumcision scar to heal (McNamara & Loiselle, 1997) and time for possible keratinization of the glans penis to occur (Cold & Taylor, 1999).

In pursuit of the question of circumcision’s impact on men’s sexual arousability, we employed the use of the laser Doppler imager (LDI) as a measure of psychophysiological sexual arousal in the genital region. The LDI offers a distinct advantage over previous measures of psychophysiological sexual arousal because it directly assesses blood flow using non-invasive imaging technology. For the purpose of this study, we used imaging technology in order to compare genital blood flow over different regions of the penis, including the glans penis (where keratinization of the penis—a hypothesized mechanism of
penile desensitization and, in turn, arousability—is hypothesized to take place) and the foreskin (hypothesized by Sorrells and colleagues (Sorrells, Snyder, Reiss, Eden, Milos, Wilcox, & Van Howe, 2007) to be the most sensitive region of the penis).

The first question posed in this paper was a methodological one—that is, is the LDI a valid measure of sexual response for men? Three specific hypotheses were tested to address this question: (i) Does the LDI detect higher blood flow in response to an erotic vs. neutral film; (ii) Does the LDI detect higher blood flow at genital vs. non-genital sites; and (iii) Is there a significant relationship between genital arousal assessed by the LDI and self-reported subjective arousal?

The second question addressed whether sexual response (either genital or subjectively perceived) differs between circumcised and intact men. Group differences in sexual arousal were assessed in the following ways: (i) Blood flow to the genitals; (ii) Blood flow to different sites of the genitals (shaft, glans penis, and the foreskin, if applicable); (iii) Subjectively reported sexual arousal assessed continuously throughout the erotic film stimulus; and (iv) A subjectively reported sexual arousal change score from prior to the erotic film and after the erotic film.

The third question addressed whether alternative measures of men’s sexual functioning or their sexual lives differ as a function of circumcision status. The following variables were explored for between-group differences across circumcision status: (i) Urological history; (ii) Sexual history; (iii) Self-reported arousability in response to pornography or masturbation; (iv) Self-reported sexual functioning via scores on the IIEF; and (v) Satisfaction with one’s own circumcision status.

**Method**

Study protocols were reviewed and approved by Queen’s University Health Sciences Research Ethics Board (HSREB); see Appendix B.

**Participants**

Participants were from the same sample as Chapter 3, as the Chapter 4 testing procedures occurred in the same testing session as the QST procedures from Chapter 3. The sample was recruited on
Queen's University campus and in the surrounding community via posters and radio advertisements, as well as online advertisements (via social media sites such as Facebook and Twitter). Eligible participants consisted of adult men between the ages of 18-40 years. The age range of participants was limited to relatively young men in order to control for age, which has been shown to be a confounding variable with respect to circumcision status and penile sensitivity (Bleustein, Fogarty, Eckholdt, Arezzo, & Melman, 2005), as well as erectile functioning (Araujo, Mohr, & McKinlay, 2004). Exclusion criteria consisted of the following: (1) younger than 18 or older than 40; (2) unable to read and write English fluently; (3) active STIs; (4) history of sexual dysfunction (e.g., erectile dysfunction, premature ejaculation); (5) anatomical abnormalities of the genitals (either congenital or acquired); (6) regular cigarette smoking (Shabsigh, Fishman, Schum, & Dunn, 1991); (7) diagnosed cardiovascular condition; (8) taking medication that may interfere with blood flow (e.g., anti-hypertensives, anticoagulants) or with sexual functioning (e.g., anti-depressants, hormones; Serretti, & Chiesa, 2009, but see also Lykins, Robinson, LeBlanc, & Cantor, 2014); (9) not identifying as a cis-gendered (i.e., biologically born) male (e.g., transgendered or intersex); (10) not sexually aroused in response to heterosexual erotic audio-visual stimuli (videos).

Materials

Structured Interview. A structured interview was conducted to collect information about socio-demographic information and relationship status. Urological health information was gathered, including history of STI infections, urological conditions, penile/testicular conditions, and urological procedures. Sexual history assessed the following: participants’ age at first intercourse, total number of sexual partners, and a tally of the number of times participants engaged in a range of partnered and solo sexual activities over the past month (e.g., masturbation, manual stimulation of partner’s genitals, partner’s manual stimulation of participant’s genitals, vaginal intercourse, etc.). Sexual arousability was assessed by asking participants to report how aroused they tend to feel in response to erotica and in response to
masturbation (on a 11-point Likert-type scale, where 0 indicated “not at all aroused” and 10 indicates “most aroused ever”).

The structured interview also contained questions about participant’s satisfaction with their circumcision status. Participants were asked to rate following questions on an 11-point Likert-type scale, where 0 indicates “completely disagree”, 10 indicates “completely agree”, and 5 indicates “neutral”:

“How happy are you with your circumcision status?”, “How much is you circumcision status is a positive part of your every day life?”, “How much is your circumcision status a negative part of your everyday life?”, “How much is your circumcision status a significant part of your who you are?”. Participants also indicated the extent to which they think about their circumcision status (“always”, “sometimes”, “rarely”, or “never”), whether they have any regrets about their circumcision status (“yes”, “no”), and whether they ever wish they had the opposite circumcision status (“yes”, “no”, “sometimes”).

**Male Genital Image Scale (MGIS).** The MGIS (Winter, 1989) is 14-item questionnaire designed to assess a participant’s perception about different aspects of his genitals (e.g., size, appearance, length). Questions are answered on a 5-point, Likert-type scale from very dissatisfied to very satisfied. Two questions were added to the MGIS to assess men’s satisfaction with their foreskin: “my circumcision status when my penis is erect” and “my circumcision status when my penis is not erect”, for a total of 16 items. A total score was calculated by summing the questions, with a higher score indicating a more favourable perception of one’s own genitals. Reliability of the MGIS was assessed for the current sample; the addition of the two questions related to circumcision status produced a slightly higher Cronbach’s alpha ($\alpha = .93$) than the original 14-item version ($\alpha = .91$).

**International Index of Erectile Functioning (IIEF).** The IIEF (Rosen, Riley, Wagner, Osterloch, Kirkpatrick & Mishra, 1997) is a 15-item measure of men’s sexual functioning over the past 4 weeks. The measure assesses five domains of sexual functioning: erectile function, intercourse satisfaction, orgasmic function, sexual desire, and overall satisfaction. Participants rate each individual question on a 6-point Likert-type scale, and scores for questions under each domain are tallied to produce 5 individual domain scores. Clinical interpretations of domain scores range from no dysfunction to severe
dysfunction. The IIEF-5 was also used (Rosen, Cappelleri, Smith, Lipsky, & Pena, 1999). It is a shorter, five-question version of the questionnaire that utilizes 5 questions of the IIEF-15 to generate a composite score of erectile functioning. The five questions comprising the IIEF-5 ask about: (1) confidence in getting/keeping an erection; (2) if erections are firm enough for penetration; (3) ability to maintain erection after penetrating a partner; (4) ability to maintain erection to completion of intercourse; (5) intercourse satisfaction. Higher scores on the IIEF subscales and the IIEF-5 composite score indicate better sexual functioning. Reliability analyses for the current sample produced a Cronbach’s alpha of $\alpha = 0.95$ for the IIEF total score and $\alpha = 0.86$ for the IIEF-5 score; subscale reliability were also high (ranged from $\alpha = 0.83$ to 0.96).

**Audio-Visual Stimuli.** Participants watched a total of 3 films. The first was an acclimatization film that consisted of nature scenes, which allowed participants to adapt to the testing procedures and provided sufficient time for anticipatory arousal to dissipate such that a true blood perfusion baseline was reached. This video lasted approximately 9 minutes, during which time 3 LDI scans were taken. Next, participants watched an erotic video consisting of a montage of clips (3 minutes each) of different adult heterosexual couples engaged in a range of consensual sexual acts including foreplay (e.g., kissing), manual stimulation of the genitals, oral sex, and penile-vaginal penetrative intercourse. Halfway through the erotic video, the film was paused and all participants were asked to ensure that their foreskin was retracted over the glans penis, if applicable. The erotic video lasted approximately 23 minutes, during which time 6 LDI scans were taken. The study concluded with a baseline video consisting of nature scenes; this video lasted approximately 6 minutes, during which time 2 LDI scans were taken. All videos were presented on a 23-inch television screen, situated at eye level approximately 4 feet from the participant.

**Genital Sexual Arousal.** Men’s genital arousal was assessed using the Laser Doppler Imager (LDI; moorLDI2-IR laser Doppler imager, Moor Inc., Axminster, England), a non-invasive, direct measure of genital perfusion (i.e., blood delivery to the capillaries of the genital tissue). The LDI utilizes the Doppler effect, which assesses change in frequency of a wave (e.g., a wave of light) relative to its
source (e.g., the LDI device), to provide a measure of blood flow. The LDI emits a low-powered laser beam that can gather signals from capillaries in the superficial tissue of the scanned region at a depth of 2-3mm below the surface of the skin. In the case of blood perfusion, there is change in the frequency of the light of the LDI laser beam when it interacts with moving blood cells as they pass through capillaries, such that a small portion of the light is shifted, detected, and converted to an electrical signal that is processed by the LDI (Wardell, Jakobsson, & Nilsson, 1993; see also Waxman & Pukall, 2009).

The LDI was placed approximately 53 cm from participant’s genitals, and visual inspection ensured the scanning region includes the participant’s full genitals, a portion of the inner thigh, and sufficient space to account for the increase in the size of the penis resulting from erection. The LDI scanned the region in a raster pattern (i.e., the laser beam swept horizontally from one end of the scanning region to the next, moved up one pixel, and scanned horizontally in the opposite direction, eventually covering the entire scanning region). Each scan lasted 2 minutes 43 seconds, for a total of 6 scans. The LDI generated a black and white image for each scan (to facilitate identification of anatomical structures in the scanned region), as well as a coloured image representing perfusion (such that “cooler” colours represent lower blood perfusion, and “warmer” colours represent higher blood perfusion; see Figure 4.1).

![Image](image.png)

*Figure 4.1. LDI scan of an erect penis with regions of interest on the shaft, glans, and inner thigh*
Blood perfusion values were determined for two or three sites in each participant: one control site (an oval shape on the inner left thigh), and two or three genital sites: the shaft (a hexagonal shape beginning at the base of the penis, spanning the girth of the flaccid penile shaft, and ending below the base of the foreskin/the circumcision scar, depending on circumcision status; see Figure 4.1), the exposed glans penis (an oval shape encompassing the majority of the glans penis; visual inspection confirmed the glans penis was exposed in intact men), and if applicable, the foreskin (an oval shape of the foreskin in its natural, un-retracted position covering the glans penis; confirmed via visual inspection). In order to ensure that the exposed glans penis was scanned, halfway through the LDI scans (i.e., after scan three and before scan four), all intact participants were asked to ensure that their foreskin was fully retracted. If it was not, they were invited to manually retract their foreskin. Thus, for intact men, the number of scans of the foreskin in its natural, un-retracted position covering the glans was limited to a maximum of three scans (taken prior to the experimenter’s instructions to manually retract the foreskin).

Regions of interest (ROIs) were created over each site, and a “flux unit”—a numerical value representing blood perfusion averaged across each pixel in the ROI—was generated. A total of 6 flux units were created per participant (one for each scan lasting 2 mins 43 secs) at each site (glans, shaft, thigh). Excessive movement of the site during a scan resulted in measurement error, which was removed via visual inspection. Thus, genital arousal values used for statistical analyses were calculated by averaging flux units across all useable LDI scans obtained during a given film (a maximum of 6 scans and a minimum of 1 scan, depending on the amount of useable data after scans with movement artifacts were removed); this process was repeated for each ROI (glans, shaft, thigh).

All analyses were performed on raw flux units; however, analyses were repeated on within-subject standardized values and revealed no differences in the pattern of response obtained, and thus are not reported in this paper. Participants who showed less than 5% change in mean blood perfusion between the erotic video and the return-to-baseline video were deemed “non-responders” and were removed from analyses. This non-responder criterion resulted in the exclusion of two circumcised men.
**Subjective Sexual Arousal.** Men were asked to indicate their subjective experience of sexual arousal during testing procedures using two methods: (1) a continuous measure; and (2) a change score, which is the difference between subjectively reported sexual arousal on a single discrete question asked before and after the presentation of the erotic film (“how sexually aroused do you feel?”). Discrete subjective arousal ratings were not included, as they are less robust to impression management than continuous or change scores (Huberman, Suschinsky, Lalumière, & Chivers, 2013).

Continuous subjective arousal was measured in real-time; participants indicated their subjective arousal using a handheld device over the course of the erotic and return-to-baseline videos. Participants indicated their subjective arousal using a handheld wireless remote (Hiro 2.4 GHz 3 in 1 Wifi Presenter, Hiro Inc., California) on an 11-point Likert-type scale, where 0 indicated no sexual arousal at all, and 10 indicated most sexually aroused ever. Participants’ subjective arousal ratings were recorded every second in an excel file on a Dell® desktop computer. Continuous subjective arousal was reduced to a single value by computing the average arousal rating across the entire length of the film for both the erotic and baseline video separately.

Subjective arousal change scores were computed by subtracting participant’s responses to a discrete question asked before and after the presentation of the erotic film stimulus, such that a positive change score indicated an increase in arousal following video presentation, a negative value indicated a decrease in arousal, and a value of zero represented no change. The question was presented over the television monitor and participants responded verbally with the number that corresponded with their experience of arousal on a Likert-type scale from 0 (fully disagree with statement) to 10 (fully agree with statement).

**Sexual Concordance.** Three sexual concordance variables were calculated: two between-subject correlations were computed for genital arousal and continuously reported subjective arousal or subjective arousal change scores, and within-subject correlations were produced with genital and continuously reported sexual arousal. First, between-subject Pearson correlations were computed across all participants using genital arousal blood flow averaged across all six LDI scans taken during the erotic film, and the
average continuously reported subjective arousal across the entire erotic film. Second, between-subject Pearson correlations were calculated between the same average genital arousal blood flow value and the subjective arousal change score value. Third, to calculate within-subject correlations, the six individual genital blood flow values (one value for each LDI scan taken during the erotic film) were correlated with six continuously reported arousal values (averaged across the same six time intervals as the corresponding LDI scans) for each participant to produce one Pearson correlation per participant. Within-subject correlations required a minimum of three genital blood flow values and three continuously reported arousal values; thus, within-subject correlations could not be calculated for participants with three or more LDI scans that were removed due to movement artifacts. As a result, correlations are missing from eight men at the shaft, and for 20 men at the glans penis. All analyses were repeated using Spearman’s rank order correlation coefficients; results were not significantly different, and thus Pearson correlations are reported.

Procedures

Interested participants responded to advertisements by contacting the Sexual Health Research Laboratory, and were invited to participate in a brief telephone-screening interview (see Appendix D). Eligible participants were invited to the laboratory for single testing session lasting 2.5–3 hours. After consent was obtained (Appendix E), a structured interview was conducted (Appendix F), followed by questionnaires completed on a computer (Appendix G). Next, participants underwent quantitative sensory testing (QST) of their genitals (results are reported in Chapter 3, or Bossio, Pukall & Steele, in preparation). After QST protocols were completed, assessment of participant’s sexual arousal was completed via LDI of genital blood flow. Participants were seated in a semi-reclined position on a medical examination table with their feet resting on stirrups as to ensure their genitals could be scanned by the LDI. The same female primary investigator conducted all study procedures, and a trained female research assistant was present at all times to aid in data collection. Participants were compensated $75 CAD for their time.
**Data Considerations**

Data were analyzed using IBM SPSS Data Analysis software. Statistical significance was set at $p < .05$. For analyses employing parametric statistical tests (e.g., repeated-measures ANOVA), Greenhouse-Geisser corrections were used to correct for violations of sphericity when this assumption was not met. Further, Brown-Forsythe transformations were interpreted if the assumptions of homogeneity of variances was violated. If the assumption of normalcy was not met, data was subject to a log transformation (if positively skewed) or reflected log transformation (if negatively skewed; Osborne, 2002). All tests were repeated using non-parametric equivalents tests; results did not differ between parametric and non-parametric equivalents, and so parametric tests are reported here.

**Results**

**Sample Characteristics**

A total of 72 men participated in the study. Data from two men were removed because they were classified as non-responders (i.e., showed less than 5% increase in mean genital arousal blood flow in response to the erotic film as compared to the neutral film), the data from four were removed due to anatomical abnormalities (e.g., permanently retracted foreskin), and four participants did not complete all parts of the testing protocol. One participant (intact) had no useable LDI scans on the location of the shaft, and four participants (all intact) had no useable LDI scans on the location of the glans penis, so these individuals are only included in analyses for which they have useable data. The total number of participants included is 62 (30 circumcised and 32 intact).

Participants were between 18 and 37 years old ($M = 24.1$, $SD = 5.05$). The majority of participants identified as Canadian (82.3%), and did not have any current religious affiliations (82.3%). The sample was highly educated (all had some level of post-secondary education), and 61.3% identified as students, while 3.2% reported that they were unemployed. Most participants (58.1%) reported an income of under $20,000 per year, although many participants fell within the $20,000 to $59,999 income bracket. The majority were in a committed relationship (see Table 4.1 for a breakdown of relationship
type), and 37.1% of participants reported that they were single and not dating. Group comparisons of all
demographic variables were performed using $t$-tests or $\chi^2$ tests; no differences were observed between
circumcised and intact men on any demographic measures assessed (see Table 4.1).
Table 4.1

**Participant demographic information**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Circumcised (n = 30)</th>
<th>Intact (n = 32)</th>
<th>Total (N = 62)</th>
<th>Test statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (M (SD))</td>
<td>24.4 (5.23)</td>
<td>23.9 (4.99)</td>
<td>24.2 (5.07)</td>
<td><em>t</em> = .09</td>
<td>.76</td>
</tr>
<tr>
<td>Birthplace (n (%))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>27 (90.1)</td>
<td>24 (75)</td>
<td>51 (82.3)</td>
<td></td>
<td>.24</td>
</tr>
<tr>
<td>United States</td>
<td>1 (3.3)</td>
<td>1 (3.1)</td>
<td>2 (3.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>1 (3.3)</td>
<td>3 (9.4)</td>
<td>4 (6.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1 (3.3)</td>
<td>4 (12.5)</td>
<td>5 (8.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education (n (%))</td>
<td></td>
<td></td>
<td></td>
<td><em>χ²</em> = 9.12</td>
<td>.24</td>
</tr>
<tr>
<td>Post-secondary ongoing</td>
<td>14 (46.7)</td>
<td>14 (43.8)</td>
<td>28 (45.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-secondary complete</td>
<td>7 (23.3)</td>
<td>7 (21.9)</td>
<td>14 (22.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate / professional ongoing</td>
<td>7 (23.3)</td>
<td>5 (15.6)</td>
<td>12 (19.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate / professional complete</td>
<td>2 (6.7)</td>
<td>5 (15.6)</td>
<td>7 (11.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupation (n (%))</td>
<td></td>
<td></td>
<td></td>
<td><em>χ²</em> = 4.01</td>
<td>.26</td>
</tr>
<tr>
<td>Employed Full-Time</td>
<td>7 (23.3)</td>
<td>12 (37.5)</td>
<td>19 (30.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed Part-Time</td>
<td>2 (6.7)</td>
<td>1 (3.1)</td>
<td>3 (4.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>21 (70)</td>
<td>17 (53.1)</td>
<td>38 (61.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>0 (0)</td>
<td>2 (6.3)</td>
<td>2 (3.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income (n (%))</td>
<td></td>
<td></td>
<td></td>
<td><em>χ²</em> = 1.50</td>
<td>.83</td>
</tr>
<tr>
<td>$0-19,999</td>
<td>18 (60)</td>
<td>18 (56.3)</td>
<td>36 (58.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$20,000-39,999</td>
<td>8 (26.7)</td>
<td>7 (21.9)</td>
<td>15 (24.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$40,000-59,999</td>
<td>3 (10.0)</td>
<td>5 (15.6)</td>
<td>8 (12.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$60,000-89,999</td>
<td>1 (3.3)</td>
<td>1 (3.1)</td>
<td>2 (3.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$90,000+</td>
<td>0 (0)</td>
<td>1 (3.1)</td>
<td>1 (1.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current religious affiliation</td>
<td></td>
<td></td>
<td></td>
<td><em>χ²</em> = 3.96</td>
<td>.27</td>
</tr>
<tr>
<td>None / NA</td>
<td>23 (76.7)</td>
<td>28 (87.5)</td>
<td>51 (82.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catholic / Christian</td>
<td>2 (6.7)</td>
<td>3 (9.4)</td>
<td>5 (8.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jewish</td>
<td>3 (10.0)</td>
<td>0 (0)</td>
<td>3 (4.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2 (6.7)</td>
<td>1 (3.1)</td>
<td>3 (4.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationship Status</td>
<td></td>
<td></td>
<td></td>
<td><em>χ²</em> = 9.12</td>
<td>.24</td>
</tr>
<tr>
<td>Single, not dating</td>
<td>9 (30.0)</td>
<td>13 (40.6)</td>
<td>22 (35.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casual sex (one or more partners)</td>
<td>4 (13.4)</td>
<td>0 (0)</td>
<td>4 (6.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dating, monogamous</td>
<td>14 (46.7)</td>
<td>14 (43.7)</td>
<td>28 (45.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dating, non-monogamous</td>
<td>0 (0)</td>
<td>1 (3.1)</td>
<td>1 (1.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>2 (6.7)</td>
<td>4 (12.5)</td>
<td>6 (9.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Separated</td>
<td>1 (3.3)</td>
<td>0 (0)</td>
<td>1 (1.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of Relationship (months)</td>
<td>18.7 (20.2)</td>
<td>28.6 (37.5)</td>
<td>23.8 (30.5)</td>
<td><em>t</em> = 1.63</td>
<td>.21</td>
</tr>
</tbody>
</table>

*Note.* Due to missing data, not all values add up to 100%
Is the LDI a Valid Measure of Men’s Genital Sexual Arousal?

Genital blood flow data were analyzed to test whether the LDI was a valid measure of genital arousal. First, we tested that an increase in genital blood flow was specific to erotic stimuli, and also specific to genital testing sites (as opposed to the thigh). Next, the relationship between genital arousal (via LDI) and subjective sexual arousal (via self-report) was explored using correlational analyses.

Sensitivity of the LDI to sexual arousal. A repeated-measures ANOVA was performed, where the dependent variable was genital blood flow, and the repeated-measures variables were testing site (shaft, glans penis, thigh), and film type (erotic, neutral) to test whether (i) a significant increase in genital blood flow occurred during the erotic film, but not the neutral film, and (ii) whether a significant increase in genital blood flow occurred at the genital testing sites (shaft, glans penis) but not the control testing site (thigh). As hypothesized, a significant interaction between testing site and film type was observed ($F(2, 92) = 6.79, p = .002, \eta^2_p = .13$). Paired $t$-tests were conducted to follow-up the significant interaction. Average blood flow during the erotic film was significantly higher compared to the neutral film at the shaft ($t(60) = 6.91, p < .001$) and the glans penis ($t(47) = 2.88, p = .006$); blood flow at these two sites did not significantly differ from one another. Unexpectedly, the control site on the thigh also showed significantly higher blood flow during the erotic scan than the neutral scan ($t(61) = 3.44, p = .001$). See Table 4.2.

Table 4.2

<table>
<thead>
<tr>
<th>Testing site</th>
<th>Erotic film $M (SD)$</th>
<th>Neutral film $M (SD)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft</td>
<td>573.67 (166.03)</td>
<td>453.03 (66.44)</td>
</tr>
<tr>
<td>Glans penis</td>
<td>624.66 (235.32)</td>
<td>498.31 (238.93)</td>
</tr>
<tr>
<td>Thigh</td>
<td>266.64 (45.76)</td>
<td>258.36 (43.32)</td>
</tr>
</tbody>
</table>
**Relationship between genital and subjective sexual arousal.** Pearson’s product-moment correlation analyses were used to determine the strength and association between physiological and subjective arousal between circumcised and intact men. Physiological sexual arousal was represented by raw flux units at the shaft and the glans penis (termed *genital arousal*). Subjective arousal was calculated in two ways: (i) continuously reported subjective arousal averaged across the entire erotic film (termed *continuous arousal*), and (ii) a change in discrete questions regarding self-reported arousal asked before and after the erotic film (termed *change scores*). Genital arousal assessed at the shaft and the glans penis was not significantly correlated with continuous arousal for circumcised or intact men; when collapsed across circumcision status, correlations remained non-significant for either site (see Table 4.3).

Correlations between genital arousal and change scores revealed a different pattern of results than those obtained from continuous arousal. Circumcised men showed significant correlations between genital arousal and change scores at the shaft and the glans penis, but for intact men, correlations were only significant at the shaft—not the glans penis. When collapsed across groups, genital arousal and change scores were significantly correlated at the shaft and the glans penis (see Table 4.3).

Within-subject correlations were calculated between genital and continuous arousal at the shaft and the glans penis. Correlations are missing from eight men at the shaft, and for 20 men at the glans penis because they did not have enough useable data points to calculate a correlation (i.e., at least 4 of the 6 LDI scans were un-useable). Within-subject correlations ranged from -.94 to .97 at the shaft, and -.97 to .98 at the glans penis (see Table 4.3 for M and SDs). Despite a large range of observed within-subject correlations at the shaft and the glans penis, both distributions were negatively skewed (skewness = -0.62, SE = .33 and -0.74, SE = .36, for the shaft and glans penis, respectively) indicating that within-subject correlations were—generally—in a positive direction.

To compare within-subject correlations across circumcision status, a reflected log transformation was performed on the correlation data (Osborne, 2002) and the transformed data were subjected to a repeated-measures ANOVA, where the dependent variable was log-transformed within-subject correlations, the within-subject variable was testing site (shaft, glans penis), and the between-subject
variable was circumcisions status. Analyses revealed no significant main effect of site \( F(1,39) = .03, p = .86 \), and no significant interaction \( F(1,39) = .08, p = .78 \). Furthermore, the between-subject effect of circumcision status approached but ultimately did not reach significance \( F(1,39) = 3.85, p = .06 \).

Table 4.3

Correlations between genital and subjective (continuous and change-scores) sexual arousal across circumcision status and testing site

<table>
<thead>
<tr>
<th></th>
<th>Circumcised</th>
<th>Intact</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Between-subject correlations for continuous arousal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaft</td>
<td>.01 (( p = .95 ))</td>
<td>.25 (( p = .17 ))</td>
<td>.08 (( p = .53 ))</td>
</tr>
<tr>
<td>Glans penis</td>
<td>.17 (( p = .37 ))</td>
<td>.28 (( p = .28 ))</td>
<td>.14 (( p = .30 ))</td>
</tr>
<tr>
<td></td>
<td>Between-subject correlations for change scores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaft</td>
<td>.44 (( p = .02 ))^**</td>
<td>.35 (( p = .05 ))^*</td>
<td>.38 (( p = .002 ))^**</td>
</tr>
<tr>
<td>Glans penis</td>
<td>.46 (( p = .01 ))^**</td>
<td>.30 (( p = .12 ))</td>
<td>.38 (( p = .005 ))^**</td>
</tr>
<tr>
<td></td>
<td>Within-subject correlations for continuous arousal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaft</td>
<td>.24 (.60)^a</td>
<td>.30 (.44)^a</td>
<td>.28 (.51)^a</td>
</tr>
<tr>
<td>Glans penis</td>
<td>.33 (.54)^a</td>
<td>.26 (.53)^a</td>
<td>.30 (.53)^a</td>
</tr>
</tbody>
</table>

Note. * \( p \leq .05 \); ** \( p < .001 \). Significance tests were not performed with within-subject correlations, so no \( p \)-values are reported. ^a Values in brackets represent standard deviation

Does the Sexual Response of Circumcised and Intact Men Differ?

**Genital response across circumcision status.** To test the hypothesis that sexual response differs across circumcision status, a one-way ANCOVA was performed with raw flux units as the dependent variable, circumcision status as the independent variable, and age as the covariate. The model was not significant \( F(1, 57) = 0.78, p = .38 \); genital response did not vary across circumcision status.

**Genital arousal across genital testing site.** We explored the hypothesis that differences in sexual response across circumcised and intact men may be discernable by comparing blood flow at different sites of the penis. In order to compare blood flow across the shaft, glans penis, and foreskin (if present), a univariate ANCOVA was performed (as only one sample of participants had a foreskin), where the dependent variable was raw flux units, and the independent variable was testing site (shaft, glans penis, and foreskin), and the control variable was participant age. A significant main effect of testing site was observed \( F(2, 138) = 3.44, p = .035, \eta_p^2 = .05 \). Follow-up pairwise comparisons revealed
that—collapsed across circumcision status—average genital blood flow at the shaft was not significantly different from the glans penis ($p = .14$), or the foreskin ($p = .16$), but significantly lower blood flow was observed at the foreskin compared to the glans penis ($p = .01$); see Figure 4.2.

![Graph showing average genital blood flow across circumcision status for three sites: Shaft, Glans, Foreskin.](graph)

**Figure 4.2.** Average genital blood flow (flux units) across circumcision status for three genital testing sites

**Note.** *p < .05

**Continuously reported subjective arousal across circumcision status.** First, a data check was performed to test whether participants reported higher subjective arousal during the erotic film compared to the neutral film. A paired-sample $t$-test was performed, where the dependent variable was average continuous arousal scores and the grouping variable was film type (erotic, neutral). Results revealed that—as expected—participants reported significantly higher levels of continuous arousal during the erotic film ($M = 4.82$, $SD = 1.76$) as compared to the return-to-baseline neutral film ($M = 0.22$, $SD = 0.44$), $t(61) = 20.63$, $p < .001$.

To test the hypothesis that continuously reported subjective arousal would differ across circumcision status, a univariate ANCOVA was performed with average continuously reported arousal as the dependent variable, circumcision status as the independent variable, and age as the covariate. The
model was not significant \( F(1, 58) = 0.38, p = .54 \), thus circumcised \( M = 4.71, SD = 1.76 \) and intact \( M = 4.94, SD = 1.81 \) men did not differ in their continuously reported subjective arousal in response to an erotic stimulus.

**Subjective arousal change scores across circumcision status.** A data check was performed to test whether participants’ self-reported sexual arousal increased following the erotic film. A paired-sample \( t \)-test was performed with participant’s responses to a single item assessing their amount of subjective arousal asked before and after the presentation of the erotic film. As hypothesized, men reported feeling significantly higher levels of subjective arousal after watching the erotic film \( M = 5.26, SD = 1.85 \) as compared to before watching the erotic film \( M = 1.24, SD = 1.49 \), \( t(61) = 13.22, p < .001 \).

To test whether subjectively reported change scores differed between circumcised and intact men, a univariate ANCOVA was performed with subjectively reported change score as the dependent variable, circumcision status as the independent variable, and age as the covariate. The model was not significant, \( F(1, 58) = 0.17, p = .68 \). Circumcised \( M = 3.89, SD = 2.33 \) and intact \( M = 4.12, SD = 2.51 \) men did not differ in their self-reported subjective sexual arousal change scores.

**Do The Sexual Lives of Healthy Men Vary Across Circumcision Status?**

**Urological health.** Few participants reported a history of urological health conditions; see Table 4.4 for a breakdown of conditions. As participants with significant urological conditions were excluded from study procedures, no participants reported any penile conditions, and none had undergone any urological surgical procedures. Group comparisons were performed to test whether frequency of urological health conditions varied across circumcision status. Fisher’s Exact Tests were used to account for small sample sizes, and analyses revealed no significant group differences in frequency of STIs, urological conditions, or testicular conditions.
Table 4.4

*Frequency of urological conditions reported in participant’s lifetime*

<table>
<thead>
<tr>
<th></th>
<th>Circumcised</th>
<th>Intact</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STI conditions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlamydia</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Genital warts/HPV</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Urological conditions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bladder/UTI</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Yeast infection</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Testicular conditions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrotal pain</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Epididymitis</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Testicular trauma</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note.* Only conditions that participants endorsed were included in this table.

**Sexual history and functioning.** Analyses were conducted to compare sexual history variables between men’s circumcision status. No group differences were observed in the sexual histories gathered from circumcised and intact men (see Table 4.5 for a full breakdown). Men’s self-reported arousability in response to erotica and masturbation was subjected to an ANOVA. Analyses revealed no significant differences between circumcised and intact men with respect to arousability to erotica ($F(1,56.42) = 2.67, p = .11$) or masturbation $F(1,49.56) = 0.002, p = .96$).
Participant’s self-reported sexual history and arousability

<table>
<thead>
<tr>
<th></th>
<th>Circumcised</th>
<th>Intact</th>
<th>Total</th>
<th>F-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at first intercourse (years)</td>
<td>17.73 (2.30)</td>
<td>17.69 (2.21)</td>
<td>17.73 (2.23)</td>
<td>.02</td>
<td>.89</td>
</tr>
<tr>
<td>Total number of lifetime sexual partners</td>
<td>7.97 (8.82)</td>
<td>7.41 (6.84)</td>
<td>7.67 (7.78)</td>
<td>.08</td>
<td>.78</td>
</tr>
<tr>
<td>Number of lifetime penile-vaginal intercourse partners</td>
<td>7.79 (8.73)</td>
<td>7.41 (6.84)</td>
<td>7.59 (7.73)</td>
<td>.04</td>
<td>.85</td>
</tr>
<tr>
<td>Number of lifetime anal intercourse partners</td>
<td>1.17 (3.70)</td>
<td>0.41 (0.67)</td>
<td>0.77 (2.62)</td>
<td>1.31</td>
<td>.26</td>
</tr>
<tr>
<td>Masturbation α</td>
<td>13.53 (9.05)</td>
<td>13.63 (10.76)</td>
<td>13.58 (9.89)</td>
<td>.001</td>
<td>.97</td>
</tr>
<tr>
<td>Manual stimulation of partner’s genitals α</td>
<td>8.17 (7.99)</td>
<td>6.35 (6.58)</td>
<td>7.23 (7.29)</td>
<td>.93</td>
<td>.34</td>
</tr>
<tr>
<td>Partner manually stimulated your genitals α</td>
<td>6.44 (6.72)</td>
<td>6.22 (6.74)</td>
<td>6.33 (6.68)</td>
<td>.02</td>
<td>.90</td>
</tr>
<tr>
<td>Oral stimulation of partner’s genitals α</td>
<td>6.86 (7.14)</td>
<td>4.42 (4.53)</td>
<td>5.60 (6.01)</td>
<td>2.54</td>
<td>.12</td>
</tr>
<tr>
<td>Partner orally stimulated your genitals α</td>
<td>7.24 (6.83)</td>
<td>4.65 (4.60)</td>
<td>5.95 (5.90)</td>
<td>3.26</td>
<td>.08</td>
</tr>
<tr>
<td>Vaginal intercourse with your partner α</td>
<td>9.66 (8.75)</td>
<td>8.26 (8.78)</td>
<td>8.93 (8.72)</td>
<td>.38</td>
<td>.54</td>
</tr>
<tr>
<td>Anal intercourse on your partner α</td>
<td>2.55 (4.49)</td>
<td>8.26 (8.78)</td>
<td>1.75 (3.59)</td>
<td>.71</td>
<td>.41</td>
</tr>
<tr>
<td>Anal intercourse on you α</td>
<td>0.34 (1.01)</td>
<td>0.97 (2.25)</td>
<td>0.49 (1.60)</td>
<td>.15</td>
<td>.70</td>
</tr>
<tr>
<td>Sex toy used on partner α</td>
<td>1.69 (3.69)</td>
<td>0.63 (2.02)</td>
<td>1.27 (2.93)</td>
<td>.62</td>
<td>.43</td>
</tr>
<tr>
<td>Sex toy used on you α</td>
<td>0.90 (2.58)</td>
<td>0.87 (1.91)</td>
<td>0.52 (1.93)</td>
<td>2.18</td>
<td>.15</td>
</tr>
<tr>
<td>Arousability to erotica β</td>
<td>6.87 (1.17)</td>
<td>7.31 (0.97)</td>
<td>7.10 (1.08)</td>
<td>2.67</td>
<td>.11</td>
</tr>
<tr>
<td>Arousability to masturbation β</td>
<td>7.33 (1.95)</td>
<td>7.31 (1.28)</td>
<td>7.32 (1.63)</td>
<td>.002</td>
<td>.96</td>
</tr>
</tbody>
</table>

Note. α = Over the past month; β = On a 11-point Likert-type scale from 0 (not at all) to 10 (very much)

Sexual functioning was assessed using the subscales of the IIEF (erectile functioning, orgasm functioning, sexual desire, and intercourse satisfaction), and also using the total score for the IIEF-5. Data from fourteen participants were removed from the intercourse satisfaction subscale, as they had not attempted intercourse in the past 4 weeks, and data from a single participant was removed from all IIEF analyses, as he did not complete the questionnaire. Average Erectile Functioning and Sexual Desire subscale scores fell within the “no sexual dysfunction” range, and average Orgasm Functioning, Intercourse Satisfaction, and IIEF-5 Total Scale score fell within the “mild sexual dysfunction” range (see Table 4.6). Descriptive statistics revealed that—as expected—all subscale distributions were negatively
skewed in the direction of no sexual dysfunction, thus a reflected log transformation was conducted for all IIEF analyses.

A repeated-measures MANCOVA was performed on the transformed IIEF subscales, where the dependent variables were scores for each of the four IIEF subscales, the between-subject variable was circumcision status, and the covariate was participant age. There was no significant interaction between IIEF subscales and circumcision status ($F(3,135) = 0.74, p = .53$), and no main between-subject effect of circumcision status ($F(1, 45) = 0.93, p = .34$). An independent-sample $t$-test was performed on the transformed IIEF-5 total score, which revealed no significant between-group difference ($t(59) = 0.26, p = .80$). Analyses were repeated for untransformed data, and the pattern of results remained the same.

Participant scores on the IIEF subscales and the IIEF-5 total score were re-coded to indicate whether each participant fell above the clinical cut-off indicative of a “sexual dysfunction”, or below that cut-off (due to the small number of participants that fell below the cut-off, all categories of sexual dysfunction were collapsed). Binomial scores were subject to a Fisher’s Exact test to account for small sample sizes. The number of men who’s responses indicated sexual dysfunction verses no sexual dysfunction did not differ across circumcision status with respect to Erectile Functioning ($\chi^2 (df = 1) = 0.55, p = .54$), Orgasm Functioning ($\chi^2 (df = 1) = 0.05, p = 1.00$), Sexual Desire ($\chi^2 (df = 1) = 0.05, p = 1.00$), Intercourse Satisfaction ($\chi^2 (df = 1) = 0.28, p = .77$), or IIEF-5 total score ($\chi^2 (df = 1) = 0.68, p = .44$).
### Table 4.6

Average IIEF subscale scores and distribution of participant’s scores according to IIEF clinical dysfunction cut-offs

<table>
<thead>
<tr>
<th></th>
<th>Average Score</th>
<th>No dysfunction</th>
<th>Mild dysfunction</th>
<th>Mild to moderate dysfunction</th>
<th>Moderate dysfunction</th>
<th>Severe dysfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td><strong>Erectile functioning</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumcised</td>
<td>26.47 (5.92)</td>
<td>24 (82.8)</td>
<td>1 (3.4)</td>
<td>2 (6.9)</td>
<td>2 (6.9)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Intact</td>
<td>24.22 (9.04)</td>
<td>24 (72.7)</td>
<td>1 (3.0)</td>
<td>4 (12.1)</td>
<td>2 (6.1)</td>
<td>1 (3.0)</td>
</tr>
<tr>
<td>Total</td>
<td>25.30 (7.71)</td>
<td>48 (77.4)</td>
<td>2 (3.2)</td>
<td>6 (9.7)</td>
<td>4 (6.5)</td>
<td>1 (1.6)</td>
</tr>
<tr>
<td><strong>Orgasm Functioning</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumcised</td>
<td>9.00 (1.80)</td>
<td>21 (72.4)</td>
<td>4 (13.8)</td>
<td>3 (10.3)</td>
<td>1 (3.4)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Intact</td>
<td>8.34 (3.13)</td>
<td>24 (72.7)</td>
<td>3 (9.1)</td>
<td>2 (6.1)</td>
<td>1 (3.0)</td>
<td>2 (6.1)</td>
</tr>
<tr>
<td>Total</td>
<td>8.66 (2.57)</td>
<td>45 (72.6)</td>
<td>7 (11.3)</td>
<td>5 (8.1)</td>
<td>2 (3.2)</td>
<td>2 (3.2)</td>
</tr>
<tr>
<td><strong>Sexual Desire</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumcised</td>
<td>9.83 (0.91)</td>
<td>21 (72.4)</td>
<td>7 (24.1)</td>
<td>1 (3.4)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Intact</td>
<td>9.78 (0.79)</td>
<td>24 (72.7)</td>
<td>7 (21.2)</td>
<td>1 (3.0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Total</td>
<td>9.81 (0.85)</td>
<td>45 (72.6)</td>
<td>14 (22.6)</td>
<td>2 (3.2)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td><strong>Intercourse Satisfaction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumcised</td>
<td>10.30 (5.60)</td>
<td>13 (44.8)</td>
<td>9 (31.0)</td>
<td>1 (3.4)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Intact</td>
<td>9.40 (5.89)</td>
<td>16 (48.5)</td>
<td>7 (21.2)</td>
<td>1 (3.0)</td>
<td>1 (3.0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Total</td>
<td>9.83 (5.72)</td>
<td>48 (77.4)</td>
<td>29 (46.8)</td>
<td>16 (25.8)</td>
<td>2 (3.2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td><strong>IIEF-5 Total Score</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumcised</td>
<td>21.20 (4.92)</td>
<td>17 (58.6)</td>
<td>8 (27.6)</td>
<td>0 (0)</td>
<td>4 (13.8)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Intact</td>
<td>19.63 (7.59)</td>
<td>22 (66.7)</td>
<td>3 (9.1)</td>
<td>0 (0)</td>
<td>6 (18.2)</td>
<td>1 (3.0)</td>
</tr>
<tr>
<td>Total</td>
<td>20.39 (6.43)</td>
<td>39 (62.9)</td>
<td>11 (17.7)</td>
<td>0 (0)</td>
<td>10 (16.1)</td>
<td>1 (1.6)</td>
</tr>
</tbody>
</table>

**Satisfaction with circumcision status.** One-way ANOVAs were performed to determine whether circumcised and intact men differed in their responses to a series of questions pertaining to personal satisfaction with one’s circumcision status, as well as a questionnaire (MGIS) assessing satisfaction with one’s genital image (see Table 4.7). Circumcised and intact men did not differ on their ratings of how happy they are with their circumcision status, or how much their circumcision status is a positive part of their every day life, a negative part of their everyday life, and a significant part of their everyday life. Group differences were not observed with respect to how often participants think about
their circumcision status. Three circumcised men and no intact men indicated that they had regrets about their circumcision status (group differences were not significant). A total of 7 men indicated that they wish they were the opposite circumcision status (four circumcised and three intact), while four men indicated they “sometimes” wished they had the opposite circumcision status (two circumcised and two intact); overall group differences were not significant. Men’s responses to the Male Genital Image Scale were summed to indicate men’s satisfaction with the appearance of their genitals; again, circumcised (\( M = 52.75, SD = 7.20 \)) and intact men’s (\( M = 51.94, SD = 7.45 \)) ratings of their genital image did not significantly differ across circumcision status (\( F(1, 59) = 0.18, p = .67 \)).

Table 4.7

*Participant’s self-reported satisfaction with circumcision status*

<table>
<thead>
<tr>
<th></th>
<th>Circumcised</th>
<th>Intact</th>
<th>Total</th>
<th>Test statistic</th>
<th>( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>How happy are you with your CS?  ( ^a )</td>
<td>7.73 (2.13)</td>
<td>7.81 (2.28)</td>
<td>7.77 (2.19)</td>
<td>( F = .02 )</td>
<td>.89</td>
</tr>
<tr>
<td>How much is your CS a positive issue for you in your everyday life?  ( ^a )</td>
<td>5.93 (2.98)</td>
<td>5.25 (2.34)</td>
<td>5.58 (2.67)</td>
<td>( F = 1.01 )</td>
<td>.32</td>
</tr>
<tr>
<td>How much is your CS a negative issue for you in your everyday life?  ( ^a )</td>
<td>1.33 (2.07)</td>
<td>1.78 (2.17)</td>
<td>1.56 (2.11)</td>
<td>( F = .69 )</td>
<td>.41</td>
</tr>
<tr>
<td>How much is your CS a significant part of who you are?  ( ^a )</td>
<td>2.46 (2.62)</td>
<td>2.56 (2.75)</td>
<td>2.52 (2.67)</td>
<td>( F = .02 )</td>
<td>.89</td>
</tr>
<tr>
<td>How often do you think about your CS?  ( ^b )</td>
<td>( \chi^2 = 2.25 )</td>
<td>.33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>3</td>
<td>7</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rarely</td>
<td>21</td>
<td>17</td>
<td>38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>7</td>
<td>8</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have any regrets about your CS?  ( ^b )</td>
<td>( \chi^2 = 3.36 )</td>
<td>.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>27</td>
<td>32</td>
<td>59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you ever wish that you were the opposite CS?  ( ^b )</td>
<td>( \chi^2 = .26 )</td>
<td>.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>24</td>
<td>27</td>
<td>51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. CS = circumcision status; \(^a\) = Scored on a 11-point Likert-type scale, where 0 indicates “completely disagree” and 10 indicates “completely agree”, thus higher scores indicate higher satisfaction; \(^b\) = Values reported represent the frequency of men who endorsed each possible response*
Discussion

Summary of Findings

This study assessed three novel questions: (i) Is the LDI a valid psychophysiological measure of male sexual arousal; (ii) Does genital response differ between circumcised and intact men; and (iii) Do circumcised and intact men vary on a number of aspects of their sexual lives? Results from this study indicated first, that the LDI is a valid measure of male sexual arousal. Sexual concordance between genital arousal and subjective arousal change scores (but not continuously reported subjective arousal) produced significant between-subject correlation coefficients at the shaft and glans penis for circumcised men, but only at the shaft for intact men. Within-subject correlations were not significantly different across circumcision status, and were much lower for continuous arousal than change scores.

Second, this study produced no evidence to suggest that sexually healthy men who were either circumcised as neonates or who were never circumcised (intact) differ in their genital sexual responses (assessed on multiple genital sites, including the shaft and the glans penis) or subjectively reported sexual arousal (via continuous report or change scores). Third, circumcised and intact men did not significantly differ on factors related to their sexual lives; no significant group differences emerged with respect to urological history, sexual satisfaction or functioning, or satisfaction with one’s circumcision status/genital image. This study provides no evidence to suggest significant differences in terms of many aspects of sexual functioning in circumcised and intact men.

LDI: A Novel Measure of Men’s Sexual Arousal

The LDI is a novel and unique measure of genital sexual arousal, in that—unlike commonly used psychophysiological assessment measures—it directly assesses genital blood flow using non-invasive imaging technology. Research has demonstrated that the LDI is a reliable and valid measure of sexual arousal in women (Waxman & Pukall, 2009). The current study is the first to demonstrate that the LDI is a valid measure of genital sexual arousal in a male sample. The LDI identified an increase in blood perfusion in response to an erotic (but not neutral) film stimulus at two sites on the male genitals (the
shaft and glans penis) and—unexpectedly—at a non-genital site on the inner left thigh. Although unexpected, perhaps increased blood perfusion at the thigh should not be a surprise, as it is likely a vestige of blood travelling to the genitals to facilitate genital arousal (i.e., erection). Indeed, Masters and Johnson (1966) documented vasocongestion of diffuse non-genital body sites (termed “sex flush”), which typically begins near the pelvis in men and moves up to the neck and face. Increased response to erotic stimuli at the inner thigh was not observed in studies assessing thermal changes (Kukkonen et al., 2007); this finding may be due to measurement differences between the LDI (which directly assesses blood flow) and thermal imaging (an indirect measure of blood flow that assesses temperature change). This finding suggests that the LDI may be more robust to measuring blood perfusion in fatty tissues than thermal imaging, which is known to produce lower temperature estimates of fatty tissues, such as the breast or—in this case—the thigh (Love, 1980).

Sexual concordance may provide further insights into the LDI as a novel measure of sexual arousal, specifically with respect to the relationship between genital and subjective sexual arousal. Research with the penile strain gauge has obtained high average estimates of sexual concordance between psychophysiological arousal and subjectively reported arousal (based on a meta-analysis: \( r = .66 \); Chivers, Seto, Lalumiere, Laan, & Grimbos, 2010). Women’s subjectively reported sexual arousal correlates more highly with genital sexual arousal via the LDI than what has been previously been reported using indirect sexual psychophysiological measures (e.g., vaginal photoplethysmography; Chivers et al., 2010). Concordance estimates obtained in the current study were lower than those previously reported in the literature (\( r \)'s under .5), and there was considerable variability across the concordance values computed (between- or within-subject correlations using continuous arousal or change scores). With respect to between-subject correlations, change scores had a much stronger relationship with genital arousal than continuous arousal. This finding is consistent with previous research, which demonstrates that continuously reporting subjective arousal may act as a distractor, especially within male samples (Wincze, Venditti, Barlow, & Mavissakalian, 1980). It is interesting, however, that using continuous arousal values to compute within-subject correlations produced much higher correlations (although a
great amount of within-subject variability was observed, consistent with research using the LDI with women; Boyer, Pukall, & Chamberlain, 2012). Overall, sexual concordance using the LDI produced moderate correlations, which indicates that there is a relationship between men’s physiological response and their subjective experience of sexual arousal in the current sample. Further, variability in sexual concordance across psychophysiological measures illustrate that male genital arousal, and the relationship between genital and subjective arousal, is a complex psychophysiological process that requires further research.

**Sexual Response and Circumcision Status are Unrelated in a Healthy Sample of Men**

Circumcised and intact men in the current sample did not significantly differ in their genital or subjective self-reports of sexual response. In fact, across circumcision status, men’s responses were remarkably similar on all measures of sexual arousal assessed. Unlike Payne et al. (2007), we did not find a between-group difference in men’s sexual response at baseline. It is interesting that the between-group difference in Payne et al. (2007) disappeared when men became aroused when, in the case of intact men, the foreskin was retracted such that the circumcised and intact penis more closely resembled one another. Perhaps the foreskin in its natural position (i.e., covering the glans penis) introduced a methodological artifact that resulted in an artificially low temperature reading, while blood perfusion readings remained robust against this artifact. Future research should aim to assess genital arousal with thermal imaging and LDI concurrently, in order to further our understanding of the strengths and weaknesses of each measure.

Genital blood flow was assessed using the LDI at three sites on the genitals: the shaft, the glans penis, and—in the case of intact men—the foreskin. Analyses revealed that blood flow at the foreskin was significantly lower than at the glans penis, while blood flow at the shaft was not significantly different from either site. Although distinct tissue composition across the test sites may partially explain these findings (i.e., tissue at the glans penis is more closely associated with mucosal membrane than epithelial tissues, which are present at the foreskin or shaft; Halata & Munger, 1986), this explanation does not explain why blood flow at the shaft and the glans penis did not significantly differ. Thus, perhaps the difference was—at least in part—a methodological one. Blood flow at the foreskin was only measured
when it was in its natural position covering the glans penis. Following a typical developmental trajectory, a full or nearly full erection typically results in the automatic mechanical retraction of the foreskin to expose the glans penis in intact men (Kayaba, Tamura, Kitajima, Fujiwara, & Kato, 1996). Because an erection—and the subsequent foreskin retraction—occurs when a penis is engorged with blood, it can be assumed that LDI scans taken of the foreskin in its natural state (i.e., covering the glans penis) occurred exclusively when the penis was in a less aroused state than LDI scans taken of the glans penis (when the foreskin was retracted in intact men). Therefore, lower blood flow (indicating less arousal) would be expected in the scans of the foreskin taken in this study, which is consistent with our findings. Future research with the LDI should include measurement of blood flow at the foreskin at multiple levels of physiological or subjective arousal. In order to allow for a consistent measure of blood flow at the foreskin from participant to participant, scans should be taken exclusively when the foreskin is covering the glans penis, as this design would avoid possible methodological problems introduced by assessing the foreskin in different positions. It should be noted, however, that lower observed blood flow at the foreskin as compared to the glans penis in this sample does not translate to functional group differences in sexual or sensory experiences (Chapter 3), as the presence or absence of a foreskin in the current sample was not associated with differences in subjective ratings of sexual arousal across the groups.

The lack of between-group differences with respect to subjective sexual arousal—be it assessed continuously or as a pre-post stimulus change score—is an important finding, and replicates findings reported by Payne et al. (2007). Thus, it appears circumcised and intact men do not differ in terms of their perception of sexual arousal. These findings are in line with research that employs quantitative sensory testing (QST) methods to assess penile sensitivity and histological methods to assess nerve fiber composition in the genitals, both of which find minimal evidence for differences in penile sensitivity across circumcision status (Chapter 3; Cox et al. 2015; Payne et al., 2007; Sorrells et al., 2007). Thus, the growing body of literature looking at objective measures of penile sensitivity, in combination with research demonstrating minimal between-group differences in objective and subjective measures of
sexual response (Payne et al., 2007), indicates that circumcision status is not significantly associated with functional or perceptual experiences of sexual response in healthy men.

Interestingly, when sexual concordance was computed separately for circumcised and intact men, between-subject sexual concordance values (via LDI and change-scores) were significantly correlated at the shaft and glans penis in circumcised men, but only at the shaft in intact men. At present, we cannot say whether correlations between genital and subjectively reported sexual arousal equate to differences in perception, or even functional differences. These findings seem to suggest that the amount of blood flow to intact men’s glans penis is not significantly correlated with the amount of sexual arousal they subjectively experience. It is unclear why these results may have emerged in the current sample, but it suggests that perceptual differences—as they relate to sexual arousal—may be noticeable at the glans penis between circumcised and intact men. It is important to note, however, that there is insufficient evidence to suggest that these differences would translate to functional differences (with respect to sexual response or functioning) in healthy men.

**Sexual Correlates of Circumcision in Healthy Men**

We tested whether there were between-groups differences in urological history, sexual history or functioning, or satisfaction with circumcision status or self-perceived genital image. No significant between-group differences emerged; the implications are discussed here.

Previous research has demonstrated that circumcision is protective against a range of urological conditions (e.g., Tobian et al., 2009) and sexually transmitted infections (e.g., Weiss, Thomas, Munabi, & Hayes, 2006). Men who were neonatally circumcised compared to those who were intact in the current sample did not differ with respect to their urological histories spanning conditions involving testicular, penile, or urological health, STIs, or history of urological procedures. Perhaps these findings were unsurprising in the current study, given the sample comprised of generally healthy men, and correspondingly, rates of reported urological conditions were very low.

Between-group differences failed to emerge with respect to men’s self-reported sexual history and arousability to masturbation and erotica. It has been hypothesized that differences in penile anatomy
between circumcised and intact men lead to differences in sexual practices; for example, O’Hara and O’Hara (1999) presume that circumcised men have deeper thrusts in order to account for a loss of penile sensitivity resulting from the removal of the foreskin. Additionally, Ferris et al. (2010) reported that, in a group of Australian men, sexual practices did vary slightly across circumcision status, in that circumcised men were more likely to report having masturbated alone in the previous 12 months. The current study, however, did not find evidence for between-group differences with respect to a wide range of partnered and solitary sexual practices. This result is interesting, given that past research has documented distinct preferences for sexual activities with a certain circumcision status among men’s sexual partners (women preferred manual, oral, and penetrative sex with circumcised men; men preferred manual, oral, and anal intercourse with intact men; Bossio, Pukall, & Bartley, 2015). Future research should explore how perceptions of one’s genitals—whether it is held by the individual or their sexual partner—may impact a couple’s sexual life.

This study attempted to replicate previous findings that have observed significant between-group differences in men’s sexual functioning via the IIEF (Cortés-González, Arratia-Maqueo, Martínez-Montelongo, & Gómez-Guerra, 2009; Fink, Carson, & DeVellis, 2002; Gao et al., 2014). In the current sample of healthy young men, no significant group differences emerged for any subscales of the IIEF (sexual functioning, orgasm functioning, sexual desire, and intercourse satisfaction), or the composite IIEF-5 score. The current study differs from previous research in that its recruitment was limited to a sample of healthy men, while past has focused on samples of men with pre-existing sexual health complaints; however, it is possible that exclusion criteria for this study eliminated the variance in men’s sexual functioning necessary to obtain a group difference, if one exists. It should be noted, however, that although men with a diagnosis of a sexual dysfunction were excluded from study procedures, the IIEF scores indicate that some degree of (mild) clinically significant sexual dysfunction was still present in the group, and the prevalence of sexual dysfunction did not differ between circumcised and intact men.

Men in the current sample did not differ in their responses to a number of questions assessing self-reported satisfaction with their circumcision status. In fact, men reported overall high levels of
satisfaction with their circumcision status, and they indicated that it was not a negative aspect of their daily life. Interestingly, these findings are consistent with research by Bossio et al. (2015) exploring men and women’s satisfaction with their sexual partner’s circumcision status. Despite women’s stated preference for circumcised partners and men’s preference for intact partners, both genders reported feeling overwhelmingly satisfied with their partner’s circumcision status, irrespective of what that status was. Thus, it appears that circumcision status is not an important predictor in satisfaction with genital image within the samples of men or their sexual partners (Bossio et al., 2015). Because there was very little variability in men’s self-reported satisfaction with their circumcision status in the current sample (i.e., men were uniformly satisfied with their circumcision status), future research would benefit from replicating these findings in a sample of men with greater variability in sexual functioning. Research suggests that low body genital image (assessed via the Male Genital Image Scale) is related to lower sexual functioning (Wilcox, Redmond, & Davis, 2015), thus, perhaps low levels of satisfaction with circumcision status—as opposed to circumcision status, per se—may play a role in impaired sexual functioning.

Limitations

One potential limitation to the current study is the use of the LDI over more common psychophysiological measures of sexual arousal typical within the literature (e.g., penile strain gauge, thermal imaging). Future research should attempt to replicate the current findings using additional measures of sexual psychophysiology. However, the LDI has the added benefit of being able to directly assess genital blood flow, which may prove useful when comparing male genitals with and without a foreskin. Additionally, the imaging capabilities of the LDI are advantageous in assessing differences in sexual response across circumcision status because it allows for assessment over a larger genital region or multiple structures of the male genitals, which cannot be done using more commonly used circumferential measures of male sexual arousal, like the penile strain gauge.

Unlike previous research looking at circumcision status and sexual functioning, this study does not employ a pre-post study design. The between-subject design used to assess sexual response in the
present study does not allow us to statistically account for individual differences in the way that pre-post study designs do; however, we argue that—in the case of circumcision—a within-subject design introduces more confounds than for which it controls (e.g., participant’s expectations for the procedure, reason for undergoing the procedure, presence of sexual dysfunctions). Future research needs to address whether men’s perceptions of their genitals, or expectations for undergoing circumcision as an adult, might impact their responses to self-report measures assessing sexual outcomes, such as sexual functioning or response.

Conclusions

This study challenges the widely accepted—but largely untested—assumption that circumcision negatively impacts sexual functioning. Findings from this study indicate that there are no significant between-groups differences in genital response or in the subjective experience of sexual arousal. Furthermore, we obtained no evidence to suggest that neonatal circumcision is associated with significant or lasting effects to men’s sexual health, sexual history, or sexual functioning within a sample of healthy men. The current sample of men reported consistently high satisfaction and low levels of distress caused by their circumcision status. The findings reported here, and research exploring penile sensitivity across circumcision status (Chapter 3), provide mounting evidence that neonatal circumcision accounts for minimal long-term differences in men’s sexual functioning and penile sensitivity. Future research should explore whether previous research findings documenting lower sexual functioning in circumcised men previously may be better explained by psychological factors (e.g., dissatisfaction with circumcision status) than by psychological factors (e.g., penile sensitivity, sexual arousability).
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Chapter 5

Attitude towards one’s circumcision status is more important than circumcision status in men’s body image and sexual functioning

Introduction

Presently, the impact of circumcision—or the removal of the prepuce—on the sexual lives of men is unclear, as the majority of research on the topic of circumcision focuses on medical and health outcomes. Although it has been hypothesized that circumcision negatively impacts men’s sexual functioning, research on the topic is limited and has produced mixed results (see Bossio, Steele, & Pukall, 2014 for a review). Sexual functioning is complex; it is known to be impacted by physiological as well as psychological or attitudinal variables. As most research on the sexual correlates of circumcision have relied on self-report measures, it is possible that confounding attitudinal factors are—in part—responsible for the mixed pattern of results. One important psychological variable known to impact sexual functioning is men’s perceived body image, such that lower satisfaction with body image is predictive of worse sexual functioning (Cash, Maikkula, & Yamamiya, 2004; Sanchez & Kiefer, 2007). It has been suggested that circumcision is associated with negative attitudes and lower body image in some samples of men (e.g., Boyle, 2015); however, this relationship has never been empirically tested. The aim of the current study was to explore men’s attitudes towards their circumcision status (e.g., whether they are circumcised or intact), and to test whether their attitude toward their circumcision status impacts other aspects of their sexual lives—namely, body image and sexual functioning.

Although it has been hypothesized that circumcision negatively impacts men’s sexual functioning (e.g., Ritters, 1982), the research on this relationship is, in fact, inconclusive. Some studies report that circumcision decreases sexual functioning (e.g., Fink, Carson, DeVellis, 2002; Kim & Pang, 2007; Shen, Chen, Zhu, Wan, & Chen, 2004), some report that it improves sexual functioning (e.g., Senel, Demirelli,
and others report that it does not adversely impact sexual functioning (e.g., Laumann, Masi, & Zuckerman, 1998; Kigozi et al., 2008; Payne, Thaler, Kukkonen, Carrier, & Binik, 2007; see Bossio et al., 2015 for a thorough breakdown of research findings). Typically, researchers have compared circumcised and intact men’s responses to validated measures of sexual functioning (e.g., International Index of Erectile Functioning, IIEF; Masood, Patel, Himpson, Palmer, Mufti, & Sheriff, 2005), or self-reported intravaginal ejaculatory latency times (IELTs; Waldinger, McIntosh, & Schweitzer, 2006). Self-report measures, however, are prone to responder biases, among other methodological issues, which may be particularly problematic for circumcision research, especially if attitudes towards one’s circumcision status are an important predictor of sexual functioning.

It is believed that circumcision reduces penile sensitivity, which in turn leads to sexual dysfunction (Cold & Taylor, 1999; Taylor, Lockwood, & Taylor, 1996). Recently, research has employed psychophysical or psychophysiological measures to assess for objective differences between the genitals of circumcised and intact men. Quantitative sensory testing (QST)—which assesses peripheral nerve functioning—has revealed minimal differences in penile sensitivity across circumcision status (Chapter 3; Payne et al., 2007; Sorrels, Snyder, Reiss, Eden, Milos, Wilcox, & van Howe, 2007). Further, sexual psychophysiological studies have employed indirect (thermal imaging; Payne et al., 2007) and direct (laser Doppler imaging; see Chapter 4) measures of penile blood flow in response to erotic audio-visual stimuli; both studies failed to find substantial between-group differences in men’s genital and subjective responses to sexual stimuli. Additionally, a review of histological findings of penile sensitivity and correlates of sexual functioning across circumcision status (Cox, Krieger, & Morris, 2015) finds minimal support for reduced sexual sensation resulting from the removal of the foreskin. The limited evidence suggesting that circumcised men experience lower sexual functioning compared to intact men appears to be based on results from studies employing self-report measures, but not from studies that use more objective measures of penile sensitivity (QST), genital and subjective sexual response (sexual psychophysiology), or penile histology. It is possible that attitudinal variables associated with
circumcision status may help explain why some self-report studies obtain a between-groups difference in sexual functioning, while studies of more objective measures do not.

Sexual functioning is known to be a complex process mediated by a number of physiological (e.g., penile sensitivity; Bleustein, Arezzo, Eckholdt, & Melman, 2002) as well as psychological (e.g., perceived body image; Cash et al., 2004) factors. Because there is little evidence supporting the notion that penile physiology differs between circumcised and intact men, it is possible that psychological factors are more variable across circumcision status. One psychological variable known to play an important role in sexual functioning is body image, which is a multidimensional construct consisting of perceptions, thoughts, and behaviours, stemming from one’s evaluation of their physical appearance (Cash et al., 2004; Gillen, Lefkowitz, & Shearer, 2006; Pruzinsky & Cash, 2002). Body image may be particularly relevant to circumcision research, because one fundamental difference between circumcised and intact men is the physical appearance of their genitals (i.e., the presence or absence of a foreskin). Although the impact of circumcision status on men’s evaluation of their body image has not been empirically studied, the relationship between these two factors has been implicated in the literature by scholars and anti-circumcision activists alike (Gemmell & Boyle, 2001; note that this study is not peer-reviewed), who predict that circumcision is associated with negative attitudes and lower body image overall.

Better body image is predictive of greater sexual functioning and satisfaction (Breuer, 2013), and—conversely—poor body image is associated with decreased sexual functioning, such as increased rates of premature ejaculation and erectile difficulties in men (Breuer, 2013, Cash et al., 2004; Sanchez & Kiefer, 2007; Laumann, Paik, & Rosen, 1999). The role of body image in men’s sexual lives also extends to their penis, specifically. For example, dissatisfaction with one’s penis correlates with lower sexual self-esteem and more sexual anxiety (Algars, Santtila, Jern, Johansson, & Westerlund, 2011; Morrison, Bearden, Ellis, & Harriman, 2005). Men who are happier with the appearance or size of their penis report more positive body image overall, better appraisal of their sexual abilities (Winter, 1989), better sexual
functioning, and higher frequencies of sexual behaviours (Algars et al., 2011; Reinholtz & Muehlenhard, 1995). Genital body image has typically focused on the appearance of the penis, or penis length. No research—to our knowledge—has empirically explored men’s perceptions of their penis while accounting for circumcision status, or the importance of such in a man’s appraisal of his body image, particularly as body image relates to sexual functioning.

Presently, there is a need to explore men’s attitudes towards their circumcision status and how these attitudes might impact men’s body image and sexual functioning. Current research suggests that circumcision status may be related to sexual functioning, but the nature of this relationship is unclear. Specifically, it is unknown whether circumcision status is an important variable in men’s sexual lives because of physiological differences (e.g., sensitivity) between circumcised and intact penises, because psychological or attitudinal variables differ between the groups, or a combination of both. In order to further our understanding of the role of circumcision status in men’s sexual lives, the current study aims to investigate the relationship among men’s circumcision status, attitudes towards their circumcision status, and the impact of these factors on two aspects of men’s sexual lives: body image and sexual functioning. This study will test the following empirical questions:

1. What attitudes do men hold towards their genitals or their circumcision status (specifically, satisfaction with the size/appearance of their penis, how they perceive their partner’s satisfaction with their penis, and satisfaction with their circumcision status)?

2. Are men’s attitudes towards their genitals/circumcision status predictive of their circumcision status?

3. What is the relationship between body image and men’s circumcision status?

3a. Does body image differ based on men’s circumcision status, or satisfaction with their circumcision status?
3b. Do body image scores predict men’s circumcision status? And furthermore, do body image scores continue to predict men’s circumcision status after controlling for satisfaction with their circumcision status?

4. What is the relationship between body image and men’s circumcision status?

4a. Does sexual functioning differ based on men’s circumcision status, or satisfaction with their circumcision status?

4b. Does sexual functioning predict men’s circumcision status? And further, does sexual functioning continue to predict men’s circumcision status after controlling for satisfaction with their circumcision status?

Method

Participants

Eligible participants met the following criteria: (i) over the age of 18; (ii) able to read and write English fluently; (iii) cisgendered (i.e., biologically born) men; and (iv) access to a private computer and Internet. Participants were recruited through print advertisements placed within the Queen’s University campus and the surrounding community of Kingston, Ontario. Online advertisements were also posted on social media websites (e.g., Facebook, Twitter), as well as relevant online communities (e.g., Reddit, men’s health websites, electronic classified sites) (see Appendix I).

Apparatus and Materials

Study procedures were approved by the University’s General Research Ethics Board (GREB) (see Appendix J). Interested participants visited the online survey page, which was hosted through the Checkbox website (Checkbox Survey Inc., Watertown, MA) and stored on a secure, private server located on the University campus. The survey took approximately 45 to 60 minutes to complete. After completion, participants were eligible to enter their email address in a monthly prize draw for $75 CAD, which lasted over the duration of data collection (13 months).
**Demographics.** Participants provided information about their age, ethnicity, educational background, SES, and religiosity (while growing up and current). Participants indicated their relationship status and the nature of the relationship, including how long they have been with their current partner (if applicable), and the gender of their partner. Sexual orientation is typically assessed by the Kinsey Scales, which include three indices that assess an individual’s romantic and sexual attractions, sexual contacts, and sexual identity in adulthood (Kinsey, Pomeroy & Martin, 1948; Kinsey, Pomeroy, Martin, & Gebhard, 1953). Consistent with previous research, we used the Kinsey Sexual Fantasy Scale, which is a 7-point scale indicating degree of sexual fantasy towards men or women; a score of 0 indicates full preference for women, a score of 6 indicates full preference for men, and a mid-point score indicated equal amount of attraction to women and men (see Appendix K for a full list of questionnaires used in this study).

**Circumcision status.** Participants indicated their circumcision status and the age at which they were circumcised (if applicable). Only participants who indicated that they were circumcised as neonates (defined as up to 3 months after birth) were included in the current study, which resulted in the exclusion of 187 participants circumcised after the neonatal period (for a total of 367 neonatally circumcised men).

**Penis satisfaction.** In order to distinguish between men’s opinion of their penis and their circumcision status, specifically, participants answered a number of questions about satisfaction with their genitals. Men indicated their level of satisfaction with the length and girth of their penis, and also with the amount of foreskin they have; questions were repeated for their penis in flaccid and erect states (6 questions total). Responses were indicated on an 11-point Likert-type scale from 0 (not at all satisfied) to 10 (extremely satisfied).

**Penis satisfaction from the partner’s perspective.** Men were asked to answer the same 6 questions (described above) about satisfaction with their genitals (length, girth, foreskin when flaccid or erect), but taking the perspective of their sexual partners (past/current). That is, participants were asked to
indicate how satisfied they believed their partners to be/have been with the appearance of their genitals. Responses were indicated on the above-mentioned 11-point Likert-type scale.

**Circumcision status satisfaction.** Participants answered a number of questions indicating their satisfaction with their own circumcision status, including “how happy are you with your circumcision status?”, “how much is it a positive issue in your everyday life?”, “how much is it a negative issue in your everyday life?”, “how much is your circumcision status a significant part of who you are?”, and “how often do you think about your circumcision status?”. Questions were answered on an 11-point Likert-type scale, from 0 (totally disagree/not at all) to 10 (totally agree/very much). Participants answered the questions “do you have any regrets about your circumcision status?” or “do you ever wish that you were the opposite circumcision status?”, with an answer of yes or no. Finally, as the amount of foreskin can vary across intact or even circumcised men, participants were asked to indicate the amount of foreskin they have by selecting one of seven anatomical drawings depicting an erect penis (see Figure 5.1a) and a flaccid penis (see Figure 5.1b)
Figure 5.1. Figures depicting amount of foreskin a participant has when erect and when flaccid

Note. Figure 5.1a depicts images for an erect penis; Figure 5.1b depicts images for a flaccid penis

**Body image.** Three validated questionnaires were administered to assess three domains of body image: genital body image, body image during sexual activities, and body image overall.
**Male Genital Image Scale (MGIS).** A modified version of the Male Genital Image Scale (MGIS; Winter, 1989) was administered. The MGIS is a 14-item scale measuring men’s perception of various aspects of their genitals (e.g., length of non-erect and erect penis, appearance of one’s scrotum, pubic hair, and overall genital appearance). Two additional questions were added to the MGIS for the purpose of the current study to assess men’s level of satisfaction related to their circumcision status when their penis is erect and when it is flaccid (i.e., “my circumcision status when my penis is erect” and “my circumcision status when my penis is not erect”). Participant responses were coded on a 5-point Likert-type scale, where 0 indicated very dissatisfied and 5 indicated very satisfied. Higher total scores suggest greater satisfaction with the appearance of one’s genitals. Cronbach’s alpha values for the current study were observed at $\alpha = 0.92$ with and without the two added circumcision status questions.

**The Body Exposure during Sexual Activities Questionnaire (BESAQ).** The Body Exposure during Sexual Activities Questionnaire (BESAQ) was administered (Cash et al., 2004), which is a 28-item measure of body image within the context of sexual activity, specifically assessing self-conscious thoughts about body image and behaviours or desires to hide parts of the body during sex. Example questions include: “during sex I worry that my partner will find aspects of my physique unappealing” or “I don’t like my partner to see me completely naked during sexual activity”. Participants indicate their response on a 5-point frequency scale, where 0 indicates never and 4 indicates almost always or always. Higher overall scores indicate lower satisfaction with body image during sexual activity. Reliability analysis for the current sample produced a Cronbach’s alpha value of $\alpha = 0.96$.

**Body Image Satisfaction Scale (BISS).** The Body Image Satisfaction Scale (BISS) is a six-item measure to assess momentary evaluative/affective body image experiences (Cash, Fleming, Alindogan, Steadman, & Whitehead, 2002). The six items assess dissatisfaction/satisfaction with one’s (i) overall physical appearance; (ii) body size and shape; (iii) weight; (iv) feelings of physical attractiveness; (v) current feelings about one’s look relative to how one usually feels; (vi) evaluation of one’s appearance
relative to the average person. Items are assessed on a 9-point, bipolar scale with “completely positive attitudes towards body image” and “completely negative attitudes towards body image” at each opposite anchor. Higher scores indicate more favourable body image. BISS scores have been shown to appropriately correlate with various trait measures of body image (Cash et al., 2012). Reliability analysis produced a Cronbach’s alpha of $\alpha = 0.86$ for the current sample.

**Sexual functioning.** Sexual functioning was assessed using the International Index of Erectile Function (IIEF; Rosen, Riley, Wagner, Osterloh, Kirkpatrick, & Mishra, 1997), a 15-item measure of sexual and erectile dysfunction over the previous 4 weeks. Items are scored on a 5-point Likert-type scale, where 1 indicates *almost never/never* and 5 indicate *almost always/always*. Participants are able to indicate if they did not attempt intercourse over the past 4 weeks; these responses are scored as a zero, and thus participants who did not engage in sexual intercourse over the past 4 weeks received a score of 0 on the IIEF and were not included in analyses. The IIEF produced 5 subscale scores, measuring erectile functioning, orgasm functioning, sexual desire, intercourse satisfaction, and overall satisfaction. Higher scores indicate better sexual functioning. Reliability analyses for the current sample produced a Cronbach’s alpha of $\alpha = 0.90$ for the IIEF total score; subscale reliability were also high (ranged from $\alpha = 0.81$ to 0.94).

**Results**

**Demographics**

A total of 657 men completed the online study (367 circumcised as neonates, 290 intact). The sample was diverse in age, ranging from 19 to 79 years ($M = 32.01$, $SD = 11.70$); the circumcised sample was significantly older than the intact sample (see Table 5.1). The largest proportion of participants was from the United States ($n = 320$, 48.7%), Canada ($n = 204$, 31.1%), or Europe ($n = 77$, 11.7%), but participants from other geographic locations are also represented (e.g., Africa, South Africa, Asia, Middle East, etc.). The participants in the current study were highly educated, and the majority reported having
full- or part-time employment, or a current student status, with average self-reported income generally falling below 50,000 dollars/pounds per year. With respect to participant’s religiosity, there was a substantial shift over the course of participant’s lives towards no religious affiliations; although most participants were brought up in religious households, the majority (66.8%) did not affiliate with any religion at the time they participated. Of religious cultures that typically circumcise their sons, a small percentage of the current sample reported being brought up in a Jewish ($n = 22, 3.3\%$) or Muslim ($n = 1, 0.2\%$) household, but at the time of their participation in this study, even fewer reported currently identifying with the Jewish religion ($n = 6, 0.9\%$), and none reported identifying with the Muslim religion.

Relationship characteristics of the sample revealed that less than half of the sample reported that they were single and not dating ($n = 278, 42.3\%$), while the rest reported that they were in a relationship (see Table 5.1 for a break-down of relationship types). Of the men reporting that they were in a relationship, the length of relationship ranged from 1 month to 45 years and 4 months ($M = 3$ years and 5 months, $SD = 6$ years and 7 months). Of the men in a sexual relationship, 275 reported that it was with a female, and 53 reported that it was with a male. The Kinsey Sexual Fantasy Scale indicated that the sample was diverse with respect to sexual orientation, with 341 men reporting exclusive sexual attraction to women, 104 reporting exclusive sexual attraction to men, and large proportions of men falling at different points within the continuum (see Figure 5.2 for a breakdown).
Group differences were explored for all demographic variables across circumcision status. Significant group differences indicated that circumcised and intact men differed with respect to age (circumcised men were significantly older than the intact men) birthplace (circumcised men were more likely to be from the United States, and intact men were more likely to be Canadian), religious upbringing (circumcised men were more likely to be Catholic/Christian/Protestant, and intact men were more likely to have no religious affiliations), and current religious affiliation (circumcised men were more likely to have no religious affiliations) (please refer to Table 5.1 for a breakdown of these differences). No significant between-group differences were observed for any other variables, including scores on the Kinsey Sexual Fantasy Scale ($\chi^2 = 4.47, p = .61, df = 6$).
### Table 5.1

**Participant demographic information**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Circumcised</th>
<th>Intact</th>
<th>Total</th>
<th>Test statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 367)</td>
<td>(n = 290)</td>
<td>(N = 657)</td>
<td>F = 4.95</td>
<td>.03</td>
</tr>
<tr>
<td>Age (M (SD))</td>
<td>32.9 (12.27)</td>
<td>30.87 (10.85)</td>
<td>32.01 (11.70)</td>
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<td></td>
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<tr>
<td><strong>Birthplace (n (%))</strong></td>
<td></td>
<td></td>
<td></td>
<td>(\chi^2 = 134.67)</td>
<td>&lt;.001</td>
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<tr>
<td>Canada</td>
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<td>121 (41.7)</td>
<td>204 (31.1)</td>
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<td>320 (48.7)</td>
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<tr>
<td>Europe</td>
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<td>65 (22.4)</td>
<td>77 (11.7)</td>
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<td>15 (5.2)</td>
<td>33 (5.0)</td>
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<td></td>
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<tr>
<td>Other</td>
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<td>14 (4.8)</td>
<td>41 (3.5)</td>
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<td></td>
</tr>
<tr>
<td><strong>Education (n (%))</strong></td>
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<td></td>
<td></td>
<td>(\chi^2 = 7.51)</td>
<td>.19</td>
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<tr>
<td>High school (some)</td>
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<td>6 (2.1)</td>
<td>11 (1.7)</td>
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</tr>
<tr>
<td>High school (complete)</td>
<td>58 (15.8)</td>
<td>34 (11.7)</td>
<td>92 (14.0)</td>
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<td>Vocational training</td>
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<td>18 (6.2)</td>
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<td>163 (56.7)</td>
<td>370 (56.3)</td>
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<td>Graduate / professional</td>
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<td>69 (23.8)</td>
<td>148 (22.5)</td>
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<tr>
<td><strong>Occupation (n (%))</strong></td>
<td></td>
<td></td>
<td></td>
<td>(\chi^2 = 12.79)</td>
<td>.17</td>
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<td>130 (44.8)</td>
<td>300 (45.7)</td>
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<td>Employed Part-Time</td>
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<td>23 (7.9)</td>
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<td>7 (2.4)</td>
<td>21 (3.2)</td>
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<tr>
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<td>102 (35.2)</td>
<td>211 (32.1)</td>
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<tr>
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<td>26 (8.9)</td>
<td>53 (8.2)</td>
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</tr>
<tr>
<td><strong>Income (n (%))</strong></td>
<td></td>
<td></td>
<td></td>
<td>(\chi^2 = 1.82)</td>
<td>.94</td>
</tr>
<tr>
<td>$0-19,999</td>
<td>135 (36.8)</td>
<td>105 (36.2)</td>
<td>240 (36.5)</td>
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<td></td>
</tr>
<tr>
<td>$20,000-39,999</td>
<td>80 (21.8)</td>
<td>64 (22.1)</td>
<td>144 (21.9)</td>
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<td></td>
</tr>
<tr>
<td>$40,000-59,999</td>
<td>51 (13.9)</td>
<td>44 (15.2)</td>
<td>95 (14.5)</td>
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<td></td>
</tr>
<tr>
<td>$60,000-79,999</td>
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<td>21 (7.2)</td>
<td>56 (8.5)</td>
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<td></td>
</tr>
<tr>
<td>$80,000-99,999</td>
<td>20 (5.4)</td>
<td>15 (5.2)</td>
<td>35 (5.3)</td>
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<tr>
<td>$100,000+</td>
<td>22 (6.0)</td>
<td>21 (7.2)</td>
<td>43 (6.5)</td>
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<tr>
<td><strong>Religious affiliation (growing up)</strong></td>
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<td></td>
<td></td>
<td>(\chi^2 = 46.75)</td>
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<tr>
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<td>80 (22.5)</td>
<td>109 (37.6)</td>
<td>192 (29.2)</td>
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<td></td>
</tr>
<tr>
<td>Catholic / Christian / Protestant</td>
<td>241 (65.6)</td>
<td>169 (58.2)</td>
<td>410 (62.4)</td>
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</tr>
<tr>
<td>Jewish</td>
<td>21 (5.7)</td>
<td>1 (0.3)</td>
<td>22 (3.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muslim</td>
<td>1 (0.3)</td>
<td>0 (0.0)</td>
<td>1 (0.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>23 (6.3)</td>
<td>11 (3.8)</td>
<td>31 (4.8)</td>
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<td><strong>Religious affiliation (current)</strong></td>
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<td>233 (63.5)</td>
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<td>439 (66.8)</td>
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<td></td>
</tr>
<tr>
<td>Catholic / Christian / Protestant</td>
<td>80 (21.8)</td>
<td>48 (16.6)</td>
<td>128 (19.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jewish</td>
<td>4 (1.1)</td>
<td>2 (0.7)</td>
<td>6 (0.9)</td>
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<td></td>
</tr>
<tr>
<td>Muslim</td>
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<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>58 (16.0)</td>
<td>70 (24.3)</td>
<td>78 (12.0)</td>
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</tbody>
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Relationship Status

<table>
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<th>Relationship Status</th>
<th>n</th>
<th>%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single, not dating</td>
<td>161</td>
<td>43.9</td>
<td>278</td>
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<tr>
<td>Dating, monogamous</td>
<td>16</td>
<td>4.4</td>
<td>163</td>
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<tr>
<td>Dating, non-monogamous</td>
<td>81</td>
<td>22.1</td>
<td>29</td>
</tr>
<tr>
<td>Married / common-law</td>
<td>96</td>
<td>26.2</td>
<td>171</td>
</tr>
<tr>
<td>Divorced / separated</td>
<td>7</td>
<td>1.9</td>
<td>9</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>1.6</td>
<td>7</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 13.69 \quad .13 \]

Length of relationship (months) (M, SD)

<table>
<thead>
<tr>
<th>Length of relationship</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
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<tr>
<td>Single, not dating</td>
<td>40.81</td>
<td>83.25</td>
</tr>
<tr>
<td>Dating, monogamous</td>
<td>40.94</td>
<td>74.08</td>
</tr>
<tr>
<td>Married / common-law</td>
<td>40.87</td>
<td>79.10</td>
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</tbody>
</table>

\[ F = 0.00 \quad .99 \]

Nature of relationship (n, (%))

<table>
<thead>
<tr>
<th>Nature of relationship</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner is a woman</td>
<td>144</td>
<td>81.8</td>
</tr>
<tr>
<td>Partner is a man</td>
<td>30</td>
<td>17.0</td>
</tr>
<tr>
<td>Partner is trans</td>
<td>1</td>
<td>0.6</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 2.34 \quad .67 \]

Note. Values may not add up to 100% due to missing data

Genitals or Circumcision Status Perceptions

Men’s perceptions of their genitals. Men’s perceptions of their genital appearance were explored separately, and collapsed over groups. When circumcised and intact men were analyzed separately, responses to questions about their perceptions of their genitals differed across groups (see Table 5.2). In the sample of circumcised men, the mean response to questions assessing men’s satisfaction with their foreskin (or lack thereof) was below 5 \( (M = 4.14, SD = 3.83 \) and \( M = 4.54, SD = 3.94 \) when flaccid and erect, respectively). Skewness analyses revealed that the data were positively skewed, and the mode response was 0 for foreskin questions, indicating that most circumcised men in this sample were dissatisfied with their lack of foreskin. Circumcised men’s satisfaction with their penile length and girth was also lower than that of the intact sample: mode responses were below 10 (length when flaccid = 7, length when erect = 8, girth when flaccid = 7) for all questions except for satisfaction with penile girth when erect, which had a mode of 10. Participant’s level of satisfaction with their foreskin (or lack therefore) was significantly correlated with their satisfaction of the length and girth of their erect penis, but not the length or girth of their flaccid penis. Again, the relationship between satisfaction with their foreskin when their penis was flaccid and erect was very strongly correlated \( (r = .90) \).
The distribution of intact men’s responses to questions about satisfaction with their penis were all negatively skewed, and the mode response was 10, indicating that intact men were satisfied with their genitals overall. All variables were significantly and strongly correlated with one another. Group comparisons revealed that intact men reported significantly higher levels of satisfaction with all aspects of their penis as compared to circumcised men (all \( p’s \leq .001 \)). The largest group differences were observed between circumcised and intact men’s self-reported satisfaction with the amount of foreskin they have, such that intact men almost unanimously rated that they were highly satisfied with the amount of foreskin they have (\( M = 9.00, SD = 2.71 \) and \( M = 9.00, SD = 2.44 \) when flaccid and erect, respectively), while circumcised men—on average—provided much lower ratings to the same question (\( M = 4.14, SD = 3.82 \) and \( M = 4.54, SD = 3.94 \) when flaccid and erect, respectively). Analyses were repeated with non-parametric equivalents, and the pattern of results remained the same.

Overall, men’s mean responses to all questions were above 5, and distributions were negatively skewed, indicating that most men in this sample view their penis (length, girth, foreskin) in a positive light (see Table 5.2). The mode response for all questions asked was 10 out of 10. Correlational analyses revealed that all penis perception questions were significantly positively correlated with one another. Of note, questions about men’s perception of their foreskin (or lack thereof) when their penis was flaccid and when it was erect was strongly positively related (\( r = 0.91 \)). Men’s levels of satisfaction with their length and girth were very highly correlated when erect (\( r = 0.84 \)) and when flaccid (\( r = 0.78 \)). The lowest correlations were observed between men’s perception of their foreskin and the length or girth of their penis, although the relationship between these variables was moderate (\( r = 0.18 \) to 0.34).
Table 5.2

Descriptive statistics and correlations among penis perception questions for circumcised and intact men

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>M (SD)</th>
<th>Mode</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>All men (N = 657)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Length flaccid</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.29 (2.75)</td>
<td>10</td>
<td>-.34</td>
</tr>
<tr>
<td>2. Length erect</td>
<td>.71***</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>7.50 (2.23)</td>
<td>10</td>
<td>-.92</td>
</tr>
<tr>
<td>3. Girth flaccid</td>
<td>.84***</td>
<td>.67***</td>
<td>-</td>
<td></td>
<td></td>
<td>6.72 (2.63)</td>
<td>10</td>
<td>-.51</td>
</tr>
<tr>
<td>4. Girth erect</td>
<td>.65***</td>
<td>.78***</td>
<td>.76***</td>
<td>-</td>
<td></td>
<td>7.60 (2.21)</td>
<td>10</td>
<td>-1.03</td>
</tr>
<tr>
<td>5. Foreskin appearance flaccid</td>
<td>.26***</td>
<td>.34***</td>
<td>.29***</td>
<td>.34***</td>
<td>-</td>
<td>5.68 (3.79)</td>
<td>10</td>
<td>-.33</td>
</tr>
<tr>
<td>6. Foreskin appearance erect</td>
<td>.18***</td>
<td>.33***</td>
<td>.21***</td>
<td>.23***</td>
<td>.91***</td>
<td>6.17 (3.82)</td>
<td>10</td>
<td>-.56</td>
</tr>
<tr>
<td>Circumcised men (n = 367)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Length flaccid</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.93 (2.69)</td>
<td>7</td>
<td>-0.21</td>
</tr>
<tr>
<td>2. Length erect</td>
<td>.69***</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>7.11 (2.30)</td>
<td>8</td>
<td>-0.74</td>
</tr>
<tr>
<td>3. Girth flaccid</td>
<td>.81***</td>
<td>.66***</td>
<td>-</td>
<td></td>
<td></td>
<td>6.40 (2.64)</td>
<td>7</td>
<td>-0.46</td>
</tr>
<tr>
<td>4. Girth erect</td>
<td>.64***</td>
<td>.75***</td>
<td>.78***</td>
<td>-</td>
<td></td>
<td>7.25 (2.32)</td>
<td>10</td>
<td>-0.92</td>
</tr>
<tr>
<td>5. Foreskin appearance flaccid</td>
<td>.06</td>
<td>.24***</td>
<td>.13*</td>
<td>.26***</td>
<td>-</td>
<td>4.14 (3.82)</td>
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<td>0.30</td>
</tr>
<tr>
<td>6. Foreskin appearance erect</td>
<td>.02</td>
<td>.23***</td>
<td>.08</td>
<td>.23***</td>
<td>.90***</td>
<td>4.54 (3.94)</td>
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<td>0.12</td>
</tr>
<tr>
<td>Intact men (n = 290)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Length flaccid</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.75 (2.76)</td>
<td>10</td>
<td>-0.54</td>
</tr>
<tr>
<td>2. Length erect</td>
<td>.72***</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>7.99 (2.04)</td>
<td>10</td>
<td>-1.20</td>
</tr>
<tr>
<td>3. Girth flaccid</td>
<td>.87***</td>
<td>.67***</td>
<td>-</td>
<td></td>
<td></td>
<td>7.12 (2.57)</td>
<td>10</td>
<td>-0.58</td>
</tr>
<tr>
<td>4. Girth erect</td>
<td>.64***</td>
<td>.82***</td>
<td>.72***</td>
<td>-</td>
<td></td>
<td>8.03 (1.98)</td>
<td>10</td>
<td>-1.13</td>
</tr>
<tr>
<td>5. Foreskin appearance flaccid</td>
<td>.49***</td>
<td>.37***</td>
<td>.50***</td>
<td>.38***</td>
<td>-</td>
<td>9.00 (2.71)</td>
<td>10</td>
<td>-1.07</td>
</tr>
<tr>
<td>6. Foreskin appearance erect</td>
<td>.33***</td>
<td>.38***</td>
<td>.34***</td>
<td>.37***</td>
<td>.81***</td>
<td>9.00 (2.44)</td>
<td>10</td>
<td>-1.67</td>
</tr>
</tbody>
</table>

Note. * p < .05; *** p < .001

How men believe their partners perceive their genitals. Men responded to the same questions about satisfaction with their genitals, but from the perspective of their (current/previous) sexual partner (see Table 5.3). An exploration of the data for circumcised and intact men separately revealed slightly different patterns of response. Although all variables were negatively skewed in favour of positive partner beliefs, the distributions of intact men’s responses were more negatively skewed than circumcised men. Interestingly, the mode response for all questions was 10, with the exception of circumcised men’s beliefs about their partner’s satisfaction with their flaccid foreskin, which was 5, indicating a neutral stance. For circumcised men, the lowest correlations were observed between partner satisfaction with foreskin when
the penis is erect and length \( (r = .29) \) or girth \( (r = .29) \) when the penis is flaccid, although these values were substantial and significantly correlated. Group comparisons (via parametric and non-parametric equivalents) revealed that intact men perceive their sexual partners as significantly more satisfied with all aspects of their genitals as compared to circumcised men (all \( p \)'s \( \leq .001 \)). Again, the largest group difference was observed with respect to questions assessing partner’s perceptions of men’s foreskin.

Collapsed across circumcision status, descriptive variables indicated that—overall—men believed their sexual partners were highly satisfied with all aspect of their genitals (see Table 5.3). Their responses to all questions were significantly and highly correlated with one another; the highest correlations were observed for partner’s satisfaction with the amount of foreskin when flaccid and erect \( (r = .88) \), and satisfaction with the length of the participant’s penis when flaccid and girth of participant’s penis when erect \( (r = .88) \).
Table 5.3

Descriptive statistics and correlations among partner's penis perception questions for circumcised and intact men

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>M (SD)</th>
<th>Mode</th>
<th>Skewness</th>
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<tr>
<td>All men (N = 657)</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1. Length flaccid</td>
<td>-</td>
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<td></td>
<td>7.61 (2.17)</td>
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<td>-0.79</td>
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<td>2. Length erect</td>
<td>.70***</td>
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<td></td>
<td>8.46 (1.80)</td>
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<td>-1.65</td>
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<td>3. Girth flaccid</td>
<td>.88***</td>
<td>.68***</td>
<td>-</td>
<td></td>
<td></td>
<td>7.68 (2.15)</td>
<td>10</td>
<td>-0.76</td>
</tr>
<tr>
<td>4. Girth erect</td>
<td>.69***</td>
<td>.80***</td>
<td>.71***</td>
<td>-</td>
<td></td>
<td>8.45 (1.80)</td>
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<td>-1.49</td>
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<td>.48***</td>
<td>.44***</td>
<td>.44***</td>
<td>.43***</td>
<td>-</td>
<td>7.38 (2.71)</td>
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<td>-0.91</td>
</tr>
<tr>
<td>6. Foreskin appearance erect</td>
<td>.39***</td>
<td>.45***</td>
<td>.35***</td>
<td>.45***</td>
<td>.88***</td>
<td>7.80 (2.65)</td>
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<td>Circumcised men (n = 367)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1. Length flaccid</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7.27 (2.22)</td>
<td>10</td>
<td>-0.62</td>
</tr>
<tr>
<td>2. Length erect</td>
<td>.70***</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>8.18 (1.93)</td>
<td>10</td>
<td>-1.38</td>
</tr>
<tr>
<td>3. Girth flaccid</td>
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<td>.67***</td>
<td>-</td>
<td></td>
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<td>7.41 (2.18)</td>
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<td>-0.63</td>
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<tr>
<td>4. Girth erect</td>
<td>.71***</td>
<td>.78***</td>
<td>.74***</td>
<td>-</td>
<td></td>
<td>8.22 (1.90)</td>
<td>10</td>
<td>-1.38</td>
</tr>
<tr>
<td>5. Foreskin appearance flaccid</td>
<td>.41***</td>
<td>.46***</td>
<td>.39***</td>
<td>.46***</td>
<td>-</td>
<td>6.59 (2.90)</td>
<td>5</td>
<td>-0.58</td>
</tr>
<tr>
<td>6. Foreskin appearance erect</td>
<td>.29***</td>
<td>.43***</td>
<td>.29***</td>
<td>.45***</td>
<td>.87***</td>
<td>6.92 (2.96)</td>
<td>10</td>
<td>-0.82</td>
</tr>
<tr>
<td>Intact men (n = 290)</td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1. Length flaccid</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8.01 (2.05)</td>
<td>10</td>
<td>-1.04</td>
</tr>
<tr>
<td>2. Length erect</td>
<td>.69***</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>8.81 (1.58)</td>
<td>10</td>
<td>-2.10</td>
</tr>
<tr>
<td>3. Girth flaccid</td>
<td>.88***</td>
<td>.67***</td>
<td>-</td>
<td></td>
<td></td>
<td>8.01 (2.06)</td>
<td>10</td>
<td>-0.94</td>
</tr>
<tr>
<td>4. Girth erect</td>
<td>.64***</td>
<td>.82***</td>
<td>.65***</td>
<td>-</td>
<td></td>
<td>8.73 (1.62)</td>
<td>10</td>
<td>-1.62</td>
</tr>
<tr>
<td>5. Foreskin appearance flaccid</td>
<td>.54***</td>
<td>.32***</td>
<td>.48***</td>
<td>.30***</td>
<td>-</td>
<td>8.35 (2.08)</td>
<td>10</td>
<td>-1.29</td>
</tr>
<tr>
<td>6. Foreskin appearance erect</td>
<td>.51***</td>
<td>.44***</td>
<td>.43***</td>
<td>.40***</td>
<td>.85***</td>
<td>8.85 (1.72)</td>
<td>10</td>
<td>-1.92</td>
</tr>
</tbody>
</table>

Note. *** p < .001

Men's perceptions of their circumcision status. Men answered a series of questions indicating their satisfaction with their circumcision status; results were explored for circumcised and intact men separately, and collapsed across groups. When analyzed separately, the observed pattern of results differed between circumcised and intact men. Overall, circumcised men reported significantly lower levels of satisfaction on all variables assessed except for how significant of an issue their circumcision status is to them, where circumcised and intact men both reported a mean value of approximately 4.5 (neutral), with the most commonly endorsed value of 0 (not significant). Additionally, circumcised men
were significantly more likely than intact men to report that they had regrets about their circumcision status and that they wished they were the opposite circumcision status (see Figure 5.3).

When the responses of all men were examined (collapsed across circumcision status), the mean responses to the questions assessing how happy men are with their circumcision status ($M = 5.85, SD = 4.26$), how positive of an issue it is in their life ($M = 4.82, SD = 3.98$), how much of a significant part of their life it is ($M = 4.54, SD = 3.53$), and how often they think about their circumcision status ($M = 4.90, SD = 3.53$) indicate that—overall—men feel neutral towards their circumcision status. On average, men indicated that their circumcision status was not a very negative aspect of their everyday life ($M = 3.49, SD = 3.98$). Interestingly, the mode value endorsed was either 0 or 1 across circumcision status for all questions asked except for the question assessing how happy men are with their circumcision status, in which the mode value endorsed was 10 (“extremely happy”).
a. How happy are you with your CS?

b. How much is your CS a positive issue for you in everyday life?

c. How much is your CS a negative issue for you in everyday life?

d. How much do you think about your CS as an important part of who you are?

e. How often do you think about your CS?

f. Do you have any regrets about your CS?

g. Do you ever wish that you were the opposite CS?

Figure 5.3. Cumulative percentage of men’s responses to questions assessing satisfaction with their circumcision status (CS)

Note. CS = circumcision status. Figures a-e: X-axis represents participant response from 0 (do not agree) to 10 (completely agree), where 5 represents neutral. Figure f-g: X-axis represents a response of “yes” or “no”. The Y-axis represents percent of participants who endorsed a given response.
Participants indicated the amount of foreskin present when flaccid and erect using a series of 6 pictures showing increasing amounts of foreskin (Figure 5.1). The amount of foreskin a participant has when flaccid and when erect was correlated with the satisfaction with circumcision status questions (see Table 5.4). All variables were significantly related to amount of foreskin with the exception of the question “how much is your circumcision status a significant part of who you are?” ($r = .04, .06$ when flaccid and erect, respectively). Correlations were larger for the amount of foreskin present when flaccid than when erect. Responses to the questions assessing how happy a participant is with their circumcision status and how much of a positive issue it is had a strong positive relationship with amount of foreskin a participant reported having, such that the more foreskin present, the more likely a participant was to feel happy with their circumcision status, and that it is a positive part of their everyday life. Additionally, the more foreskin participants reported having, the less likely they were to consider their circumcision status a negative part of their everyday life, and they reported thinking about it slightly less often (see Table 5.4).

Table 5.4

*Men’s perception of their circumcision status (CS) and the amount of foreskin they have when flaccid or erect*

<table>
<thead>
<tr>
<th>Question</th>
<th>Amount of foreskin flaccid</th>
<th>Amount of foreskin erect</th>
</tr>
</thead>
<tbody>
<tr>
<td>How happy are you with your CS?</td>
<td>.55***</td>
<td>.48***</td>
</tr>
<tr>
<td>How much is your CS a positive issue for you in your everyday life?</td>
<td>.50***</td>
<td>.43***</td>
</tr>
<tr>
<td>How much is your CS a negative issue for you in your everyday life?</td>
<td>-.38***</td>
<td>-.32***</td>
</tr>
<tr>
<td>How much is your CS a significant part of who you are?</td>
<td>.04</td>
<td>.06</td>
</tr>
<tr>
<td>How often do you think about your CS?</td>
<td>-.17***</td>
<td>-.10*</td>
</tr>
</tbody>
</table>

*Note.*** $p < .001*
Do men’s perceptions of their genitals predict circumcision status? In order to determine which attitudes towards one’s circumcision status could best predict circumcision status, a logistic regression was performed with circumcision status (circumcised, intact) as the dependent variable. All penis perception questions were entered into the logistic regression first, in order to control for participant’s satisfaction with their penis, overall. Next, questions assessing satisfaction with circumcision status were entered into the regression. Outliers, as indicated by an initial iteration of the analyses were removed, resulting in 638 participants included in the analysis. A test of the full model against the constant only model was significant after controlling for satisfaction with one’s penis ($\chi^2 = 426.71, p < .001, df = 11$), indicating that the predictors as a set reliability distinguished between circumcised and intact men. Nargelkerke’s $R^2$ of .49 indicated a strong relationship between prediction and grouping. Prediction success overall was 85.2% (82.0% for circumcised, 89.3% for intact). The Wald criterion demonstrated that—after controlling for men’s satisfaction with their penis—how happy they are with their circumcision status (“Happy”) and how often they think about their circumcision status (“Often”) both made significant contributions to prediction ($ps < .001$). EXP(B) values indicated that when the Happy and Often scores are raised by one unit, the likelihood of a participant being circumcised is 3.00 and 1.31 times less likely, respectively. Due to the relative importance of the Happy variable as a predictor of circumcision status, it was included as a control variable in the logistic regression analyses described below.

Body Image

Group differences. A multivariate analysis of variance (MANOVA) was conducted to determine the effect of circumcision status (circumcised, intact) and happiness with circumcision status (happy, unhappy) on three dependent variables: the BISS, BESAQ, and MGIS scores. Analyses were conducted with 458 participants (249 circumcised and 209 intact) who had complete data on all three dependent variables. The main effect of circumcision status was not significant, but a significant main effect of happiness with circumcision status was found, Wilk’s $\Lambda = .83, F(3, 452) = 31.43, p < .001, \eta_p^2 = .17$. 

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Table 5.5 contains means and standard deviations of the dependent variables for all three groups. Follow-up ANOVAs were conducted on the three dependent variables as follow-up tests to the MANOVA; in all cases, men who were happier with their circumcision status reported more favourable body image on the genital image, sexual activity body image, and global body image measures. Analyses were repeated controlling for participant age, and the pattern of results did not differ.

Table 5.5

<table>
<thead>
<tr>
<th></th>
<th>Circumcised (n = 209)</th>
<th>Intact (n = 249)</th>
<th>Total (N = 458)</th>
<th>F</th>
<th>p</th>
<th>ηp²</th>
</tr>
</thead>
<tbody>
<tr>
<td>BISS</td>
<td></td>
<td></td>
<td></td>
<td>7.22</td>
<td>.007</td>
<td>.02</td>
</tr>
<tr>
<td>Happy</td>
<td>31.21 (10.98)</td>
<td>33.17 (9.32)</td>
<td>32.59 (9.86)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unhappy</td>
<td>27.98 (8.98)</td>
<td>27.73 (11.00)</td>
<td>27.97 (9.08)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>29.07 (9.80)</td>
<td>32.89 (9.46)</td>
<td>30.81 (9.82)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BESAQ</td>
<td></td>
<td></td>
<td></td>
<td>21.40</td>
<td>.001</td>
<td>.05</td>
</tr>
<tr>
<td>Happy</td>
<td>25.87 (19.52)</td>
<td>22.81 (19.50)</td>
<td>23.72 (19.52)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unhappy</td>
<td>38.10 (26.57)</td>
<td>45.64 (25.65)</td>
<td>38.57 (26.50)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>33.98 (25.04)</td>
<td>24.01 (20.44)</td>
<td>29.43 (23.57)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MGSI</td>
<td></td>
<td></td>
<td></td>
<td>93.73</td>
<td>.001</td>
<td>.17</td>
</tr>
<tr>
<td>Happy</td>
<td>64.08 (10.10)</td>
<td>65.89 (10.80)</td>
<td>65.35 (10.61)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unhappy</td>
<td>49.58 (10.03)</td>
<td>46.18 (13.38)</td>
<td>49.37 (10.26)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>54.47 (12.16)</td>
<td>64.85 (11.77)</td>
<td>59.21 (13.04)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Higher BISS and MGIS scores indicate better body image; lower BESAQ scores indicate better body image.

**Predicting circumcision status.** A logistic regression analysis was conducted to predict circumcision status using participants’ scores on the MGIS, BESAQ, and BISS. After outliers were removed, a test of the full model against a constant only model with 589 participants (328 circumcised, 261 intact) was statistically significant, indicating that the predictor at a set reliability distinguished between circumcised and intact men ($\chi^2 = 85.31, p < .001$ with $df = 3$). Nargelkerke’s $R^2$ of .21 indicated a moderate relationship between prediction and grouping, with an overall prediction success of 68.2%
(74.3% for circumcised, 60.6% for intact). The Wald criterion demonstrated that the MGIS score was the only variable to make a significant contribution to prediction \((p < .001)\), such that a one unit increase in the MGIS score (i.e., higher satisfaction with genital image) is associated with a 1.08 decreased likelihood of being circumcised.

The logistic regression was repeated, controlling for participant’s happiness with their circumcision status; the full model was significant \(\chi^2 = 532.07, p < .001\) with \(df = 4\), but the inclusion of the three body image factors did not significantly differ from the model with the covariate \((Happy)\) only \(\chi^2 = 2.84, p = .42\) with \(df = 3\). Nargelkerke’s \(R^2\) of .55 indicated a strong relationship with the inclusion of participant’s happiness, with prediction success of 80.4% (74.7% for circumcised and 87.6% for intact). Body image scores did not significantly contribute to the prediction after controlling for participant’s happiness with their circumcision status. A one-unit increase in happiness was associated with a 68% reduction in the likelihood of being circumcised.

**Sexual Functioning**

**Group differences.** A multivariate analysis of variance (MANOVA) was conducted to determine the effect of circumcision status (circumcised, intact) and happiness with circumcision status (happy, unhappy) on five dependent variables, the subscales of the IIEF (i.e., Erectile Functioning, Orgasm Functioning, Sexual Desire, Intercourse Satisfaction, and Overall Sexual Satisfaction). Analyses were conducted with 406 participants (221 circumcised, 185 intact) who had complete data on all five dependent variables. The main effect of circumcision status was not significant, but a main effect of happiness with circumcision status was revealed, Wilks’s \(\Lambda = .95, F(5, 398) = 4.61, p < .001, \eta_p^2 = .06\) (see Table 5.6). Follow-up ANOVAs were conducted on the five dependent variables as follow-up tests to the MANOVA; in all cases except for the Sexual Desire subscale, men who were happier with their circumcision status reported experiencing better sexual functioning. Analyses were repeated controlling for participant age, and the pattern of results did not differ.
### Table 5.6

**Descriptive statistics for the IIEF subscales by circumcision status and by happiness with circumcision status**

<table>
<thead>
<tr>
<th></th>
<th>Circumcised ($n = 221$)</th>
<th>Intact ($n = 185$)</th>
<th>Total ($N = 407$)</th>
<th>$F$</th>
<th>$p$</th>
<th>$\eta^2_p$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Erectile functioning</strong></td>
<td></td>
<td></td>
<td></td>
<td>21.03</td>
<td>&lt;.001</td>
<td>.05</td>
</tr>
<tr>
<td>Happy</td>
<td>24.93 (5.38)</td>
<td>24.27 (5.67)</td>
<td>24.46 (5.59)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unhappy</td>
<td>21.00 (7.59)</td>
<td>15.33 (5.16)</td>
<td>20.78 (7.58)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>22.29 (7.17)</td>
<td>23.98 (5.86)</td>
<td>23.06 (6.65)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Orgasm functioning</strong></td>
<td></td>
<td></td>
<td></td>
<td>4.57</td>
<td>.03</td>
<td>.01</td>
</tr>
<tr>
<td>Happy</td>
<td>8.49 (2.19)</td>
<td>8.94 (1.88)</td>
<td>8.81 (1.98)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unhappy</td>
<td>7.66 (2.65)</td>
<td>7.67 (2.07)</td>
<td>7.66 (2.63)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7.93 (2.54)</td>
<td>8.90 (1.90)</td>
<td>8.37 (2.31)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sexual desire</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.08</td>
<td>.78</td>
<td>.00</td>
</tr>
<tr>
<td>Happy</td>
<td>6.08 (1.51)</td>
<td>5.82 (1.76)</td>
<td>5.90 (1.69)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unhappy</td>
<td>5.68 (1.95)</td>
<td>6.00 (1.67)</td>
<td>5.69 (1.93)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5.81 (1.82)</td>
<td>5.83 (1.75)</td>
<td>5.82 (1.79)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intercourse satisfaction</strong></td>
<td></td>
<td></td>
<td></td>
<td>15.13</td>
<td>&lt;.001</td>
<td>.04</td>
</tr>
<tr>
<td>Happy</td>
<td>11.00 (4.46)</td>
<td>10.53 (4.76)</td>
<td>10.66 (4.67)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unhappy</td>
<td>7.34 (5.22)</td>
<td>5.83 (5.23)</td>
<td>7.28 (5.22)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8.55 (5.27)</td>
<td>10.37 (4.84)</td>
<td>9.38 (5.15)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall sexual satisfaction</strong></td>
<td></td>
<td></td>
<td></td>
<td>10.39</td>
<td>&lt;.001</td>
<td>.03</td>
</tr>
<tr>
<td>Happy</td>
<td>7.92 (2.45)</td>
<td>7.91 (2.28)</td>
<td>7.91 (2.32)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unhappy</td>
<td>5.82 (2.39)</td>
<td>6.67 (2.66)</td>
<td>5.86 (2.40)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6.52 (2.60)</td>
<td>7.86 (2.29)</td>
<td>7.13 (2.55)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Higher scores indicate better sexual functioning.

**Predicting circumcision status.** A logistic regression analysis was conducted to predict circumcision status using participant’s scores on five IIEF subscales. After outliers were removed, a test of the full model against a constant only model with 655 participants was statically significant, indicating that the predictor at a set reliability distinguished between circumcised and intact men ($\chi^2 = 40.85, p < .001$ with $df = 5$). Nargelkerke's $R^2$ of .12 indicated a moderate relationship between prediction and grouping, with overall prediction success of 61.7% (67.3% for circumcised, 54.5% for intact). The Wald criterion demonstrated that Orgasm Functioning ($p = .004$) and Overall Sexual Satisfaction ($p < .001$) significantly contributed to prediction ($p < .001$). A one-unit increase in Orgasm Functioning and Overall...
Sexual Satisfaction (i.e., better sexual functioning) was associated with a 1.16 and 1.22 decreased likelihood of being circumcised, respectively.

The logistic regression was repeated after participant’s happiness with their circumcision status was controlled for; the full model was significant ($\chi^2 = 235.06, p < .001$ with $df = 6$), but the inclusion of the IIEF subscales did not significantly differ from the model with the covariate (Happy) only ($\chi^2 = 11.21, p = .05$ with $df = 5$). Nargelkerke’s $R^2$ of .55 indicated a strong relationship with the inclusion of participant’s happiness, with prediction success of 79.1% (73.3% for circumcised and 86.8% for intact). After controlling for happiness with circumcision status, Orgasm Functioning remained a significant predictor of circumcision status ($\rho = .03$), such that a one-unit increase in orgasm functioning was associated with a 1.16 decreased likelihood of being circumcised. A one-unit increase of “happiness” was associated with a 69% decreased likelihood of being circumcised.

**Discussion**

**Summary of findings**

This online study is the first—to our knowledge—to empirically explore the role of circumcision status in tandem with men’s attitudes about their circumcision status on body image and sexual functioning. The distribution of results show that the circumcised sample of men is comprised of three groupings (those who are extremely dissatisfied with being circumcised, those who are extremely satisfied, and those who are neutral), while the intact sample of men is comprised of two groups (extremely satisfied or neutral). The largest proportion of circumcised men reported feeling extremely dissatisfied with being circumcised, while the largest proportion of intact men reported feeling extremely satisfied with being intact. The more foreskin a participant reported having, the greater their self-reported satisfaction with their circumcision status. The most important predictor of circumcision status among men in this sample—after controlling for satisfaction with their penis—was a single question assessing
how happy they are with their circumcision status, such that one unit increase in self-reported happiness with circumcision status corresponded to a three-fold decrease in the likelihood of being circumcised.

Circumcised and intact men did not significantly differ with respect to their body image or sexual functioning; however, men who were dissatisfied with their circumcision status reported lower body image on all variables assessed (genital image, body image during sexual activity, and global body image) and worse sexual functioning on all subscales (Erectile Functioning, Orgasm Functioning, Intercourse Satisfaction, Overall Sexual Satisfaction), except for Sexual Desire. Logistic regressions revealed that happiness with one’s circumcision status was a more important predictor of circumcision status than any body image scale, or any sexual functioning subscale with the exception of Orgasm Functioning, which was associated with a 16% reduction in the likelihood of being circumcised. For both the body image and sexual functioning logistic regression, a one-unit increase in a man’s happiness with his circumcision status was associated with a 68% and 69% reduction in the likelihood of being circumcision, respectively.

**Demographics of the Sample Population**

The sample of men that participated in this online study represents a diverse population with respect to demographic composition; the age range is large, and an array of different cultural, religious, economic status, and educational backgrounds are represented. Further, a large proportion of this sample identified with a sexual orientation other than heterosexual; in fact, the sample included participants from the entire spectrum of the Kinsey Scale, from 0 (full preference for women) to 6 (full preference for men). Due to the nature of our recruitment strategy and the self-selected nature of participants choosing to partake in the survey, the sample of men who participated in this survey was not random. Further, we were unable to recruit religiously represented groups—in particular, members of religious groups who frequently undergo neonatal circumcision as a religious rite (e.g., Jewish and Muslim identified individuals); thus, the findings reported here are not necessarily representative of the larger male population.
Men’s Attitudes Towards their Genitals and Circumcision Status

The findings from this study indicate that—overall—men have positive attitudes towards their penis with respect to length, girth, and amount of foreskin when flaccid or erect. Men were happier with their penis when erect than when flaccid, consistent with previous research (Morrison et al., 2005). Furthermore, men reported that their partners (men and women) were even more satisfied with their genitals than the men themselves, which is somewhat consistent with research demonstrating that women tend to evaluate their sexual partner’s penis more favourably than men do (Lever, Frederick, & Peplau, 2006). All of the questions assessing satisfaction with penis appearance were strongly correlated to one another. The highest correlation observed ($r = .91$) indicated that both circumcised and intact men provided nearly equal ratings of satisfaction with the amount of foreskin they have, irrespective of whether their penis is flaccid or erect. This finding is particularly interesting in the sample of circumcised men. If circumcised men were dissatisfied with the aesthetic appearance of having no foreskin, then one might expect their levels of dissatisfaction to diminish when they were aroused, as intact and circumcised penises look similar when fully erect (i.e., the foreskin of intact men retracts to expose the glans, similar—although not identical—to a circumcised penis). However, the fact that some circumcised men remain dissatisfied with the amount of foreskin they have, even when aroused, may suggest that their dissatisfaction extends beyond the appearance of their genitals.

Research on men’s attitudes towards their circumcision status is lacking. One study found that circumcised teenage boys aged 11-14 years reported higher satisfaction with their circumcision status than intact boys (Schlossberger, Turner, & Irwin, 1991). Another study, which assessed locker room teasing patterns in a sample of 290 young men (aged 17-24 years) in the United States, found that having an intact penis accounted for 33% of locker room teasing, yet only 3% of the whole sample wished that their penis appearance was different (Alexander, Storm, & Cooper, 2014). Ferris et al. (2010) found that—in a sample of Australian men who responded to a single-item measure as part of a larger online study—circumcised men were somewhat less likely to worry about their body image during sex as
compared to intact men. Results from the current study are not consistent with previous research, in that circumcised men reported lower satisfaction with their penis, and lower perceived partner satisfaction, as compared to intact men. This finding may be due, in part, to the relatively dissatisfied subgroup of circumcised men in the current sample. Regardless, the findings suggest that—in some samples of men—attitudes towards the amount of foreskin they have are related to how they feel (and how they perceive their partners to feel) about their genitals.

Differences between circumcised and intact men were pronounced with respect to attitudes about one’s own circumcision status. A similar pattern of results emerged in men’s responses to questions assessing how happy they are with their circumcision status, how much of a positive issue it is in their everyday life, and how much of a negative issue it is. That is, within the sample of men who participated in this study, intact men appear to consist of two possible groupings (i.e., those who are extremely satisfied or feel neutral towards being intact), while circumcised men appear to consist of three possible groupings (i.e., those who are extremely dissatisfied, neutral, or extremely satisfied with being circumcised). Less distinct groupings were observed with respect to how much a person considers their circumcision status an important part of their self-concept. Thus, the circumcised and intact men in the current study do not appear to consider their circumcision status as a defining feature of their self-concept, although circumcised men report thinking about their circumcision status significantly more than intact men. Taken together, these findings indicate that—for a substantial proportion of men in this sample—circumcision status is not a negative, or important, issue; however, there is a subgroup of men for whom their circumcision status is highly distressing, and these men tend to have been neonatally circumcised.

A regression analysis was performed to assess which attitudes towards one’s circumcision status were important predictors of one’s actual circumcision status, after controlling for how men felt about their penis in general. Although the frequency that a man thinks about his circumcision status was a significant predictor (such that a one-unit increase in the amount they think about their circumcision
status is associated with a 31% reduction in the likelihood of being circumcised), a man’s happiness with his circumcision status was the most important predictor of circumcision status. This finding highlights the importance of a man’s attitude towards his circumcision status, and indicates that—at least within this sample—circumcised men are less likely to be happy with their circumcision status than intact men. One possible explanation for the high levels of distress among some circumcised men, and the relative importance of one’s self-reported happiness with their circumcision status, is the lack of choice in their circumcision status. The issue of choice and neonatal circumcision has been the center of a heated debate for decades (for example, see: McMath, 2015; Svoboda, Van Howe, & Dwyer, 2000). In the current sample, significantly more circumcised men indicated that they have regrets about their circumcision status, and they wished they were the opposite circumcision status (i.e., intact) as compared to intact men. Perhaps this finding is, in part, reflective of the fact that, intact men are easily able to rectify dissatisfaction with their circumcision status by undergoing circumcision. On the other hand, circumcised men have far fewer options to reverse their circumcision status, and the options that are available to them (e.g., foreskin “restoration”; Hammond, 1999) are timely, labour-intensive, and never truly “restorative” (because the nerve fibers lost to circumcision cannot be re-grown). Future research is needed to obtain an accurate base-rate estimation with respect to the frequency that men fall into the category of “highly distressed” over their circumcision status, as this reaction—among others—should be addressed in future public policy statements about circumcision.

**Body Image**

Our analyses revealed that body image ratings do not significantly differ between circumcised or intact men; however, men who are happier with their circumcision status reported higher satisfaction with their genital image, their body image during sexual activities, and their overall body image. As might be expected, men’s genital image rating was the most important predictor of circumcision status, prior to controlling for happiness with circumcision status (which was the best predictor, overall). Thus, findings highlight the relative importance of men’s attitudes towards their circumcision status over and above their
circumcision status alone. Few studies have explored men’s body image within the context of their circumcision status. Similar to the current study, Schlossberger et al. (1991) found that global body image (assessed via the Peterson Body Image Scale) did not significantly differ between a sample of circumcised and intact teenage boys, aged 11-14 years, but they did find that circumcised boys reported higher satisfaction with their circumcision status. Unfortunately, the authors did not control for circumcision status satisfaction in their analysis of body image. Future research exploring the relationship between men’s body image and sexual outcomes should control for men’s perceptions of their genitals, and their perception of/satisfaction with their circumcision status, in particular.

The role of men’s appraisal of their circumcision status—as opposed to circumcision status itself—in how men rate their body image is an interesting finding. First, it suggests that a man’s attitude towards the amount of foreskin he has extends beyond his genital perception, and is related to his general body image during sex and his body image globally. Higher satisfaction with perceived penis size is related to men’s general assessment of their physical attractiveness (Lever et al., 2006), and Morrison and colleagues (Morrison et al., 2005) suggest that the locus of male genital dissatisfaction was penis size. However, both of these studies failed to consider circumcision status, which—according to the current study—represents another important possible locus of genital dissatisfaction, at least among some men. We cannot determine whether dissatisfaction with one’s circumcision status is the result of low overall body image, or perhaps dissatisfaction with one’s circumcision status has negative implications for overall body image; future research should explore the directionality of this relationship. Additionally, these findings highlight the importance of a man’s appraisal of his circumcision status with respect to body image, as opposed to the actual appearance of his genitals (i.e., whether he has a foreskin or not). The relative importance of genital perception over genital appearance has been documented, typically with respect to penis size (Davis, Paterson, & Binik, 2011; Lever et al., 2006; Son, Song, Kim, & Paick, 2003), and worse appraisals of penis size are associated with negative sexual outcomes in straight and gay men (Algars et al., 2011; Morrison et al., 2005; Peplau, Frederick, Yee, Maisel, Lever, & Ghavami,
Thus, negative attitudes towards circumcision status may be another important body image variable with potential consequences on men’s sexuality.

**Sexual Functioning**

The deleterious impact of circumcision on sexual functioning has been speculated, but empirical research has failed to produce a clear pattern of results. The current study is consistent with research failing to demonstrate a significant group difference in sexual functioning between circumcised and intact men, and extends the research by indicating that men who are dissatisfied with their circumcision status are more likely to experience sexual dysfunction.

The novel finding that men’s negative attitudes towards their circumcision status—as opposed to their circumcision status, per se—is associated with lower sexual functioning builds on body image research demonstrating that with lower body image in men is associated with impaired sexual functioning. It appears that, in the current sample of men, perception of a single aspect of their genitals (i.e., amount of foreskin present) is sufficient to produce group differences with respect to self-reported sexual functioning. It is possible that mixed results in the circumcision status/sexual functioning research is—at least in part—the result of a failure to control for men’s attitudes towards their circumcision status. For example, many such studies test for between-group differences in sexual functioning using a pre-post study design, whereby adult men elect to undergo adult circumcision, typically to correct a pre-existing problem with their penis such as sexual dysfunction or aesthetics (e.g., Şenkul, İşeril, Şen, Karademir, Saraçoğlu, & Erden, 2004). Thus, one might expect that participants would experience a substantial increase in satisfaction with their circumcision status after circumcision. Indeed, some studies document increased satisfaction with their circumcision status following the procedure (Shen et al., 2004; Senel, Demirelli, & Pekcan, 2011); however, few studies assess men’s attitudes, and no studies—to our knowledge—control for satisfaction with circumcision status in their analyses. This paper is the first to empirically demonstrate the importance of a man’s perception of—not just his genitals—but a specific
aspect of his genital appearance on sexual functioning outcomes, and how this attitudinal variable may be more important in sexual functioning than circumcision status, itself.

With respect to predicting circumcision status from men’s scores on the IIEF subscales, Orgasm Functioning remained a significant predictor, even after controlling for happiness with circumcision status. Although Orgasm Functioning was weakly related to circumcision status—and considerably less important than happiness—this finding calls for future research. Many “intactivists” hold that circumcision reduces orgasm functioning because it impairs penile sensitivity (Boyle, Goldman, Svoboda, & Fernandez, 2002). Indeed, some studies (Shen et al., 2004; Frisch, Lindholm, Grønbæk, 2011; Senkul et al., 2004) have found longer ejaculatory latency times (ELTs) in circumcised as compared to intact men (although other studies have found no difference; Kim & Pang, 2007; Waldinger et al., 2009). Furthermore, one study (Sorrells et al., 2007) documented lower tactile sensitivity in the glans penis of circumcised men, which, the authors hypothesize, may indicate a functional explanation for lower orgasm functioning. However, the finding of lower glans penis sensitivity to tactile stimuli was not replicated by Payne et al. (2007) or Bossio (Chapter 3). Furthermore, Payne et al. (2007) found that tactile sensitivity of the glans penis decreases with arousal, which suggests that the lower tactile sensitivity observed by Sorrells et al. (2007) may not play an important part in men’s sexual response (Cox et al., 2015). Indeed, both Payne et al. (2007) and Bossio (Chapter 3) failed to find a difference in psychophysiological sexual response across circumcision status (sexual response was not assessed by Sorrells et al. (2007)). Thus, it is unlikely that impaired orgasm functioning in circumcised men is the result of lower penile tactile sensitivity alone.

Findings from this study offer a new possible explanation for impaired sexual functioning in circumcised compared to intact men; perhaps attitudinal or cognitive variables related to one’s circumcision status (e.g., dissatisfaction, time spent thinking about it) impair men’s ability to reach orgasm. Masters and Johnson coined the phrase “spectatoring” (1970) to refer to intense self-focus during sexual activity. Spectatoring has been tied to lower body image and increased rates of sexual dysfunction.
in men (Abrahamson, Barlow, Beck, Sakheim, & Kelly, 1985; Cranston-Cuebas & Barlow, 1990). It is possible that worse orgasm functioning is predictive of being circumcised because men who are unhappy with their circumcision status (in this sample, primarily circumcised men) are more likely to engage in spectatoring. In support of this potential association, a large proportion of this sample (especially circumcised men) reported thinking about their circumcision status almost constantly. Future research exploring the impact of circumcision status on sexual functioning needs to control for participant attitudes towards their circumcision status. Controlling for participant attitudes towards circumcision status would be particularly important in pre-post study designs where attitudinal shifts can be expected after participants voluntarily choose to undergo circumcision. Furthermore, the findings from this study point towards possible clinical interventions for men with orgasm difficulties; that is, clinicians should assess whether men hold strongly negative attitudes towards their genitals, as psychological interventions targeting these cognitions may prove helpful in treating orgasm difficulties, as opposed to altering one’s circumcision status surgically or through body modification.

**Limitations and Future Directions**

Although the findings of this study provide a novel contribution to the circumcision literature, they are not without their limitations. The most important limitation has already been addressed; that is, the sample population that participated in the current study is not representative of the general population. A previous study assessed attitudes towards one’s circumcision status (using the same questions as this study) in a sample of sexually healthy men between the ages of 18 and 37 years (Chapter 4); no group differences emerged. Compared to the current sample, men in Chapter 4—when collapsed across circumcision status—reported that they were happier with their circumcision status ($M = 7.17$ vs. $5.85$), it was a moderately positive issue for them ($M = 5.85$ vs. $4.82$), and it was not a negative issue for them ($M = 1.56$ vs. $3.42$). It is therefore possible that the current sample may over-represent people on extreme ends of the spectrum, with respect to attitudes towards circumcision status. Indeed, it is likely that men with polarized attitudes towards circumcision may have been more motivated to complete the entire
questionnaire than men with more neutral or less negative attitudes. This is, however, the first study to empirically document a sample of men who experience distress over their circumcision status. Furthermore, this study contributes to the literature by demonstrating the possible deleterious consequences to some aspects of men’s sexuality (e.g., body image, sexual functioning) that may arise from negative attitudes towards their own circumcision status. Future research is needed to further study this subpopulation of men who are dissatisfied with their circumcision status.

We demonstrated that satisfaction with one’s circumcision status is related to body image, as well as sexual functioning; however, because of the survey design of this study, directionality of these relationships cannot be assumed. For example, we cannot presume whether dissatisfaction with one’s circumcision status is a consequence of pre-existing body image or sexual complaints, if dissatisfaction with one’s circumcision status can cause negative consequences to other aspects of one’s life, or, perhaps, if the relationship is bi-directional or involves additional variables. Future research should aim to experimentally test the directionality of the relationship between circumcision status and body image or sexual functioning.

Conclusions

This study is the first to demonstrate that attitudes towards circumcision status may be more important than circumcision status, per se, with respect to men’s body image and sexual functioning. Furthermore, our findings demonstrate that attitudes towards one’s circumcision status can vary greatly across men. While intact men who participated in this study appeared to have overall better outcomes with respect to attitudes, body image, and sexual functioning, there is a sample of circumcised men who are highly distressed by their circumcision status, and these negative attitudes are associated with worse body image and sexual functioning outcomes. This paper is the first—to our knowledge—to experimentally demonstrate that there is a sample of men for which neonatal circumcision is associated with negative outcomes to their sexual lives; however, information related to the extent of these negative outcomes, and the base rate of this population, is currently unknown. Finally, this study highlights the
need for future research to control for attitudes towards circumcision status when studying the relationship between circumcision status and sexual outcomes, such as body image or sexual functioning.
References


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Chapter 6

You either have it or you don’t: The impact of male circumcision status on sexual partners

Introduction

Circumcision refers to the removal of some or all of the prepuce, or penile foreskin, and is one of the most widely performed surgical procedures worldwide. There exists a great deal of research on health outcomes associated with circumcision, which has been fundamental in recent changes to public policy in the United States; the most recent report by the American Academy of Pediatrics (AAP) states that “the benefits of neonatal circumcision outweigh the costs” (AAP, 2012, pp. 764). Additionally, the Center for Disease Control has released a report that mirrors the AAP’s endorsement of neonatal circumcision (CDC, 2014). Despite the body of research outlining health correlates of circumcision, the impact of circumcision on sexual correlates of men and their sexual partners is extremely limited (see Bossio, Pukall & Steele, 2014). Despite the existence of a handful of studies (e.g., Payne, Thaler, Kukkonen, Carrier, & Binik, 2007; Sorrells, et al., 2007), it remains unknown whether the removal of foreskin impacts men’s penile sensitivity, sexual functioning, or sexual enjoyment. Additionally, research is needed to determine whether the presence or absence of a penile foreskin differentially impacts the sexual partners of men. Given that circumcision results in changes to the anatomical structure of the penis (i.e., the removal of the mobile foreskin sheath), it would be important to assess whether such changes to the penis extend beyond the individual.

The limited body of research exploring the effects of circumcision status on partner sexual functioning has produced mixed results. O’Hara and O’Hara (1999) surveyed women who reported having had sexual experiences with both intact and circumcised men. Participants were recruited from
magazines and an anti-circumcision newsletter, and invited to complete a mail-in survey with over 40 questions related to sexual history, sexual functioning, as well as subjective opinions about circumcision status. The authors concluded that women were less likely to experience “vaginal” orgasms, and were more likely to have vaginal discomfort and reduced vaginal secretions during intercourse with a circumcised man compared to an intact partner. It also appeared that sexual enjoyment during “prolonged intercourse” was lower in women with their circumcised compared to intact partners; when referring to experiences with circumcised partners, women were more likely to report that they “want to get it over with” and were less likely to “really get into it”. The authors concluded that women prefer intact to circumcised sexual partners for sexual enjoyment, citing the mobile sheath of the intact penis as a potential anatomical explanation because it is believed to minimize friction against the vaginal wall, allowing for the maintenance of vaginal lubrication (O’Hara & O’Hara, 1999, pp. 69).

Frisch and colleagues (2011) assessed the impact of circumcision on sexual functioning using responses to a national health survey from Denmark regarding the sexual lives of men and their female spouses. Only 5% \((n = 103)\) of the total sample of sexually active men \((N = 1996)\) reported being circumcised, 15% \((n = 15)\) of whom were circumcised before the age of 6 months. Few differences in sexual functioning were observed in the male sample; circumcised men were more likely than intact men to report frequent orgasm difficulties, but rates of erectile difficulties, early ejaculation, and dyspareunia (i.e., pain during sexual intercourse) did not differ between groups. Within the total sample of sexually active female respondents \((N = 1982)\), 4% \((n = 75)\) reported that their partner was circumcised, and 28% \((n = 20)\) of circumcised partners had undergone the procedure before 6 months of age. Women with circumcised partners were more likely than women with intact partners to report difficulties in overall sexual functioning, including orgasm difficulties, insufficient vaginal lubrication, dyspareunia, and vaginismus (i.e., difficulty with vaginal penetration).

The studies conducted by O’Hara and O’Hara (1999) as well as Frisch and colleagues (2011) suggest that circumcision is associated with negative outcomes on sexual functioning for female partners.
Although these two studies provide important contributions to the circumcision literature, they have some notable methodological shortcomings. For example, the Frisch et al. (2011) sample was conducted on a population where circumcision—especially in newborns—is exceedingly rare. Frisch and colleagues did not control for the age at circumcision, nor did their analyses consider women’s previous exposure to circumcision status. The methodology in the O’Hara and O’Hara (1999) paper is also problematic, as a proportion of the sample was recruited from an anti-circumcision newsletter, thus introducing a high likelihood of bias. Additionally, neither O’Hara and O’Hara (1999) or Frisch and colleagues (2011) make use of validated measures within their surveys, but instead rely on single item responses for their assessment of sexual functioning.

One additional study reported on changes in women’s sexual satisfaction in African populations before and after their partners underwent circumcision as adults (Kigozi, Lukabwe, Kagaayi, Wawey, Nuntume, Kigozi, et al., 2009). Following their partner’s circumcision procedure, 2.9% of the sample of women interviewed reported that their sexual functioning was worse, 57.3% reported no change, and 39.8% reported improvement in sexual functioning. The authors concluded that male circumcision “has no deleterious effect on female sexual satisfaction”. The randomized pre-post experimental design of this study offers a methodological advantage over self-report surveys; however, a number of factors need to be considered before findings from this study can reasonably be applied to non-African cultures. First, it is currently unknown whether circumcision status differentially impacts men or their partners depending on the age at which the procedure is performed. Therefore, it is unclear whether the findings from studies in which adult men are experimentally assigned to undergo circumcision or not can be applied to populations in which circumcision is typically performed in neonates—the standard age in North America. As well, multiple factors may contribute to changes in women’s self-reported sexual functioning and satisfaction in pre-post circumcision studies. For example, the surgical alteration of men’s genitals may lead to changes in behaviour or beliefs about genitals/sexuality on the part of either partner, or perhaps long periods of celibacy during post-surgical healing times may impact reports of
sexual satisfaction or functioning. Indeed, aspects of human sexuality are highly variable over time, irrespective of adult circumcision. Furthermore, the purpose of the pre-post experimental design in the Kigozi et al. (2009) study was to explore whether circumcision can protect against HIV acquisition in African cultures, where rates of HIV/AIDS are considered epidemic. It is possible that participant’s expectations for the study may have introduced a response bias, as all data were self-report, and participants were fully informed of the purpose of the study. Indeed, research exploring the acceptability of circumcision as a protective procedure against HIV transmission illustrates that men and women are willing to preferentially favour circumcision when they believe it offers protection against HIV (Figueroa & Cooper, 2010; Gonzales, Zea, Reisen, Bianchi, Rodríguez, Pardo, & Poppen, 2012; Mattson, Bailey, Muga, Poulussen, & Onyango, 2005).

Individual or cultural beliefs about circumcision represent another important area of study that has received little attention. Understanding beliefs about circumcision may shed light onto the sociocultural impact of the procedure, which may in turn lead to improved understanding of the role of circumcision in the sexual lives of adults. Most research assessing beliefs about circumcision focuses on individuals’ opinions about the acceptability of the procedure. Typically, acceptability research takes the form of qualitative studies or self-report questionnaires asking men and/or women to comment on their willingness to circumcise themselves (in the case of men), their partners (in the case of women; male partners have not been included in the research at this time), or their children (men and women). Often, hypothetical situations are introduced to assess participant’s acceptance of circumcision under particular conditions, for example, if circumcision is shown to protect against HIV (Halperin, Fritz, McFarland, & Woelk, 2005; Lagarde, Dirk, Puren, Reathe, & Bertran, 2003; Rain-Taljaard, Lagarde, Taljaard, Campbell, MacPhail, Williams, & Auvert, 2003; Tsela & Halperin, 2006), or if it was guaranteed to be a safe and affordable procedure (Bailey, Neema, & Othieno, 1999; Kebaabetswe, Lockman, Mogwe, Mandevu, Thior, Essex, & Shapiro, 2003; Mattson et al., 2005; Scott, Weiss, & Viljoen, 2005). A review by Westercamp and Bailey (2007) illustrated that barriers to acceptability of circumcision in African
countries include pain, cultural/religious/social reasons, cost, fear of complications, and feared negative impact to sexual functioning or partner’s sexual enjoyment. Factors that contribute to the acceptability of circumcision include hygiene, believed increases to sexual functioning or partner’s enjoyment, and – not surprisingly for a population at high risk of HIV/AIDS – protection against HIV or STIs. Researchers have recently begun looking at populations of men who have sex with men (MSM) to determine acceptability for circumcision as a potential immunization against HIV transmission in this population, which also has documented high rates of HIV/AIDS. Again, it is not surprising that MSM populations were willing to undergo circumcision if evidence for its effectiveness against HIV/AIDS or other STIs was demonstrated, although considerably higher acceptance rates were observed for a sample of men from Brazil (86%; Gonzales et al., 2012) than a sample of men from China (30%, Lau, Zhang, Yan, Lin, Choi, Wang, Hao, et al., 2011). Thus, beliefs about the acceptability of circumcision appear contingent on a number of medical and sociocultural factors. Expanding acceptability research to include additional factors beyond health benefits, such as circumcision status preference, impact on sexual functioning or enjoyment, or beliefs about circumcision status would provide valuable information on possible sociocultural or relationship factors related to the procedure – aspects of the circumcision literature that have gone otherwise unaddressed by the research.

An alternative avenue to explore popular beliefs about circumcision may be parents’ reasons for choosing to circumcise or not circumcise their newborn sons. A considerable amount of research demonstrates that the medical literature has minimal impact on parent’s decision to circumcise their sons or not (Tiemstra 1999; Oh, Kim, Kim, Kim, Kim, Kim, et al., 2002; Walton, Østbye, & Campbell, 1997; Larsen & Williams, 1990). Binner and colleagues (2002) surveyed a sample of women giving birth in the United States, and found no change in the mother’s decision to circumcise their sons or not after reading an empirically based AAP handout summarizing the medical literature on circumcision. Commonly reported reasons parents cite for deciding whether or not to circumcise their sons include the father’s circumcision status (Rediger & Muller, 2013; Walton et al., 1997; Xu & Goldman, 2008) and
hygiene (Rediger & Muller, 2013; Xu & Goldman, 2008). In some cases, women report reasons related to their son’s future sexuality, including visual appeal of the genitals or increased sexual enjoyment (Williamson & Williamson, 1988). Once again, research on parent’s decision to circumcise or not circumcise their sons provides some information about public opinion towards the procedure, but fails to directly assess the impact of such opinions on men, their sexual partners, and the sexual lives of couples.

Research on the impact of circumcision on the sexual lives of men and their partners is limited, as the majority of research on circumcision has focused on health correlates. What exists fails to take into account potentially important confounding variables (e.g., age at circumcision, sexual orientation; see Bossio et al., 2014 for a review) or lacks methodological rigor (e.g., not accounting for past exposure to circumcision status, not including validated measures). The current study aims to address the impact of neonatal circumcision on the sexual lives of men’s partners. We recruited a sample of women and men who report being in a current sexual relationship with a man with the intent to explore the impact of circumcision status on the following domains: (i) sexual functioning; (ii) sexual satisfaction; (iii) general preferences for circumcision status; and (iv) beliefs about circumcision status.

**Method**

**Participants**

Eligible participants met the following criteria: (i) over the age of 18 years; (ii) able to read and write English fluently; and (iii) in a sexual relationship with a cisgendered (i.e., biologically born) male partner for at least the past 3 months. Participants were excluded based on the following criteria: (i) if they or their partner were circumcised as an adult, or circumcised to correct a medical condition (e.g., phimosis); (ii) if they or their partner had any anatomical or medical abnormalities of the penis (e.g., complications during circumcision, hypospadias, genital modifications such as piercings); and (iii) if their partner had a diagnosis of a sexual dysfunction.
A total of 196 individuals who met eligibility criteria completed the study in full. Participants ranged in age from 19 to 71 years ($M = 27.5, SD = 8.6$), and included 168 women between the ages of 19 and 57 years ($M = 26.9, SD = 7.4$) and 28 men between the ages of 20 and 71 years ($M = 31.5, SD = 13.4$). All participants reported being in a sexual relationship with a man for a minimum of three months; the average length of relationship was 4.2 years ($SD = 5.2$ years; range = 3 months – 35.3 years; see Table 6.1).

Table 6.1

Participant and couple characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Female partners ($n = 168$)</th>
<th>Male partners ($n = 28$)</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of Participant (yrs)</td>
<td>26.87 7.4 19 - 57</td>
<td>31.5 13.4 20 - 71</td>
<td>6.98</td>
<td>.009</td>
</tr>
<tr>
<td>Age of Partner (yrs)</td>
<td>28.28 8.65 19 - 70</td>
<td>32.18 14.25 18 - 69</td>
<td>3.94</td>
<td>.05</td>
</tr>
<tr>
<td>Length of Relationship (mos)</td>
<td>50.68 62.49 3 - 424</td>
<td>50.29 70.88 3 - 243</td>
<td>0.001</td>
<td>.98</td>
</tr>
</tbody>
</table>

The majority of participants indicated that they were born in Canada ($n = 145; 74\%$) or the United States ($n = 24; 12.2\%$), while others reported that they were born in Europe ($n = 9; 4.6\%$) or other countries ($n = 15; 7.5\%$). The current sample was highly educated, with the majority indicating that they attended college or university ($n = 120; 61.2\%$), and many indicating graduate-level education ($n = 66; 33.7\%$); the largest subsample of this group indicated that they were currently in school ($n = 105; 53.6\%$), while others were employed full-time ($n = 59; 30.1\%$) or part-time ($n = 22; 11.2\%$). The majority of this sample indicated their current religious stance as Agnostic, Atheist, or “none” ($n = 113; 57.7\%$), although many indicated that they were Catholic/Christian ($n = 39; 19.9\%$), Jewish ($n = 11; 5.6\%$), or another religion. Most participants described their relationship as monogamously dating ($n = 124; 63.3\%$), married ($n = 35; 17.9\%$), or common-law/engaged ($n = 25; 12.8\%$); however, a subsample of the population reported that they were in an open relationship ($n = 8; 4.1\%$) or single ($n = 4; 2\%$; Table 6.2).
## Table 6.2

**Participant Demographics**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Women  ((n = 168))</th>
<th>Men  ((n = 28))</th>
<th>Total  ((N = 196))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (n)</td>
<td>% (n)</td>
<td>% (n)</td>
</tr>
<tr>
<td><strong>Birthplace</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>78.6 (132)</td>
<td>46.4 (13)</td>
<td>74 (145)</td>
</tr>
<tr>
<td>United States</td>
<td>8.3 (14)</td>
<td>35.7 (10)</td>
<td>12.2 (24)</td>
</tr>
<tr>
<td>Europe</td>
<td>4.8 (8)</td>
<td>3.6 (1)</td>
<td>4.6 (9)</td>
</tr>
<tr>
<td>Other</td>
<td>8.3 (14)</td>
<td>14.3 (4)</td>
<td>7.5 (15)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>3.6 (6)</td>
<td>10.7 (3)</td>
<td>4.6 (9)</td>
</tr>
<tr>
<td>Community college</td>
<td>6 (10)</td>
<td>10.7 (3)</td>
<td>6.6 (13)</td>
</tr>
<tr>
<td>Vocational training</td>
<td>0.6 (1)</td>
<td>0 (0)</td>
<td>0.5 (1)</td>
</tr>
<tr>
<td>University undergraduate</td>
<td>56 (94)</td>
<td>46.4 (13)</td>
<td>54.6 (107)</td>
</tr>
<tr>
<td>University graduate</td>
<td>33.9 (57)</td>
<td>32.1 (9)</td>
<td>33.7 (66)</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed Full-Time</td>
<td>29.2 (49)</td>
<td>35.7 (10)</td>
<td>30.1 (59)</td>
</tr>
<tr>
<td>Employed Part-Time</td>
<td>10.7 (18)</td>
<td>14.3 (4)</td>
<td>11.2 (22)</td>
</tr>
<tr>
<td>Student</td>
<td>56.0 (94)</td>
<td>39.3 (11)</td>
<td>53.6 (105)</td>
</tr>
<tr>
<td>Parenting Full-time</td>
<td>2.4 (4)</td>
<td>0.0 (0)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Disability</td>
<td>1.2 (2)</td>
<td>7.1 (2)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>0.6 (1)</td>
<td>0.0 (0)</td>
<td>0.5 (1)</td>
</tr>
<tr>
<td>Retired</td>
<td>0.0 (0)</td>
<td>3.6 (1)</td>
<td>0.5 (1)</td>
</tr>
<tr>
<td><strong>Religion (Current)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None / Atheist / Agnostic</td>
<td>55.3 (93)</td>
<td>71.4 (20)</td>
<td>57.7 (113)</td>
</tr>
<tr>
<td>Spiritual, no label</td>
<td>9.5 (16)</td>
<td>10.7 (3)</td>
<td>9.7 (19)</td>
</tr>
<tr>
<td>Catholic</td>
<td>12.5 (21)</td>
<td>0.0 (0)</td>
<td>10.7 (21)</td>
</tr>
<tr>
<td>Christian</td>
<td>10.1 (17)</td>
<td>3.6 (1)</td>
<td>9.2 (18)</td>
</tr>
<tr>
<td>Jewish</td>
<td>6.5 (11)</td>
<td>0.0 (0)</td>
<td>5.6 (11)</td>
</tr>
<tr>
<td>Muslim</td>
<td>0.6 (1)</td>
<td>0.0 (0)</td>
<td>0.5 (1)</td>
</tr>
<tr>
<td>Other</td>
<td>4.2 (7)</td>
<td>14.3 (4)</td>
<td>6.6 (13)</td>
</tr>
<tr>
<td><strong>Relationship Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>1.8 (3)</td>
<td>3.6 (1)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Dating, monogamous</td>
<td>64.3 (108)</td>
<td>57.1 (16)</td>
<td>63.3 (124)</td>
</tr>
<tr>
<td>Dating, non-monogamous</td>
<td>2.4 (4)</td>
<td>14.3 (4)</td>
<td>4.1 (8)</td>
</tr>
<tr>
<td>Common-law</td>
<td>8.3 (14)</td>
<td>7.1 (2)</td>
<td>8.2 (16)</td>
</tr>
<tr>
<td>Engaged</td>
<td>3.6 (6)</td>
<td>10.7 (3)</td>
<td>4.6 (9)</td>
</tr>
<tr>
<td>Married</td>
<td>19.6 (33)</td>
<td>7.1 (2)</td>
<td>17.9 (35)</td>
</tr>
<tr>
<td><strong>Nature of Relationship</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exclusive</td>
<td>92.9 (156)</td>
<td>64.3 (18)</td>
<td>88.8 (174)</td>
</tr>
<tr>
<td>Non-exclusive</td>
<td>6.5 (11)</td>
<td>35.7 (10)</td>
<td>11.2 (21)</td>
</tr>
<tr>
<td><strong>Circumcision Status of Current</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumcised</td>
<td>54.8 (92)</td>
<td>50 (14)</td>
<td>54.1 (106)</td>
</tr>
<tr>
<td>Intact</td>
<td>45.2 (76)</td>
<td>50 (14)</td>
<td>45.9 (90)</td>
</tr>
<tr>
<td><strong>Circumcision Status of Self</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumcised</td>
<td>--</td>
<td>46.4 (15)</td>
<td>--</td>
</tr>
<tr>
<td>Intact</td>
<td>--</td>
<td>53.6 (13)</td>
<td>--</td>
</tr>
</tbody>
</table>
Measures

Experience with circumcision status. Participants were asked to indicate the circumcision status of their current partner, as well as recall the number of circumcised and/or intact past sexual partners that participants had engaged in a series of different sexual activities with (i.e., vaginal intercourse (women only), anal intercourse, fellatio (performed on a partner), and manual-penile stimulation (performed on a partner). A circumcised partner was defined as a man who had undergone a surgical procedure to have his penile foreskin removed shortly after birth, while an intact partner was defined as a man whose penile foreskin had not been surgically removed (i.e., the penile foreskin was intact). Participants also indicated the circumcision status of the first partner they engaged in penetrative intercourse with, as well as the circumcision status of the partner with whom they achieved their first orgasm (if applicable).

Satisfaction with partner’s circumcision status. Partners indicated their personal levels of satisfaction with their current partner’s circumcision status on a number of variables, including: satisfaction overall, how much of a positive issue their partner’s circumcision is in their everyday life, how much of a negative issue it is, how satisfied they are with their partner’s circumcision status when their partner’s penis is flaccid and when it is erect, and the extent to which they wished their partner was the opposite circumcision status. Questions were answered on a 10-point Likert-type scale, where 1 indicated “very dissatisfied” and 10 indicated “very satisfied”.

Female sexual functioning. Female participants completed the Female Sexual Function Index (FSFI; Rosen, Brown, Heiman, Leiblum, Meston, Shabsigh, Ferguson, et al., 2000), a 19-item measure of sexual dysfunction. The FSFI provides a measure of sexual functioning on six domains: desire, arousal, lubrication, orgasm, pain, and satisfaction. Higher scores indicate greater sexual functioning. The FSFI and its subscales demonstrate good test-retest reliability in each domain when re-administered within a four-week period (r = .79 to .86) and the test possesses high internal consistency (Cronbach’s alpha values observed at α = 0.82 and higher; Rosen et al., 2000). Cronbach’s alpha values for the current study were observed at α = 0.79 and higher. Additionally, highly significant mean difference scores on each of
the subscales between women with sexual arousal disorder and age-matched controls indicate good construct validity ($p \leq .001$) (Masheb, Lozano-Blanco, Kohorn, Minkin, & Kerns, 2004; Rosen et al., 2000).

**Male sexual functioning.** Male participants completed the International Index of Erectile Function: Adapted tool for Men who have Sex with Men (IIEF-MSM; Coyne, Mandalia, McCullough, Catalan, Noestlinger, Colebunders, & Asboe, 2010). The IIEF-MSM is a 14-item measure of sexual dysfunction that has been adapted from the IIEF for use with men who have sex with men (MSM). Lower values indicate better sexual functioning. The measure assesses five domains of sexual functioning: erectile function, intercourse satisfaction, orgasmic function, sexual desire, and overall satisfaction. The IIEF-MSM has been shown to be a valid and reliable measure of men’s sexual functioning, and all subscales possess high internal consistency (Cronbach’s alpha values have been observed at $\alpha = 0.82$ and higher; Coyne et al., 2010). The current study produced Cronbach’s alpha values of $\alpha = 0.71$ and higher.

**General preferences for circumcision status.** Participants were asked to indicate the circumcision status of their ideal partner for four (women) or three (men) different sexual activities performed on the partner: vaginal intercourse (women only), anal intercourse, fellatio, and manual-penile stimulation. Participants were asked to indicate circumcision status preferences for each sexual activity on an 11-point bipolar scale, such that one end of the scale (0) represented *full preference for an intact penis*, the mid-point (5) indicated *no preference for a given circumcision status*, and the opposite end of the scale (10) indicated *full preference for a circumcised penis*. This scale allowed participants to indicate the degree of preference for either an intact or circumcised partner on a 5-point departure from the midpoint (*no preference*). Thus, on the 11-point scale, 0 to 4 represented degree of preference for an intact partner (where 0 is *full preference* for intact and 4 is *slight preference*), 5 represented no preference for a specific circumcision status, and 6 to 10 represented degree of preference for a circumcised partner (where 10 is *full preference for circumcised* and 6 is *slight preference*).
Beliefs about circumcision status. Beliefs about circumcision status were assessed on a number of domains. Participants were provided with a series of statements and asked to indicate which – if any – circumcision status best fit the description. Beliefs included the following: most hygienic, cleaner, the social norm, most common in my country, most common for my age group, more erotic, more attractive, more natural, provides greater pleasure during penile-vaginal intercourse, provides greater pleasure during penile-anal intercourse, feels nicer to touch, is more interesting, reduces risk of transmitting STIs, is preferred by men themselves, is preferred by female sexual partners of men, and is preferred by male sexual partners of men. Participants were provided with the option to decline to respond, or to indicate that they do not perceive a difference.

Procedure

Study procedures were approved by the University’s General Research Ethics Board (GREB) (see Appendix L). Participants were recruited to take part in an online survey through print advertisements placed within Queen’s University campus and the surrounding community, located Kingston, Ontario (Appendix M). Online advertisements were also used via social media websites (e.g., Facebook, Twitter), as well as relevant online communities and listservs. Data were collected online, and completion of the survey took approximately 30 minutes (see Appendix N). The survey was hosted through the Checkbox website (Checkbox Survey Inc., Watertown, MA) and stored on a secure, private server located on the University campus. After completion, participants were eligible to enter their name in a monthly prize draw for $75 CAD; this prize draw lasted over the duration of data collection.

Results

Experiences with Circumcision Status

Women. Of the women in the current sample, 76 (45.2%) reported being in a current sexual relationship with an intact man, and 92 (54.8%) reported being in a current sexual relationship with a circumcised man (Table 6.2). Group comparisons revealed that women with circumcised partners were
significantly older than women with intact partners \((F(1,167) = 10.58, p = .001)\), and had significantly older partners \((F(1, 167) = 11.06, p = .001)\). Women with circumcised partners reported having had a greater number of circumcised partners for vaginal \((F(1, 163) = 8.47, p = .004)\), anal \((F(1, 57) = 8.86, p = .004)\), oral \((F(1, 161) = 5.92, p = .016)\), and manual \((F(1, 159) = 5.19, p = .024)\) sexual activities. Conversely, women with intact partners reported having a greater number of intact partners for vaginal \((F(1, 163) = 19.44, p < .001)\), oral \((F(1, 166) = 18.03, p < .001)\), and manual \((F(1, 159) = 16.11, p < .001)\) sexual activities, but not anal intercourse \((F(1, 57) = 3.64, p = .06; \text{Table 6.3})\).

The number of women in the current sample who engaged in sexual activities with circumcised men only, intact men only, and both circumcised and intact men was tallied (Table 6.4). Most women were able to identify the circumcision status of their partners for any given activity. The largest proportion of women reported having had vaginal intercourse, fellatio, and manual-penile stimulation with both circumcised and intact men; equal numbers of women reported engaging in anal penetrative intercourse with circumcised or intact men only.

**Men.** An equal number of men within the current sample reported presently being in a sexual relationship with intact and circumcised partners \((n = 14, 50\%; \text{Table 6.2})\). Men were significantly older than the female sample. Unlike the female sample, no significant differences were observed with respect to the age of the male sample \((F(1, 27) = 3.50, p = .07)\) or their sexual partners \((F(1, 27) = 2.54, p = .12)\) based on circumcision status. Additionally, among the male sample, men’s age did not differ as a function of their own circumcision status \((F(1, 27) = 0.13, p = .72; \text{Table 6.3})\).
Like women, men were tallied based on whether they had engaged in various sexual activities with circumcised partners only, intact partners only, or both circumcised and intact partners (see Table 6.4). Similar to women, the largest percentage of men reported having had anal intercourse, fellatio, and manual-penile stimulation with both circumcised and intact men.
Table 6.4

Breakdown of women and men’s sexual experiences by circumcision status

<table>
<thead>
<tr>
<th>Sexual Activity</th>
<th>Intact only</th>
<th>Circumcised only</th>
<th>Both intact and circumcised</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women % (n)</td>
<td>Men % (n)</td>
<td>Women % (n)</td>
<td>Men % (n)</td>
</tr>
<tr>
<td>Vaginal intercourse</td>
<td>15.85 (26)</td>
<td>--</td>
<td>28.66 (47)</td>
<td>--</td>
</tr>
<tr>
<td>Anal intercourse</td>
<td>12.5 (21)</td>
<td>21.43 (6)</td>
<td>12.5 (21)</td>
<td>14.29 (4)</td>
</tr>
<tr>
<td>Fellatio</td>
<td>13.69 (23)</td>
<td>14.29 (4)</td>
<td>25.0 (42)</td>
<td>7.14 (2)</td>
</tr>
<tr>
<td>Manual-penile stimulation</td>
<td>13.69 (23)</td>
<td>7.14 (2)</td>
<td>23.21 (39)</td>
<td>3.57 (1)</td>
</tr>
</tbody>
</table>

Satisfaction with Partner’s Circumcision Status

Men and women participants were analyzed separately on their responses to a number of questions about their own level of satisfaction with their current partner’s circumcision status. All analyses were repeated controlling for the circumcision status of participant’s first partner, the number of sexual partners of each circumcision status they reported, participant’s age, and in the case of men, their own circumcision status. Past experiences and cohort effects did not impact analyses, thus these results are not included here.

Women. Women’s satisfaction with their current partner’s circumcision status was not significantly different between women with a circumcised partner and those with an intact partner ($F(1,166) = 0.01, p = .93$); women with either a circumcised or intact partner rated feeling highly satisfied with their partner’s circumcision status. Women did not differ in ratings of their partner’s circumcision status as a positive ($F(1, 164) = 0.001, p = 0.97$) or negative issue for them ($F(1,165) = .12, p = .73$) regardless of the status of their partner.
Participants were asked to rate their level of satisfaction with their partner’s circumcision status when their partner’s penis was flaccid and when it was erect. Women with circumcised partners were significantly more satisfied with their partner’s circumcision status when flaccid compared to women with intact partners, $F(1, 164) = 5.07, p = .03$, partial $\eta^2 = .03$. However, groups no longer differed in satisfaction ratings with their partner’s circumcision status when their partner was erect, $F(1,166) = .73, p = .39$. Lastly, women were asked to indicate the extent to which they wished their partner was the opposite circumcision status, and women indicated equally low responses to this question, irrespective of partner’s circumcision status, $F(1, 164) = 0.27, p = .61$ (Figure 6.1).

Figure 6.1. Women’s self-reported satisfaction with their partner’s circumcision status

Note. *$p < .05$
Men. Men’s satisfaction with their partner’s circumcision status was not significantly different between men with a circumcised and those with an intact partner ($F(1, 26) = 3.17, p = 0.09$). Men with intact partners rated their partner’s circumcision status as a significantly more positive issue than men with circumcised partners, $F(1, 26) = 7.29, p = .01$, partial $\eta^2 = .22$. Similarly, men rated their partner’s circumcised penis as a significantly more negative issue for them compared to men with intact partners, $F(1,26) = 10.24, p = .004$, partial $\eta^2 = .28$.

Men with intact partners reported that they were significantly more satisfied with their partner’s circumcision status when flaccid ($F(1, 26) = 8.36, p = .008$, partial $\eta^2 = .24$) and when erect ($F(1, 26) = 6.31, p = .02$, partial $\eta^2 = .20$) compared to men with circumcised partners. Lastly, men responded with consistently low rates when asked to indicate the extent to which they wished their partner was the opposite circumcision status, irrespective of their partner’s circumcision status, $F(1, 26) = 1.42, p = .25$ (Figure 6.2).

![Figure 6.2. Men’s self-reported satisfaction with their partner’s circumcision status](image)

*Note. * $p < .05$; ** $p < .01$
Sexual Functioning

**Women.** A logistic regression analysis was conducted to predict partner’s circumcision status using 5 scales of the FSFI (desire, arousal, lubrication, orgasm frequency, and pain) as predictors. The satisfaction subscale was not included in this analysis (see next subsection). A test of the full model against a constant only model was not statistically significant, indicating that the predictors do not distinguish between circumcised or intact sexual partners in the current sample ($\chi^2 = 3.85, p = .57, df = 5$). The logistic regression was repeated controlling for women’s age to assess for a cohort effect, but the pattern of results was unchanged.

Separate one-way ANOVAs were employed with the above mentioned five FSFI subscales as dependent variables, and partner circumcision status (circumcised or intact) as the independent variable to investigate whether women’s sexual functioning differs as a function of their partner’s circumcision status. Analyses were repeated using ANCOVAs to control for women’s age; results did not differ from those reported here, and thus are not included. Women with circumcised and intact partners did not differ significantly on their self-reported responses to the FSFI subscales measuring sexual desire ($F(1, 166) = 1.12, p = .29$), experiences of sexual arousal ($F(1, 166) = 0.21, p = .65$), vaginal lubrication ($F(1, 166) = 0.98, p = .32$), orgasm ease ($F(1, 166) = 0.39, p = .53$) or pain with penetrative intercourse ($F(1, 166) = 1.45, p = .23$; Table 6.5).
Table 6.5

Men’s self-reported satisfaction with their partner’s circumcision status

<table>
<thead>
<tr>
<th></th>
<th>Sexual desire M (SD)</th>
<th>Vaginal lubrication M (SD)</th>
<th>Sexual arousal M (SD)</th>
<th>Orgasm ease M (SD)</th>
<th>Sexual satisfaction M (SD)</th>
<th>Pain with penetration M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C partner</td>
<td>7.09 (2.23)</td>
<td>18.09 (2.96)</td>
<td>17.55 (2.57)</td>
<td>11.91 (3.13)</td>
<td>13.04 (2.46)*</td>
<td>13.04 (2.60)</td>
</tr>
<tr>
<td>I partner</td>
<td>7.42 (1.76)</td>
<td>18.49 (2.09)</td>
<td>17.72 (2.21)</td>
<td>11.61 (3.15)</td>
<td>13.75 (1.69)*</td>
<td>13.75 (1.99)</td>
</tr>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C partner</td>
<td>3.93 (1.49)</td>
<td>11.4 (6.22)</td>
<td>4.5 (1.29)</td>
<td>4.36 (2.10)</td>
<td>4.5 (1.29)</td>
<td></td>
</tr>
<tr>
<td>I partner</td>
<td>3.93 (1.44)</td>
<td>10.27 (4.63)</td>
<td>3.86 (0.86)</td>
<td>4.29 (2.16)</td>
<td>3.86 (0.86)</td>
<td></td>
</tr>
</tbody>
</table>

*Note:* *p* < .05. C = circumcised; I = intact; scales for women indicate subscales from the FSFI, while scales for men indicate IIEF-MSM subscales.

**Men.** A similar logistic regression analysis to the female sample was conducted with the male sample to predict partner’s circumcision status using 4 scales of the IIEF-MSM (desire, erectile functioning, intercourse satisfaction, and orgasm functioning) as predictors. The satisfaction subscale of the IIEF-MSM was not included in this analysis (see next subsection). A test of the full model against a constant only model was not statistically significant, indicating that the predictors do not distinguish between circumcised or intact sexual partners in the current sample ($\chi^2 = 1.15, p = .89, df = 4$). The inclusion of men’s age as a covariate in the logistic regression did not change the pattern of results.

Separate one-way ANOVAs were employed with the aforementioned four IIEF-MSM subscales as dependent variables, and partner circumcision status (circumcised or intact) as the independent variable to investigate whether men’s sexual functioning differs depending on the circumcision status of their partners. Similar ANCOVAs were included to control for men’s age; the pattern of results were unchanged from those reported here. Men’s responses did not differ significantly as a function of partner’s circumcision status for any subscale of the IIEF-MSM, including self-reported sexual desire.
erectile functioning ($F(1, 19) = 0.23, p = .64$), intercourse satisfaction ($F(1, 26) = 2.41, p = .13$), or orgasm functioning ($F(1, 26) = 0.01, p = .98$; Table 6.5).

**Sexual Satisfaction**

**Women.** Women’s scores on the Sexual Satisfaction subscale of the FSFI were compared across partner circumcision status. A one-way ANOVA revealed a significant main effect of circumcision status, $F(1, 166) = 4.51, p = .04$, partial $\eta^2 = .03$ (Table 6.5). Women with intact partners ($M = 13.75, SD = 1.69$) reported significantly higher levels of sexual satisfaction than women with circumcised partners ($M = 13.04, SD = 2.46$). Including women’s age as a covariate produced the same results.

**Men.** Men’s scores on the Overall Sexual Satisfaction subscale of the IIEF-MSM were compared across partner’s circumcision status. A one-way ANOVA revealed a no significant effect of circumcision status on men’s sexual satisfaction, $F(1, 26) = 4.25, p = .05$ (Table 6.5). An ANCOVA controlling for men’s age produced the same results.

**General Preferences for Circumcision Status**

**Women.** To evaluate whether women prefer men with a certain circumcision status for a variety of sexual activities (i.e., vaginal intercourse, anal intercourse, fellatio, and manual-penile stimulation), separate one-sample $t$-tests were conducted. Mean circumcision status preference scores for each sexual activity type was compared to the test-value of 5, which represents no preference for circumcision status. Only women who had experience with the sexual activity in question were included in each analysis.

The sample mean circumcision preference score for vaginal intercourse of 5.78 ($SD = 2.89$) was significantly different from the test-value of 5 ($t(163) = 3.46, p = .001, d = 0.27, 95\% CI [0.33, 1.23]$) in the direction of a preference for a circumcised penis. Cohen’s $d$ indicates a small effect size. The sample mean circumcision preference score for anal intercourse of 5.52 ($SD = 2.95$) was not different from 5 ($t(55) = 1.32, p = .19$). The sample mean circumcision preference score for fellatio of 6.28 ($SD = 3.04$) was significantly different from 5 ($t(161) = 5.38, p < .001, d = 0.42, 95\% CI [0.81, 1.76]$) in the direction...
of a preference for a circumcised penis. Cohen’s $d$ indicates a medium effect. Lastly, the sample mean circumcision preference score for manual-penile stimulation of 5.38 ($SD = 3.19$) was not significantly different from 5 ($t(159) = 1.51, p = .13$). Thus, women in the present sample demonstrated a preference for a circumcised penis when engaging in vaginal intercourse and fellatio, but no preference with respect to circumcision status for anal intercourse or manual-penile stimulation (see Figure 6.3).

**Men.** To evaluate whether men prefer a certain circumcision status for anal intercourse, fellatio, and manual-penile stimulation, separate one-sample $t$-tests were performed. The mean preference score for each sexual activity type (i.e., anal intercourse, fellatio, and manual-penile stimulation) was compared to the test-value of 5, the number representing no preference for circumcision status. Similar to women, men who had not engaged in the given activity were excluded from the analysis.

![Figure 6.3. Women’s circumcision status preference for different sexual activities](image)

*Figure 6.3. Women’s circumcision status preference for different sexual activities*

*Note. * $p < .05$; ** $p < .01$; *** $p < .001$*
The sample mean circumcision preference score for anal intercourse of 3.29 ($SD = 2.42$) was significantly different from 5 ($t(27) = 3.75, p = .001, d = 0.71, 95\% CI [-2.65, -0.78]$) in the direction of a preference for an intact penis. Cohen’s $d$ indicates a large effect size. Similarly, the sample mean circumcision preference score for fellatio of 3.32 ($SD = 3.12$) was significantly different from 5 ($t(27) = 2.85, p = .008, d = 0.54, 95\% CI [-2.89, -0.47]$) in the direction of a preference for an intact circumcision status. Cohen’s $d$ indicates a medium effect size. Finally, the sample mean circumcision preference score for manual-penile stimulation of 2.50 ($SD = 2.62$) was also significantly different from 5 ($t(27) = 5.05, p < .001, d = 0.95, 95\% CI [-3.52, -1.48]$) in the direction of a preference for an intact circumcision status. Cohen’s $d$ indicates a large effect size (Figure 6.4).

![Figure 6.4](image)

*Note.* $^* p < .05; ^{**} p < .01; ^{***} p < .001$
Beliefs about Circumcision Statuses

We tested whether women and men believe circumcision status matters on a number of different factors by indicating which circumcision status (intact, circumcised, or no difference) was best described by a series of statements (e.g., “The most hygienic circumcision status is…”). Chi-squared analyses were conducted for women and men to compare whether there was a significant difference between the number of participants who indicated “no difference” compared to those who chose one circumcision status or another. Significant analyses were followed-up to determine which circumcision status was more commonly attributed to a certain statement (Figures 6.5 and 6.6).

Women. There was a significant difference in the number of women who indicated circumcision status makes no difference compared to those who indicated circumcision status does make a difference on the following attributions: hygiene, cleanliness, social norm, more common in their country, more common for their age group, natural, attractive, provides more pleasure during anal intercourse, pleasurable to touch, reduced STIs, preference for men, and preference for female partners of men. Women indicated a belief that circumcised penises were more: hygienic ($\chi^2 = 86.74, p < .001, df = 1$), clean ($\chi^2 = 73.49, p < .001, df = 1$), socially normative ($\chi^2 = 50.74, p < .001, df = 1$), common in their country ($\chi^2 = 47.32, p < .001, df = 1$), common for their age group ($\chi^2 = 60.47, p < .001, df = 1$), attractive ($\chi^2 = 41.95, p < .001, df = 1$), pleasurable to touch ($\chi^2 = 8.82, p = .003, df = 1$), likely to lower risk of STIs ($\chi^2 = 32.97, p < .001, df = 1$), and that they are more preferred by men themselves ($\chi^2 = 4.96, p = .03, df = 1$) as well as female sexual partners of men ($\chi^2 = 71.05, p < .001, df = 1$). Women indicated that intact penises were more natural ($\chi^2 = 108.7, p < .001, df = 1$), and they indicated that circumcision status makes no difference for pleasure during anal sex ($\chi^2 = 30.03, p < .001, df = 1$). Women did not indicate that circumcision status was relevant for the following beliefs: most erotic, most pleasurable during vaginal intercourse, most interesting, and most preferred by male sexual partners of men.
Men. There was a significant difference in the number of men who indicated that circumcision status
does versus does not matter on the following belief statements: social norm, common for their country,
common for their age group, erotic, natural, attractive, pleasurable to touch, and interesting. Men
indicated that circumcised penises were more common in their country ($\chi^2 = 5.26, p = .02, df = 1$) and
they indicated a belief that intact penises are more: natural ($\chi^2 = 23.15, p < .001, df = 1$), attractive ($\chi^2 =
5.00, p = .03, df = 1$), pleasurable to touch ($\chi^2 = 14.72, p < .001, df = 1$), erotic ($\chi^2 = 7.2, p = .007, df = 1$),
and interesting ($\chi^2 = 18.18, p < .001, df = 1$). Men in the present sample did not significantly differ in
whether they believed circumcised or intact penises to be the social norm ($\chi^2 = 2.01, p = .08, df = 1$) or
more common for their age group ($\chi^2 = 0.73, p = .39, df = 1$). Men did not indicate that circumcision
status was relevant for the following beliefs: most hygienic, most clean, most pleasurable for vaginal or
anal intercourse, offers a reduction against STIs, is preferred by men, or is preferred by female or male
sexual partners of men.

Figure 6.5. Women’s beliefs about circumcision status

*Note. $* p < .05; ** p < .01; *** p < .001
Figure 6.6. Men’s belief about circumcision status

Note. * $p < .05$; ** $p < .01$; *** $p < .001$

Discussion

Summary of Findings

This study was an exploratory examination into the impact of men’s circumcision status on their sexual partners with a specific focus on sexual functioning, sexual satisfaction, general preferences for circumcision status, and beliefs about circumcision status. Circumcision status did not appear to impact sexual functioning for women or men who participated in the current study, and while sexual satisfaction remained similar between men with intact and circumcised partners, women with intact partners reported higher levels of sexual satisfaction. Women with circumcised partners reported higher levels of satisfaction with their partner’s circumcision status as compared to those with intact partners only when their partner’s penis was flaccid. Conversely, men with intact partners rated higher level of satisfaction with their partner’s circumcision status on multiple domains. Despite differences in satisfaction across
circumcision status, women and men rated overall high levels of satisfaction with their partner’s circumcision status and did not wish for it to change. With respect to partner’s preferences and beliefs about circumcision status, women’s responses suggested that they favoured circumcised penises for vaginal intercourse and manual-penile stimulation, and that they held more positive beliefs about circumcised penises. In contrast, men’s responses indicated a strong preference for intact penises for all sexual activities, and also held more positive beliefs about intact penises.

**Satisfaction with Partner’s Circumcision Status**

We explored the importance of circumcision status within the context of a sexual relationship by assessing women and men’s satisfaction with their current partner’s circumcision status. Within the current sample, women with circumcised partners indicated higher levels of satisfaction with their partner’s circumcision status compared to women with intact partners only when their partner was flaccid. When erect, circumcision status is difficult to distinguish, as the foreskin of an intact penis is retracted to expose the glans, similar to a circumcised penis. Presumably, women with intact partners expressed slightly less satisfaction relative to women with circumcised partners in response to the increased visibility of their partner’s foreskin when flaccid. In contrast, men with intact partners reported consistently higher levels of satisfaction with their partner’s circumcision status compared to those with circumcised partners. The effect sizes observed in the male sample for significant analyses were larger than the effect size of the significant group difference in the female sample, although significant effect sizes in the male sample were small to moderate. It is unclear why gender differences in satisfaction with partner circumcision status emerged in the current sample.

Perceptions of body and genital image have been tied to sexual functioning and quality of life in women, and men – particularly gay identified men (e.g., Berman, Berman, Miles, Pollets, & Powell, 2003; McCreary & Sadava, 2001; Peplau, Frederick, Yee, Maisel, Lever, & Ghavami, 2009; see also Weiderman, 2012). Partners undoubtedly play a role in individual’s perceived body image; however,
research to date has not directly explored how a sexual partner’s perceptions of one’s body/genitals impact the other person’s body image. The results of the current study suggest that women and men consider circumcision status when appraising their partner’s genitals. It is important to note that although levels of satisfaction varied with the circumcision status of women and men’s sexual partners, participants rated consistently high overall satisfaction with their partner’s circumcision status and low levels of desire for their partner to be the opposite circumcision status, irrespective of their partner’s actual circumcision status. Women and men’s patterns of response indicate that partner circumcision status is likely to have minimal impact on the overall relationship. Furthermore, controlling for past experience with different circumcision statuses or the male participant’s own circumcision status did not impact outcomes, thus the current study provides no evidence that familiarity with a particular circumcision status impacts satisfaction with the circumcision status of one’s partner. Future research should explore the impact of partner’s satisfaction with one’s circumcision status on men’s perception of their overall body image, their sexual functioning, quality of life, and relationship functioning.

**Sexual Functioning and Satisfaction**

A largely untested argument in the circumcision literature is whether the sexual functioning of men’s partners is differentially effected by circumcision status. The rationale for this hypothesis typically centers on the presence or absence of the mobile sheath of skin (i.e., the foreskin). For example, O’Hara and O’Hara (1999) hypothesize that the foreskin reduces friction during penetration, resulting in fewer vaginal/anal abrasions for the receptive partner. Findings from the current study offer no support for the hypothesis that foreskin (or the lack thereof) impacts sexual functioning for female or male partners of men, which is inconsistent with previous research (Frisch et al., 2011; O’Hara & O’Hara, 1999). The current study offers methodological advantages over previous studies. Most notably, the current study employs the use of standardized measures of sexual functioning for women and men; previous research has relied on responses to single questions to assess different aspects of sexual functioning, such as ease
of orgasm or vaginal lubrication. Furthermore, this is the first paper to our knowledge that includes a male sample in the assessment of circumcision status’ impact on sexual functioning.

The sexual satisfaction subscale of the FSFI and IIEF-MSM was analyzed separately to explore the specific hypothesis that self-reported sexual satisfaction will differ based on partner’s circumcision status. Only women differed in their ratings of sexual satisfaction, such that women with intact partners reported higher levels of sexual satisfaction compared to those with circumcised partners. The observation that women with intact partners endorsed higher sexual satisfaction ratings on the FSFI is interesting, considering that women’s responses to other subsections of this survey indicated a preference for circumcised penises (e.g., higher self-report satisfaction with their partner’s flaccid penis compared to women with intact partners, higher preference for circumcised penis during some sexual activities, more positive beliefs about circumcised penises). It is possible that the presence of foreskin provides some benefits to sexual satisfaction outside of the domains assessed by the FSFI. Additional research is required to clarify the nuanced role of foreskin in sexual intercourse and partner enjoyment/sexual satisfaction, particularly among women.

**General Preferences for Circumcision Status**

To further explore the role of circumcision status on the sexual lives of men’s sexual partners, we tested the hypothesis that individuals will demonstrate differential preferences for circumcision status depending on the sexual activity. Indeed, women and men demonstrated circumcision status preferences for a range of sexual activities, and gender differences in these patterns emerged. Women reported a small to medium preference towards circumcised partners for vaginal intercourse and fellatio, but preference for anal intercourse or manual stimulation of her partner’s genitals did not reach significance (although they were in the direction of a preference for circumcised partners as well). Men, conversely, showed a large preference toward intact partners for anal intercourse, fellatio, and manual stimulation of his partner’s genitals. This pattern of response is consistent with participant’s ratings of satisfaction with their partner’s
circumcision status, in that women show some preference to circumcised penises, while men demonstrate a much stronger preference to intact penises.

Previous research has hypothesized that sex with an intact penis would be more enjoyable for men’s sexual partners due to the mobility of the foreskin (e.g., O’Hara & O’Hara, 1999); findings from the present study support this hypothesis for men – who expressed a strong preference for sex with intact partners – but not for women. Research has demonstrated that sexual practices in MSM populations differ slightly based on men’s circumcision status; circumcised men have been shown to engage in a wider range of sexual activities than intact men (Laumann, Masi, & Zuckerman, 1997), and are more likely to engage in receptive anal sex (Mao, Templeton, Crawford, Imrie, Prestage, Grulich, Donovan et al., 2008). Richters and colleagues (2006), in contrast, found no differences in men’s self-reported sexual practices with women across circumcision status in a group of men recruited from Australia, although circumcised men reported more liberal sexual attitudes. The current study contributes to the literature, suggesting that circumcision status may be related to sexual practices of individuals or couples. Women’s reported preference for some sexual activities with circumcised partners is consistent with the results of Williamson and Williamson’s (1988) study indicating that, in a small sample from the United States, women preferred sexual activities with circumcised men. The present study is unique in that it is the first to demonstrate a distinct preference for sex with intact men in a sample of MSM; however, the rationale behind this finding cannot be gleaned from the current study. Future research should employ qualitative research methods to explore variables that factor into individual’s self-reported circumcision status preference for sexual acts; for example, exploring whether previous experiences (e.g., total number of sexual partners, amount of experience with each circumcision status) plays a role in future preference for either circumcision status. Experimental methodology may contribute to the understanding of circumcision status on the sexual lives of men and their partners by directly testing the hypothesized impact foreskin is said to have on sexual functioning. Empirical studies could explore physiological consequences of sex with intact or circumcised men, such as whether maintenance of vaginal lubrication
during penetrative intercourse varies with partner circumcision status, or whether the presence of a mobile foreskin does, in fact, reduce the likelihood of dermal abrasions during vaginal or anal intercourse.

**Beliefs about Circumcision Status**

The existence of multiple organizations both against (e.g., Intactivists, Intact America, Canadian Foreskin (CFAP) Awareness Project, National Organization of Circumcision Information Resource Centers (NOCIRC)) and in favour (e.g., Circinfo.net, Circlist) of male circumcisions evidences that at least some members of the public hold strong beliefs about circumcision. The current study attempts to quantify some publically regarded beliefs about circumcision status in a sample of women and men.

Consistent with results reported in this paper, women and men differed in their beliefs about circumcision status; women considered circumcision status relevant to a larger number of facets compared to men, and overall, women typically attributed more positive beliefs to circumcised penises while men attributed more positive beliefs to intact penises. Past research suggests that North American women evaluate circumcised penises more favorably (e.g., more pleasant to touch, cleaner, look sexier; Williamson & Williamson, 1988), but studies on circumcision beliefs have typically not included MSM samples.

Gender differences were observed on all belief domains, including those assessing health, social norms, and sexuality. For example, women attributed more positive health-related aspects of male genitalia to circumcised penises (e.g., they are more hygienic, cleaner, and have lower risk of contracting an STI) compared to men, who indicated circumcision status was not relevant for any of these health factors. Women’s endorsement of circumcised penises as socially normative and men’s endorsement of intact penises as normative may be attributable to cohort differences in the present sample; men and their partners were significantly older than the female sample, and thus potentially represent different prevalent circumcision practices over time (e.g., Nelson, Dunn, Wan, & Wei, 2005). Decreasing rates of neonatal circumcision in Canada and the US since the 1970s mean that one would expect the younger sample of women to report intact penises as more representative of the population; however, rates of circumcision
are known to vary widely by region and ethnicity, which are factors we did not assess in the current sample. Unfortunately, we are unable to directly assess whether the observed results in the current study can be attributed to a cohort effect. Similar gender differences were observed with respect to belief statements about sexual aspects of circumcision; once again, women demonstrate a clear preference for circumcision, while men prefer intact penises. Perhaps gender differences in attitudes towards circumcision status impact responses to previous sections in the current survey, or vise versa. Unfortunately, we are unable to infer directionality from the observational nature of the questions asked in the current study. Future research should employ experimental designs in order to assess the role that beliefs about circumcision status plays on the sexual lives of men and their sexual partners.

Limitations

The purpose of this paper was to offer an exploratory investigation of circumcision status as it applies to the sexual partners of men. Although this study offers some unique methodological strengths over past research, such as the inclusion of a male sample, utilization of empirically validated measures, and assessment of variables regarding circumcision that have not yet been explored (e.g., satisfaction, personal beliefs), this research is not without limitations. The current study design relied on self-report, which introduces the likelihood of responder bias, as well as errors in responding. For example, Stoner and colleagues (2003) observed 6 out of 15 women recruited for a study on perception of partner’s risky sexual behaviour misidentified their partner’s circumcision status, which was later confirmed by physician examination. The reliance on participant’s recall of past partner’s circumcision status is a shortcoming of the current study. Future research should consider confirming partner’s circumcision status by recruiting the partners themselves, or through the use of a physician; however, it would not be feasible to confirm circumcision status for all past partners, and thus adequate statistical measures should be taken (e.g., ensuring sufficient statistical power) in order to account for potential errors in responding.
Another methodological shortcoming of the current study is the relatively small sample size of MSM surveyed ($n = 28$). Due to the small sample size, the results reported for this subsample should be considered preliminary, and consequently interpreted with caution. Future research should aim to replicate the findings presented in this paper using a larger sample of MSM. However, the sample of men included was diverse with respect to the demographic variables assessed; for example, the MSM’s sample age range is larger than that observed in the female sample. Further, many of the effect sizes observed in the male sample were of a size that suggests the findings were robust. Therefore, the results pertaining to the MSM sample reported in current study provides a valuable contribution to the circumcision literature because it is the first study—to our knowledge—to explore the impact of circumcision status on a sample of men who have sex with men.

Although we observed a number of interesting effects within this paper, we are unable to infer causation behind such findings. Future research exploring the impact of circumcision status on men’s sexual partners should employ experimental designs or qualitative methods in order to develop a greater understanding of the factors underlying participant’s responses. Particular attention should be paid to the observed gender differences, as well as the role of attitudes towards circumcision status on study outcomes.

**Conclusions**

This study suggests that a man’s circumcision status plays a role in the sexual life of his current partner, and this role differs depending on the gender of that partner. This exploratory study demonstrated a general preference for circumcised penises in the female sample recruited, and a preference for intact penises in the male sample. Irrespective of individual’s opinions about circumcision status, the presence or absence of foreskin does not appear to impact sexual functioning for women or men, although women with intact partners did report significantly higher levels of sexual satisfaction compared to women with circumcised partners. Furthermore, women and men reported overall high satisfaction with their partner’s
genitals, and overwhelmingly reported that they did not wish for a change in their partner’s circumcision status.
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Chapter 7

General Discussion

This research explored the sexual correlates of neonatal circumcision through a review of the current state of the circumcision literature (Chapter 2), with a focus on sexual outcomes associated with the procedure, as well as four empirical studies (Chapters 3-6). The first two studies (Chapter 3 and 4) took place in the laboratory, and assessed for differences in penile sensitivity and genital response across circumcision status with the use of psychophysical and psychophysiological methodologies. Chapter 3 assessed penile sensitivity using quantitative sensory testing to explore tactile, pain, warmth detection, and heat pain thresholds in two samples of young, healthy adult men (those who had undergone neonatal circumcision, and those who had not (i.e., they were intact)). Sensory thresholds were assessed on the glans penis, the midline shaft, an area proximal to the midline shaft, the foreskin (if applicable), and a control site (the volar surface of the forearm). Chapter 4—using a similar sample of circumcised and intact men—assessed men’s sexual response genitally (using the LDI) and subjectively (using continuous as well as discrete self-reported change scores) while watching erotic audio-visual stimuli. We also compared a number of self-reported variables across groups, including urological health, sexual health, sexual functioning, and attitudes towards one’s circumcision status. These first two studies are important because they explore the popularized—but largely untested—hypothesis that circumcision results in a significant reduction in penile sensitivity, which, in turn, leads to impairment in sexual functioning. The third and fourth studies were conducted online; these survey studies assessed attitudes about circumcision status held by men (Chapter 5) and their sexual partners (Chapter 6), as well as the subsequent impact of these beliefs on the attitude-holder’s sexual lives. The major findings from these five chapters are summarized below, followed by a discussion of the major themes and implications of these findings.
In Chapter 2, the existent research on circumcision was reviewed, with the aim of highlighting important gaps in the literature—most notably—related to the sexual correlates of circumcision (Bossio, Pukall, & Steele, 2014). First, a review was conducted of the foundational research used by the American Academy of Pediatrics in the most recent public policy statement endorsing neonatal circumcision in the United States (Blank et al., 2012). Here it is argued that public policy makers need to carefully consider whether health research on circumcision is applicable to the North American populations that these policies are intended to inform, and further, to consider whether more cost-effective alternatives to circumcision may exist (e.g., education on proper condom use). Next, lack of high-quality research exploring the sexual outcomes associated with neonatal circumcision is highlighted. Three recommendations are made for the direction of future research on the sexual outcomes of circumcision: First, research needs to employ high-quality methodologies (e.g., objective measures, validated questionnaires, healthy samples of men), both to improve on the experimental design of the extant literature, and to counteract experimenter bias that has been noted in the circumcision literature (e.g., Van Howe, 2007). Second, the impact of neonatal circumcision on penile sensitivity and sexual response should be tested directly using psychophysical or psychophysiological methods. Third, psychosocial factors related to circumcision on men and their (female and especially male) sexual partners should be considered. The review ends by urging public policy makers to shift from the current strict health focus towards a more inclusive, multidimensional picture of circumcision. The empirical studies performed in subsequent chapters of this dissertation aim to address some of the gaps in the circumcision research highlighted within the review in Chapter 2.

The results from Chapter 3 provided no evidence to support the notion that men who were circumcised neonatally experience lower or impaired penile sensitivity as compared to intact men. No between-group differences emerged with respect to thresholds for touch, pain, warmth sensation, or heat pain at any site tested. Failure to find between-group differences in sensitivity thresholds at the glans penis suggests that the current sample of circumcised men did not experience desensitization due to the
keratinization of their permanently exposed glans penis. With respect to the sensitivity of the foreskin, there was insufficient evidence to suggest that it is the most sensitive (and thus most sexually “relevant”) region of the penis. Similar to previous research (Sorrells et al., 2007), lower thresholds were observed (i.e., higher sensitivity) to fine-touch stimuli at the foreskin compared to the other sites tested, but this finding was not replicated during the pain, warmth sensation, or heat pain testing protocols. Sorrells and colleagues (2007) interpreted the foreskin’s sensitivity to fine-touch as an indicator that the most sensitive part of the penis is removed during circumcision, which, in turn, is likely to confer negative consequences to sexual functioning. However, recent histological findings implicate C-fibers (activated by pain and thermal stimuli) in erotic sensation, not A-fibers (activated by fine-touch). As the foreskin was not more sensitive to stimuli intended to activate C-fibers in the current study (e.g., pain or thermal stimuli), it is unlikely that removal of the nerve fibers in the foreskin during circumcision is detrimental to sexual functioning; however, future research is needed to directly link histological findings, psychophysical findings, and men’s self-reported experience of erotic sensation at different sites of the genitals. Replication of this study is needed with pain and heat pain stimuli that can reach a higher maximum intensity, as the pain and heat pain results from this study represent a lower-bound estimate of men’s actual pain thresholds. Additionally, extension of these findings to include a broader age range may shed light on the role of age (a documented confounding variable; Bleustein, Fogarty, Eckholdt, Arezzo, & Melman, 2005) in circumcision and penile sensitivity. In summary, these findings suggest that—if differences do exist in men’s sexual functioning across circumcision status—these differences are unlikely to be the result of sensitivity differences in penile sensitivity.

Chapter 4 examined sexual response in a sample of healthy circumcised and intact men. This study employed the use of laser Doppler imaging (LDI), a novel, non-invasive tool that—unlike previous psychophysiological measures of sexual arousal—allows for the direct assessment of genital blood flow. As this study is the first to utilize LDI in a male sample, findings confirm that it is a valid measure of sexual arousal in men. Sexual response—assessed genitally and subjectively—did not differ significantly

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between circumcised and intact men. Further, the two groups of men did not differ significantly on any additional aspects of their sexual lives assessed, including urological history, sexual history, sexual functioning, or attitudes about their circumcision status. This study offers a unique exploration of the impact of circumcision on sexual functioning, as—unlike previous research that typically recruits adult men undergoing circumcision to correct pre-existing medical or sexual problems—we recruited a sample of healthy men that were either circumcised neonatally, or never circumcised (intact). The between-subject study design eliminated many possible confounding variables introduced by adult circumcision (e.g., participant expectations, self-selected sample, pre-existing sexual complaints, dissatisfaction with one’s circumcision status). Thus, the results of Chapter 4 do not support the assertion that circumcision performed in infancy is related to long-term impacts on sexual response, the subjective experience of sexual response, or the sexual lives of healthy men.

Chapter 5 is the first study—to our knowledge—to empirically demonstrate the importance of men’s attitudes towards their own circumcision status, and the potential implications of such attitudes on their sexual lives. In response to questions assessing attitudes towards their own circumcision status, men who participated in this online study reported either a neutral stance towards their circumcision status (“neither satisfied or dissatisfied”), or a polarized stance towards it (“extremely satisfied” or “extremely dissatisfied”). The largest proportion of circumcised men who completed this survey indicated that they were extremely dissatisfied with being circumcised, while the largest proportion of intact men indicated they were extremely satisfied with being intact. The best predictors of circumcision status in the current sample—after controlling for men’s opinions towards the appearance of their penis more generally—indicated that the more time spent thinking about one’s circumcision status, and the happier they are with their circumcision status, the less likely they are to be circumcised.

Men who were dissatisfied with their circumcision status reported lower body image (on a measure of genital image, body image during sexual activities, and body image in general), and lower sexual functioning; this finding was irrespective of men’s actual circumcision status. In fact, satisfaction
with one’s circumcision status was a better indicator of whether a man was circumcised or not when compared to either body image or sexual functioning. Orgasm functioning, though, did remain a significant predictor of circumcision status after controlling for attitude (however, it was substantially less powerful than the attitude variable). Interestingly, men’s attitudes towards their circumcision status were substantially different than the same attitudes reported by men in Chapter 4; this disparity is likely due to a selection bias in the sample that participated in Chapter 5. That is, it is likely that men with more polarized opinions about their circumcision status—in particular, men who are dissatisfied with having been circumcised—may have been more motivated to complete the survey than men who are not substantially impacted by their circumcision status. Thus, future research would benefit from assessing attitudes towards circumcision status in a nationally representative sample. Findings from this study highlight the importance of attitudes towards one’s circumcision status, in particular, the potential for negative sexual consequences for men who are unhappy with their circumcision status. The sample that these conclusions are drawn from is not representative; thus, the reported results cannot necessarily be applied to the population at large. However, these results draw attention to a group of men for whom neonatal circumcision is associated with poor long-term outcomes, and thus provides insight into a subpopulation of men whom the circumcision literature would be remiss to ignore. Possible clinical implications follow from these findings.

Chapter 6 extended on the research from Chapter 5 to examine attitudes towards circumcision status held by the sexual partners of men (Bossio, Pukall, & Bartley, 2015). Women and men who reported being in a sexual relationship with a man for a minimum of 3 months completed an online survey. Distinct gender differences emerged in the sample, such that women demonstrated an overall preference for circumcised partners, and men indicated an overall preference for intact partners. The preference demonstrated by men was stronger than that demonstrated by women. Furthermore, women reported holding more positive beliefs about circumcised men, while men endorsed more positive beliefs about intact men. Interestingly, despite distinct preferences for a particular circumcision status among the
female and male participants, sexual functioning did not differ as a function of the partner’s actual circumcision status (i.e., partners of circumcised and intact men reported significantly equivalent levels of sexual functioning). Additionally, women and men reported feeling high levels of satisfaction with their partner’s circumcision status, and they did not want their partner to change their circumcision status, irrespective of what circumcision status their partner was. These findings were not explained by cohort effects, participants’ past sexual experiences, familiarity with a particular circumcision status, or—in the case of men—one’s own circumcision status. Researchers have hypothesized that the mobile sheath of the foreskin confers sensory benefits for men’s sexual partners (O’Hara & O’Hara, 1999; Williamson & Williamson, 1988), but the findings from this study do not support this idea, as the results indicated no significant differences in sexual functioning across partners of circumcised and intact men. The gender differences observed in this study implicate cultural or social influences in the development of attitudes towards circumcision status. Future research is required to expand upon these findings to include a larger sample in order to assess the applicability of these findings to the greater North American population.

In summary, the current research program suggests that neonatal circumcision is associated with minimal long-term impacts on penile sensitivity and genital response in healthy men. Although some obvious anatomical differences exist across circumcised and intact men (e.g., the glans penis of circumcised men are typically exposed, circumcised men have less sensory receptors than intact men by virtue of having had their foreskin removed), the impact of these anatomical differences likely do not have a significant impact on the sexual lives of these men. Findings from this multidimensional research program suggest that documented between-group differences in circumcision research (e.g., self-reported sexual functioning) may—at least in part—be due to attitudinal differences between the groups. Indeed, it appears that one’s attitude towards one’s circumcision status is—in some cases—a more important predictor of sexual outcomes than one’s actual circumcision status. Furthermore, attitude towards one’s circumcision status was also identified as a distinguishing factor between female and male partners of men. Although attitudes towards circumcision status differ between women and men who have sex with
men, a man’s circumcision status is not likely to impact the sexual functioning of their partner, and overall, women and men report high levels of satisfaction with their partner’s circumcision status, irrespective of their partner’s actual circumcision status.

Another novel and important finding from this research program suggests that at least a subset of men who have been neonatally circumcised may run a higher risk of negative sexual outcomes associated with their circumcision status than intact men. We found a large proportion of circumcised men in Chapter 5 who reported that they were extremely dissatisfied with their circumcision status. Although the sample recruited was self-selected and thus not representative of the overall population, the number of circumcised men who reported feeling distressed by their circumcision status was noteworthy, as lower satisfaction with one’s circumcision status was predictive of worse sexual outcomes, such as body image and sexual functioning. It is possible that dissatisfaction among some neonatally circumcised men may be attributable—in some way—to a “lack of choice” on the matter of their circumcision status. That is, it is much easier for an intact man to change his circumcision status in adulthood than a circumcised man. Future research is needed to better understand this previously unstudied group of men who are dissatisfied with their circumcision status. Most importantly, research should aim to determine the prevalence rates of men who experience long-term negative psychosocial consequences of neonatal circumcision, as this information would be valuable to circumcision policy makers. Clinical implications may follow from these findings, as psychological interventions aimed at reducing distress related to one’s circumcision status may lead to overall improvements to sexual functioning or satisfaction in this sample of men.

The prevalence of pro- and anti-circumcision organizations highlights the polarized and oftentimes emotional nature of the circumcision debate. The link between circumcision and cultural or religious beliefs run deep, and is further complicated by the sexual implications of this surgical procedure. Given the high prevalence of circumcision—particularly within North America—a thorough and unbiased exploration of the topic is important. Unfortunately, a great deal of the circumcision literature is wrought with researcher biases (for an example, see Van Howe (2015) for a discussion of a bias in the
circumcision and STI research). As highlighted in Chapter 2, circumcision research needs to move towards empirically sound, methodologically rigorous research designs—particularly those including objective, as opposed to self-report measures—in order to reduce the impact of experimenter biases of research findings. Further, knowledge dissemination is a critical aspect for increased public awareness regarding the procedure, and a step towards reducing the impact of popular, albeit unfounded beliefs about circumcision (for example, that circumcision reduces penile sensitivity). An important first step in knowledge dissemination involves providing parents of infant males with unbiased, empirically supported information about circumcision (e.g., proper cleaning techniques, prevalence rates, the impact on sexual functioning and penile sensitivity) in order to aid in their decision-making. Thus, improving the quality of research on neonatal circumcision, and focusing on knowledge dissemination targeted at parents of infant males—as well as health care professionals—can be expected to have a profound, long-term positive impact on men and their sexual partners.

In closing, this research program demonstrates that circumcision status can be an important variable in determining healthy sexual outcomes in the sexual lives of men and their partners, although the role of circumcision appears to be more attitudinal than physiological. Public policy statements need to include sexual correlates—especially attitude—in future policy statements related to circumcision status. As with all surgical procedures, there are benefits as well as risks to circumcision. Psychosocial risks should be given equal weighting to physical complications in the decision to circumcise, be it on the individual level, or the level of public policy. Public policy would benefit from a multidimensional approach when assessing the literature on neonatal circumcision. Further, a shift towards reducing experimental bias in the field of circumcision research and a focus on knowledge dissemination are important next steps. Findings from this study are intended to inform public policy, and help inform individual stakeholders, including medical professionals, parents of infant children, as well as men and the sexual partners of men.
References


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June 1st, 2015
Jennifer Bossio
Ph.D. Candidate
Queen's University

Dear Ms. Bossio,

In response to your request, on behalf of The Canadian Journal of Human Sexuality (CJHS), I grant you permission to include/reproduce your article "You either have it or you don't: The impact of male circumcision status on sexual partners", accepted for publication in Vol. 24, No.2 of CJHS, in your Ph.D. dissertation.

Best,

Alex McKay, Ph.D.
Managing Editor/ The Canadian Journal of Human Sexuality
Executive Director/ Sex Information and Education Council of Canada (SIECCAN)/ http://www.sieccan.org/
416-466-5304
Appendix B

Health Sciences Research Ethics Board (HSREB) Approval

QUEEN'S UNIVERSITY HEALTH SCIENCES & AFFILIATED TEACHING HOSPITALS RESEARCH ETHICS BOARD
December 06, 2012

Ms. Jennifer Bossio
Department of Psychology
Queen’s University

Dear Ms. Bossio,

Study Title: PSYC-130-12 The effects of circumcision on sexual functioning and sensitivity in men
Co-Investigators: Dr. S. Steele and Dr. C. Fucik
Full Board Meeting Date: November 12, 2012

The members of the Queen’s University Health Sciences & Affiliated Teaching Hospitals Research Ethics Board have examined the revised protocol, revised telephone screening form, revised interview questions, IIEF-15 questionnaire, quality sensory testing questions, arousal questionnaire – pre-film and post-film, revised recruitment notices, emails and advertisements, revised debriefing form, resource list, budget summary table, payment confirmed form and the revised information and consent form for your project (as stated above) and consider it to be ethically acceptable. This approval is valid for one year from the date of this letter. Please attend carefully to the following list of ethics requirements you must fulfill over the course of your study:

Reporting of Amendments: If there are any changes to your study (e.g. consent, protocol, study procedures, etc.), you must submit an amendment to the Research Ethics Board for approval.

Reporting of Serious Adverse Events: Any unexpected serious adverse event occurring locally must be reported within 2 working days or earlier if required by the study sponsor. All other serious adverse events must be reported within 15 days after becoming aware of the information.

Reporting of Complaints: Any complaints made by participants or persons acting on behalf of participants must be reported to the Research Ethics Board within 7 days of becoming aware of the complaint. Note: All documents supplied to participants must have the contact information for the Research Ethics Board.

Annual Renewal: Prior to the expiration of your approval (which is one year from the date of the Chair’s signature below), you will be reminded to submit your renewal form along with any new changes or amendments you wish to make to your study. If there have been no major changes to your protocol, your approval may be renewed for another year.

Yours sincerely,

Chair, Research Ethics Board

Study Code: PSYC-130-12 Romeo #6007568

Investigators please note that if your trial is registered by the sponsor, you must take responsibility to ensure that the registration information is accurate and complete.
The membership of this Research Ethics Board complies with the membership requirements for Research Ethics Boards and operates in compliance with the Tri-Council Policy Statement; Part C Division 5 of the Food and Drug Regulations; OHRP, and U.S. DHHS Code of Federal Regulations Title 45, Part 46 and carries out its functions in a manner consistent with Good Clinical Practices.

Federalwide Assurance Number: #FWA00004184, #IRB00001173

Current 2012 membership of the Queen's University Health Sciences & Affiliated Teaching Hospitals Research Ethics Board:

Dr. A.F. Clark, Emeritus Professor, Department of Biochemistry, Faculty of Health Sciences, Queen's University (Chair)

Dr. H. Abdollahi, Professor, Department of Medicine, Queen's University

Dr. R. Brison, Professor, Department of Emergency Medicine, Queen’s University

Dr. C. Cline, Assistant Professor, Department of Medicine, Director, Office of Bioethics, Queen's University, Clinical Ethicist, Kingston General Hospital

Dr. M. Evans, Community Member

Dr. S. Horgan, Manager, Program Evaluation & Health Services Development, Geriatric Psychiatry Service, Providence Care, Mental Health Services, Assistant Professor, Department of Psychiatry

Ms. J. Hudaciu, Community Member

Dr. B. Kisilevsky, Professor, School of Nursing, Departments of Psychology and Obstetrics and Gynaecology, Queen’s University

Dr. J. MacKenzie, Pediatric Geneticist, Department of Paediatrics, Queen's University

Ms. D. McNaughton, Community Member

Ms. P. Newman, Pharmacist, Clinical Care Specialist and Clinical Lead, Quality and Safety, Pharmacy Services, Kingston General Hospital

Ms. S. Rohland, Privacy Officer, ICES Queen's Health Services Research Facility, Research Associate, Division of Cancer Care and Epidemiology, Queen’s Cancer Research Institute

Dr. B. Simchison, Assistant Professor, Department of Anesthesiology and Perioperative Medicine, Queen's University

Dr. J. Tang, Medical Resident, Department of Emergency Medicine, Queen's University

Ms. W. Weisbaum, L.L.B. and Adjunct Instructor, Department of Family Medicine (Bioethics)
Appendix C

Advertisements for In-Lab Study

Male Sexual Arousal Study

Queen’s University Department of Psychology needs healthy men aged 18-35 to participate in a research study.

Study Procedures:
- Short questionnaires about physical and sexual health and body image.
- Blood flow imaging of the genital region while watching different films, including sexually explicit films.
- Sensory testing of your forearm and genital region.

Participation will take approximately 3 hours and all information is strictly confidential.

***Nominal Compensation Provided ***

Interested?
For more information, please contact the Sexual Health Research Lab
(613) 533-3276
SHRL@queensu.ca

Investigators: Igor Rossio, M.Sc., Caroline Pukall, Ph.D., and Stephen Steele, M.D.
Are you a man between 18 and 40 years of age?

We're studying various aspects of male health and sexuality.

CLICK HERE TO LEARN MORE ABOUT OUR STUDIES
Appendix D

Telephone Screening Interview

Date of call: __________________________ Called participant: _____ Participant called: _____

1. How did you hear about this study?

☐ Newspaper ad: Which one? ___________________________________________
☐ Poster: Where? _____________________________________________________
☐ Word of mouth
☐ Physician’s office
☐ Other: How? ______________________________________________________

Study information

Study information

I am first going to tell you a bit about why this research is being done and then explain in detail exactly what your participation entails. Please interrupt if you have any questions. Also, please be advised that this telephone screening takes about 20 minutes and contains some questions of a sensitive nature. Would you like to continue at this time with the screening? YES   NO^ (^ if prefer a different time, record date and time for next call: ________________)

Circumcision refers to the surgical removal of the penile foreskin, and is one of the most commonly performed surgical procedures world-wide. The purpose of this study is to investigate differences between adult men who have been circumcised compared to men who have not been circumcised, including differences in sexual functioning and penile sensitivity, among other factors.

Your participation in this study involves one appointment at the Sexual Health Research Laboratory in the Department of Psychology at Queen’s University. Your appointment consists of three parts, which I will give you a quick overview of now, and then explain each part in detail. The first part involves the completion of a short questionnaire, and should take approximately 15 minutes. The second part involves Quantitative Sensory Testing, which should take approximately 1 hour to complete. The final part of this study involves Laser Doppler Imaging of your genitals while you watch three different films. This should take approximately 1 hour to complete for a total completion time of approximately 2.5 – 3 hours.

The questionnaire will be filled out in the Sexual Health Research Laboratory and will cover information about sexual functioning, medical history, and body image. You are under no obligation to answer any questions that you feel uncomfortable answering.

The Quantitative Sensory Testing (QST) portion of the study will be conducted by a trained female researcher and her trained female assistant. You will be asked to remove your clothing from the waist down and you will sit on a medical examination table with your legs hanging off of the table. The
The researcher will then use **two measurement devices**; one device to detect touch, and one to detect heat. These devices will be placed on one spot on your forearm and three or four different spots on your genitals, depending on your circumcision status (that is, two spots on the penile shaft, one spot on the head of the penis, and if you are not circumcised, one extra spot on the foreskin). First, the measurement device intensity will increase until you can detect it. Next, we will repeat the same procedure until you first experience pain. As soon as you indicate that you feel *any* pain, the device will be *immediately* removed and you will be asked to rate the intensity and unpleasantness of the touch. Some men may feel apprehensive about this pain, but the intensity of the touch or heat increases very gradually, and it is removed as soon as you indicate any pain at all.

Finally, after a short break, the LDI portion will be set up by the same female researcher and her assistant. Seated on an exam table, the researcher will place the LDI machine close to – but without touching – your genitals. You will be given a pair of DVD goggles that will be used to watch three films. After everything is set up, the experimenter and assistant will be behind a screen the entire testing session to give you privacy. Two films will involve nature scenes and the third will be an erotic film showing a male and female actor engaged in sexual activities. During the erotic film, you will be asked to indicate when you are physically aroused so that the experimenter can start the LDI machine. The first two films will be approximately 7 minutes in length and the third film will run for a maximum of 15 minutes. Before and after the films you will be asked to answer questions that appear on the screen, and to rate your level of sexual arousal during the films.

At the very end of the session, you will be asked to watch a neutral video for approximately 5 minutes, and rate your level of sexual arousal before leaving.

Although some discomfort may be experienced during this testing, no health risks are posed, and the discomfort should not last for very long. You are able to stop or control the session at any time. For your time and convenience, you will be reimbursed $75.00 upon completion of all parts of the study.

**Do you have any questions?**

**Are you interested in seeing if you are eligible for participating in the study?**

**YES →** Thank them and fill in relevant identifying/contact information in the FileMaker Pro participant database. Once complete, copy their participant ID number and start a new screening form in the study database.

**NO →** Thank them for their time, and ask them to feel free to call back if they change their mind. End the screening interview.

**1. Do you mind answering some questions about your medical and sexual history to determine if you are eligible for the study?**  

**NO →** Verbal consent obtained. Go to #2

If **YES →** Explain that we need to ask these questions to determine their eligibility for the study. If they are still hesitant, ask them to think about it and call back.

**2. How old are you? _________________________**

If under **18 years →** Cannot participate: “I am sorry, but in order to participate in this study, you must be 18 years of age or older in order for us to obtain legal consent. Unfortunately, you are not eligible
to participate in this study. Do you have any questions for me about this? Thank you again for your interest in our study. Have a nice day/evening.” End call.

If over 35 years ➔ Cannot participate: “I am sorry, but in order to participate in this study, you must be under 35 years of age. Unfortunately, you are not eligible to participate in this study. Do you have any questions for me about this? Thank you again for your interest in our study. Have a nice day/evening.” End call.

DOES NOT WANT TO SAY – “Unfortunately, to determine whether you are eligible to participate in the study, we must obtain this information. Please take some time to think about this, and if you decide you would like to give me this information, feel free to call me back and we will continue with the questions. Thank you for your time. Have a nice day/evening.” End call.

3. Are you fluent in English? NO* YES

*If not fluent in English ➔ “I am sorry, but in order to participate in this study, you must be fluent in English. Unfortunately, you are not eligible to participate in this study. Do you have any questions for me about this? Thank you again for your interest in our study. Have a nice day/evening.” End call.

4. Are you primarily right-handed, left-handed, or ambidextrous?

   Right  Left  Ambidextrous

5. Do you smoke regularly (e.g., cigarettes, cigars, pipes)? YES* NO

Note: Social smokers (i.e. 1-2 cigarettes/week) are eligible

* If participant smokes ➔ “I am sorry, but in order to participate in this study, you must be a non-smoker. Because this study is examining blood flow and smoking can alter an individual’s blood flow, you are not eligible to participate in this study. Do you have any questions for me about this? Thank you again for your interest in our study. Have a nice day/evening.” End call.

6. Do you have a history of drug and/or alcohol abuse? YES* NO

Note: Abuse will be defined as drug/alcohol use that interferes with one’s daily functioning.

* If participant has history of drug and/or alcohol abuse ➔ “I am sorry, but in order to participate in this study, you must not have a history of drug/alcohol abuse. Unfortunately, you are not eligible to participate in this study. Do you have any questions for me about this? Thank you again for your interest in our study. Have a nice day/evening.” End call.

7. Do you have any genital piercings? YES* NO

* If participant has genital piercings ➔ “I am sorry, but in order to participate in this study, you must not have genital piercings. Because the study uses laser Doppler imaging, genital piercings interfere with the imaging. Unfortunately, you are not eligible to participate in this study. Do you have any questions for me about this? Thank you again for your interest in our study. Have a nice day/evening.” End call.

8. Are you currently suffering from any medical or psychiatric condition? YES NO ➔ go to #9

➔ If YES, what condition(s) have you been diagnosed with? ________________________________

➔ Are you taking any medications for this/these conditions? YES* NO
If yes, which one(s)? _____________________________________________

Are you receiving any other treatment for this/these conditions? YES NO

If yes, which one(s)? _____________________________________________

Have you previously taken any medication or received any other treatment for this/these conditions? YES NO

If yes, which one(s)? _____________________________________________

If YES, does this condition interfere significantly with your daily functioning? YES* NO

If YES, does this condition interfere significantly with your sexual functioning? YES* NO→ go to #9

* If the man’s response includes depression, use of antidepressants, or other medication known to affect sexual functioning, diseases of vascular system, and other diseases such as diabetes, thyroid disorder, cardiovascular disease, neurological disease, stroke, then say “I am sorry, but in order to participate in this study, you must be free from any medical or psychiatric conditions that can impair sexual functioning. Unfortunately, you are not eligible to participate in this study. Do you have any questions for me about this? Thank you again for your interest in our study. Have a great day/night!” End call.

9. What is your circumcision status?
   ☐ Uncircumcised
   ☐ *Circumcised: At approximately what age were you circumcised? (month/year) Where you circumcised as a religious rite? YES NO

* If circumcised after 2 months old → “I am sorry, but for this study we are only recruiting men who were circumcised shortly after being born. Do you have any questions for me about this? Thank you again for your interest in our study. Have a nice day/evening.” End call.

10. Do you have any penile deformities or anatomical abnormalities? These can be either congenital, (such as micropenis), or due to trauma (such as severe complications resulting from circumcision, or Peyronie’s disease) YES* NO

* If he does report some genital abnormality → “I am sorry but at this time we are only recruiting men with no anatomical abnormalities of the penis. The study involved measuring different parts of the penis in order to assess the role of circumcision on sexual functioning. Do you have any questions for me about this? Thank you again for your interest in our study. Have a nice day/evening.” End call.

11. Are you transgendered or intersex? YES* NO

* If he does consider himself to be transgendered or intersex → “I am sorry but in order to participate in this study, you must be a cisgendered male. The study involved measuring different parts of the
penis in order to assess the role of circumcision on sexual functioning. Do you have any questions for me about this? Thank you again for your interest in our study. Have a nice day/evening.” End call.

12. Do you consider yourself to be heterosexual?  
YES*  NO  
* If he does not consider himself to be heterosexual → “I am sorry but in order to participate in this study, you must be heterosexual. The questionnaires that we will be using have only been validated for heterosexual relationships, and the erotic film we present depicts heterosexual sexual activities. As this is a new area of research for our lab, we will be expanding to include same-sex oriented men in future genital testing studies. Do you have any questions for me about this? Thank you again for your interest in our study. Have a nice day/evening.” End call.

13. Have you ever had penetrative intercourse?  
YES*  NO  
* If he has never had penetrative intercourse → “I am sorry, but in order to participate in this study, you must have engaged in penetrative intercourse. Unfortunately, you are not eligible to participate in this study. Do you have any questions for me about this? Thank you again for your interest in our study. Have a great day/night!” End call.

14. Have you ever had a prostate examination?  
NO  
→ If yes, when (month/year)? ____________________________

15. Do you experience genital pain, such as during penile-vaginal penetration?  
YES*  NO  
* If he has superficial or serious pain during penile-vaginal penetration → “I am sorry, but in order to participate in this study, you must be free from genital pain. Unfortunately, you are not eligible to participate in this study. Do you have any other questions for me at this time? Thank you again for your interest in our study. Have a nice day/evening.” End call.

16. Have you ever suffered, or are you currently suffering from chronic pain?  
YES  NO → go to #16  
→ If yes, what condition(s) have you been diagnosed with? ____________________________

→ Are you taking any medications for this/these conditions?  
YES*  NO  
→ If yes, which one(s)? ____________________________

→ Are you receiving any other treatment for this/these conditions?  
YES  NO  
→ If yes, which one(s)? ____________________________

→ Have you previously taken any medication or received any other treatment for this/these conditions?  
YES  NO  
→ If yes, which one(s)? ____________________________

→ If YES, does this condition interfere significantly with your daily functioning?  
YES*  NO
17. Do you currently experience low sexual desire? This may include symptoms such as no sexual thoughts or fantasies.

YES*  NO

→ Does this low sexual desire cause you or your partner to feel distressed?
  YES  NO

18. Do you experience extreme aversion or avoidance of sexual contact from a partner because of feelings such as panic, anxiety, disgust or nausea?

YES*  NO

→ Does this aversion or avoidance cause you or your partner to feel distressed?
  YES  NO

19. Do you find it difficult to attain or maintain an erection that interferes with ability to complete sexual activity?

YES*  NO

→ Does this difficulty to attain/maintain an erection cause you or your partner to feel distressed?
  YES  NO

20. Do you find it difficult to have an orgasm, even after what you consider to be sufficient stimulation?

YES*  NO

→ Does this difficulty to have an orgasm cause you or your partner to feel distressed?
  YES  NO

21. Do you experience ejaculation with very little sexual stimulation (either before or shortly after penetration) and before you wish to ejaculate?

YES*  NO

→ Does this short ejaculation time cause you to feel distressed?
  YES  NO

22. Do you have difficulty getting sexually aroused during solitary masturbation?

YES*  NO

→ Does this difficulty to become aroused cause you to feel distressed?
  YES  NO

23. Do you have difficulty getting sexually aroused with a partner?

YES*  NO

→ Does this difficulty to become aroused cause you or your partner to feel distressed?
*If YES is provided for any questions #16-21, say: “I am sorry, but in order to participate in this study, you must be free from sexual difficulties. Unfortunately, you are not eligible to participate in this study at this time. However, in the future we will be recruiting men with sexual difficulties for a similar study. Would you like us to contact you when we begin recruiting for that study?”

YES

NO

“Do you have any questions for me about this? Thank you again for your interest in our study. Have a nice day/evening.” End call.

“The erotic video you will be viewing in this study consist of scenes depicting consenting adults engaged in a variety of sexual activities including kissing, masturbation, oral sex and penile-vaginal penetration. There is no talking or storyline in the video and the scenes are quite explicit.”

24. Have you ever watched sexually explicit movies or videos? YES NO*

25. Do you feel uncomfortable about or object to the idea of watching a sexually explicit movie in this study? YES* NO

* If the caller has never watched a sexually explicit movie or feels uncomfortable watching them, say → “I am sorry, but in order to participate in this study, you must have experience watching sexually explicit movies and feel comfortable doing so as this is part of the study’s procedure. Therefore, you are not eligible to participate in the current study. However, if you change your mind, please feel free to call the lab back and we can continue with screening. Thank you again for your interest in the study. Have a nice day/evening.” End call.

26. Do you have any difficulty getting aroused at sexually explicit videos or movies? YES* NO

* Please describe the difficulties you have:

____________________________________________________

____________________

Thank you for answering all of those questions!

END OF SCREENING

Initial Decision:

NOT ELIGIBLE _____ * (If they are not eligible, explain to them why and thank them for their time.)

NOT SURE ____ (If not sure, tell them that you will call them back after discussing it with the
ELIGIBLE _____† (Tell them that they are eligible for the study; see below.)

†Are you interested in participating in the study?  YES  NO  NOT SURE

→ If no/not sure, thank them for their time and ask them to call back if they change their minds. Answer any questions they might have, especially if they are not sure.

Interview & LDI Testing Date/time booked: ________________________________________

Graduate Student/RA booked: ____________________________________________________

There are a few things that we request before you come in to participate. We will send you an email reminder outlining these requests a few days before your appointment. The first is that you must abstain from alcohol or caffeine, including coffee, tea, chocolate, or soft drinks, for at least four hours before testing. You also must abstain from sexual intercourse for 24 hours before testing. These two requests are to ensure that blood flow in the genitals is at normal, non-aroused levels. I am also going to ask that you trim excess pubic hair before coming to the session, as dense hair can detract from the resolution of the scan. And because the researcher will be touching your genitals with measurement devices, please ensure that your genitals are cleaned prior to testing.

If not circumcised, read: This may involve retracting the foreskin to clean the area typically covered by the foreskin.

On the day of testing, please go to the entrance of Humphrey Hall. The graduate student will come and greet you in the building lobby.

Provide the participant with directions to Humphrey Hall if needed.

Do you have any questions for me?
Appendix E

Letter of Information and Consent (In-Lab Study)

LETTER OF INFORMATION AND CONSENT

THE EFFECTS OF CIRCUMCISION ON SEXUAL FUNCTIONING AND SENSITIVITY IN MEN

INVESTIGATORS:
Jenn Bossio, MSc, Department of Psychology, Queen’s University
Caroline F. Pukall, PhD, Department of Psychology, Queen’s University
Steven Steele, MD, Department of Urology, Kingston General Hospital

Purpose of the study

Circumcision refers to the surgical removal of the penile foreskin, and is one of the most commonly performed surgical procedures in the world. The student investigator of this study, Jenn Bossio, M.Sc., under supervision of Dr. Caroline Pukall, intends to investigate differences between adult men who have been circumcised compared to men who have not been circumcised in their sexual functioning and penile sensitivity, among other factors. The purposes of this study are:

1) To explore the effect of circumcision on self-reported sexual functioning, sexual health, and body image
2) To determine if male genital sensitivity differs as a function of circumcision status.
3) To determine the effect that circumcision status has on male genital arousal by measuring penile blood-flow using the Laser Doppler Imager.


**Study procedures**

You are invited to participate in this study of circumcision and sexual functioning and sensitivity. Participation in this study is voluntary and you are free to withdraw at any time. If you choose to participate in this study, you will participate in one appointment at the Sexual Health Research Laboratory in the Department of Psychology at Queen’s University. Your appointment will consist of three parts. The first part involves the completion of a brief interview and questionnaire, and should take approximately 30 minutes. The second part involves Quantitative Sensory Testing (QST) where different parts of your genitals will be touched with a few different measurement devices, and you indicate when you can feel the touch of these devices, or when you first experience pain at the touch of these devices. This should take approximately 1 hour to complete. The final part involves Laser Doppler Imaging (LDI) of your genitals while you watch four different films. This should take approximately 1 hour to complete, for a total completion time of approximate 2.5 – 3 hours.

The interview and questionnaire will be completed in the SHRL and will cover information about sexual functioning, medical history, and body image. The experimenter will conduct the interview, and the questionnaire will be completed on paper. You are under no obligation to answer any questions that you feel uncomfortable answering.

The QST portion will be conducted by a female researcher and her trained assistant. You will be asked to remove your clothing from the waist down and be seated on a medical examination table with your legs hanging off of the table. Seated on the exam table, the researcher will use measurement devices to touch one spot on your forearm and three different spots on your genitals (two spots on the penile shaft, and one spot on the head of the penis), plus one additional spot on your genitals (i.e., the foreskin) if you are uncircumcised. The intensity of the touch will increase until you can detect it, or until it causes some pain, at which point the device will be immediately removed and you will be asked to rate the intensity and pleasantness/unpleasantness of the touch. The measurement devices will measure sensitivity to a small, light touch, and heavier touch, and heat.

After a short break, the LDI portion will be set up by the same female researcher and her assistant. Seated on the exam table, the researcher will place the LDI machine close to, but without touching, your genitals. The experimenter and assistant will be behind a screen the entire testing session to give you privacy. You will watch three films. Two films will involve nature scenes. The other film will be erotic clips showing male and female actors engaged in sexual activities. The nature films will be approximately 5-10 minutes in length and the erotic video will last for approximately 30 minutes. Before and after the films you will be asked to verbally answer questions that appear on the screen, and to rate your level of sexual arousal during the films.

This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen’s policies.
Advantages of participating in this study

There are no direct benefits from participating in this study. Indirect benefits may include the opportunity to learn about your genital and subjective sexual arousal, and you will have access to resources related to circumcision, mental health, and sexual health and functioning.

Disadvantages of participating in this study

There are no known physical, psychological, economic, or social risks associated with participating in this study. However, it is possible that you may experience some discomfort during the LDI session or QST, as you will be sitting for approximately 1 hour each session. Some of the questions asked during the interview and questionnaire session cover sensitive topics, such as sexual functioning. As such, you may experience some discomfort answering some of the items. You are not required to answer any questions that you feel uncomfortable answering. In the case that you do experience distress from the testing procedures or any portions of the questionnaires, we provide you (and all participants) with a mental health resource sheet that has contact information for various mental health agencies in the community.

Confidential nature of this study

Your participation in this study is strictly confidential. The investigators will take all reasonable measures to protect the confidentiality of your records. Any identifying information you provide (e.g., your name) will be kept strictly confidential. All information you provide will be identified by a de-identified ID code. You will not be identified in any publication or reports of this research; data will be aggregated in all reports of this study. All answers are strictly confidential and will be kept safe on a private and secure server located at Queen’s University.

Limits of Confidentiality

All information disclosed during your participation in this research study is confidential and will not be disclosed to anyone with your written and informed consent except where reporting is required by law, that is –

1. Where there is suspicion that a child or children (that is, an individual who is PRESENTLY under the age of 16) has been or is being abused,

2. Where the research participant is likely to harm herself or himself unless protective measures are taken,

3. Where the research participant presents a serious danger of violence to others, and

4. If the research participant reveals that she has been sexually abused by a healthcare provider (for example, a psychologist or physician) covered by the Regulated Health
Professionals Act, it is necessary by law to report the name of the perpetrator to his/her governing body.

Compensation

Upon completion of the study, you will receive $75.00 as compensation for your time and inconvenience. If the study has to be terminated for scientific reasons, or if you choose to withdraw from the study, compensation will be adjusted according to the fraction of the study completed.

Discontinuation of this study

Your participation in this study is completely voluntary and you may withdraw from this study at any time without any consequence. If any questions or concerns arise during the course of testing, please feel free to speak with one of the investigators. You are also free to refuse to answer any question posed without need of explanation on your part. If you decide that you would like to discontinue your participation, all activities will cease immediately. In addition, the investigators may end your participation in this study for purely scientific reasons at any time.

Any questions about study participation may be directed to the principle investigator, Jenn Bossio, at jennifer.bossio@queensu.ca, or supervisor, Dr. Caroline Pukall, at pukallc@queensu.ca. Any ethical concerns about the study may be directed to the Chair of the Queen's University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board, Dr. Albert Clark at clarkaf@queensu.ca or 613-533-6081.

Some of the questions in this survey are sensitive in nature. If you are feeling distressed, please consult the following sources for help:

Telehealth Ontario: 1-866-797-0000

Frontenac Community Mental Health Services (24 hour): (613) 544-4229


Lennox & Addington Community Crisis Centre: (613) 354-7388

Telephone Aid Line Kingston (TALK): (613) 544-1771

Kids Help Phone: Parents Help Phone: 1-888-603-9100

Sexual Health Resource Centre: (613) 533-2959
CONSENT FORM

I, ________________________________, have volunteered to participate in the study entitled The effects of circumcision on sexual functioning and sensitivity in men, conducted by doctoral student, Jenn Bossio, M.Sc., her supervisor Dr. Caroline Pukall, and their collaborator Dr. Steven Steele.

I consent to the information contained in the Letter of Information and Consent and understand what is required for participation in the study. I understand that I will receive a copy of the Letter of Information and Consent form for my records outlining the rationale of the study and that following completion or termination of my participation in the study I will receive a debriefing form that again states the purpose of the study, and contains mental health and sexual health resources, should I wish to use them.

I have read and understood the Letter of Information for this study, have had the purpose and procedures of this study explained to me by a trained graduate student, and understand what is required for participation in the study. I understand that my participation in the study is completely voluntary and that I am free to withdraw at any time. I have been given sufficient time to consider the above information and have had the opportunity to ask questions which have been answered to my satisfaction. I understand the potential benefits and risks associated with participating in this study and understand that my confidentiality will be protected throughout the study. I am voluntarily signing this form. I will retain a copy of the Letter of Information and Consent form for my information.

Should I have further questions, I understand that I can contact any of the following individuals:

- **Jenn Bossio** (613) 533-3276; jennifer.bossio@queensu.ca, PhD student, Department of psychology at Queen’s University
- **Dr. Caroline Pukall** (613) 533-3200; caroline.pukall@queensu.ca, Associate Professor at the Department of Psychology at Queen’s University and primary investigator.
- **Dr. Richard Beninger** (613) 533-2486; beninger@queensu.ca, Professor and Head of the Department of Psychology at Queen’s University.
- **Dr. Albert Clark** (613) 533-6081; clarkaf@queensu.ca, Chair of the Queen’s University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board.
IN SUMMARY OF WHAT I HAVE READ (PLEASE CHECK TO INDICATE THAT YOU HAVE READ AND CONSENT TO THE FOLLOWING PARTS OF THE STUDY):

- Purpose of the study
- Study procedures:
  - Interview
  - QST session (penile sensitivity testing)
  - LDI session (sexual arousal testing)
- Advantages of participating in the study
- Disadvantages of participating in the study
- Limits of confidentiality
- Compensation
- Discontinuation of the study

I HAVE READ THE ABOVE STATEMENTS AND FREELY CONSENT TO PARTICIPATE IN THIS RESEARCH.

_____________________________________  ______________________________________  ________________
Participant’s name                     Participant’s signature                  Date

_____________________________________  ______________________________________  ________________
Name of person                         Signature of person                     Date
Obtaining consent                      Obtaining consent
Appendix F

Interview (In-Lab Study)

INTERVIEW

Circumcision Study

Jenn Bossio

Subject Number ________________

Interviewer ____________________

Date of Interview ________________

Order of testing (list genital sites below):

1. ____________________________
2. ____________________________
3. ____________________________
4. ____________________________
5. ____________________________
PART A: SOCIO-DEMOGRAPHIC INFORMATION

1) Age: __________

2) Place of birth
   1) Canada  
   2) United States  
   3) Eastern Europe  
   4) Western Europe  
   5) Africa  
   6) Asia  
   7) Australia  
   8) Middle East  
   9) Latin/South America  
   10) Caribbean  
   11) Other: __________

3) What culture do you consider yourself most associated with?
   1) Canadian  
   2) Québécois  
   3) American  
   4) Irish/Scottish/Welsh  
   5) Native American  
   6) Greek/Italian Canadian  
   7) Eastern European  
   8) Western European  
   9) African  
   10) Asian  
   11) Australian  
   12) Middle Eastern  
   13) Latin/South American  
   14) Jewish  
   15) Other: ______________

4) What is your native language?
   1) English  
   2) French  
   3) Other: ______________

5) In what religion were you brought up, if any?
   1) Christian  
   2) Protestant  
   3) Jewish  
   4) Muslim  
   5) Catholic  
   6) None  
   7) Other: ______________

6) Do you currently identify with any religious community?
   1) Yes: Which one? ______________
   2) No: go to #8

7) How important is religion (or the lack thereof) currently in your daily life on a scale from 0 to 10? (0 = not at all, 10 = extremely important): ______

8) What is the highest level of formal education you have received?
   1) Some high school  
   2) High school graduate  
   3) Some trade school  
   4) Trade school graduate  
   5) Some college/undergraduate degree  
   6) College/undergraduate degree  
   7) Some graduate school/professional training  
   8) Graduate/professional school degree

9) How many years of education has that included? ______
   *note: up to grade 12 = 12 years

10) What is your occupational status?
    1) Employed full-time  
    2) Employed part-time  
    3) Unemployed  
    4) Retired  
    5) Student  
    6) On disability  
    7) Other: ______________

10) What is your approximate total annual income? (taxable)
    1) $0 - $19,999  
    2) $20,000 - $39,999  
    3) $40,000 - $59,999  
    4) $60,000 - $89,999  
    5) $90,000 and over  
    6) Decline Response
PART B: MEDICAL UROLOGICAL HISTORY

Since the time of the screening, have there been any changes with your:

1. Medical health
   1) YES. Please explain: ____________________________________________
   2) NO

2. Psychiatric/psychological status
   1) YES. Please explain: ____________________________________________
   2) NO

3. Sexual health/functioning
   1) YES. Please explain: ____________________________________________
   2) NO

4. Are you currently taking any medication?
   1) YES. For what reason: __________________________________________
      For how long? __________________________________________
   2) NO

5. Have you ever had a male genital exam? This would entail having a doctor or urologist manually inspect your genitals.
   1) YES
   2) NO

   If yes: How long ago was your last urogenital exam?
   1. Less than 6 mos
   2. 6 – 11 mos
   3. 1 – 2 yrs
   4. 2 – 5 yrs
   5. More than 5 yrs

6. Do you have any genital modifications?
   1. Yes; genital tattoos (please specify): _______________________________
   2. Yes; genital piercings (please specify): _____________________________
   3. None
   4. Other (please specify): __________________________________________
   5. Decline Response
PART C: CIRCUMCISION QUESTIONS

The following are questions related to your circumcision status

1. Are you circumcised?
   1. Yes
   2. No → If no, please skip to question 7

2. Do you know where the procedure was performed? If YES, please specify:
   1. Hospital
   2. Medical clinic
   3. Personal residence
   4. Religious institution (e.g. synagogue, mosque)
   5. Other (please specify): ___________________________
   6. Decline response
   7. Don’t know

3. Do you know the procedure used for your circumcision? If YES, please specify:
   1. Shield and Knife (Scalpel)
   2. Forceps Guided
   3. Sleeve Resection
   4. Plastibell
   5. Tara KLamp
   6. SmartKlamp
   7. Zhenxi Rings
   8. Gomco Clamp
   9. Laser
   10. Other (please specify): ___________________________
   11. Decline response
   12. Don’t know

4. Do you know the type of anesthesia used? If YES, please specify:
   1. Topical
   2. General anesthesia
   3. Some form of pain relief other than formal anesthesia (e.g. wine, oral medication)
   4. Other (please specify): ___________________________
   5. None
   6. Decline response
   7. Don’t know

5. Do you know what the reasons were for your circumcision? If YES, please select all that apply:
   1. Religious reasons
   2. Social norm
   3. For appearance
   4. Hygiene
   5. To resemble your father
   6. To correct phimosis
   7. Medical reasons (other than phimosis)
   8. Other (specify) : ___________________________
   9. Decline response
10. Don’t know

6. Do you know if there were any complications with the circumcision procedure?
   1. Yes (please specify): ___________________________________________
   2. No
   3. Don’t know
   4. Decline response

⇒ If not circumcised, skip to here (questions for all men):

7. How happy are you with your circumcision status?
   Circle response (where 0 represents very dissatisfied and 10 represents very satisfied, and 5 represents neutral)
   0 1 2 3 4 5 6 7 8 9 10
   1. Decline response

8. How much is your circumcision status a positive issue for you in your every day life? Or a positive part of who you are?
   Answer on a scale of 0 - 10 where 0 represents not a positive issue at all and 10 represents a very big positive issue, and 5 represents neutral)
   0 1 2 3 4 5 6 7 8 9 10
   1. Decline response

9. How much is your circumcision status a negative issue for you in your every day life? Or a negative part of who you are?
   Answer on a scale of 0 - 10 where 0 represents not a negative issue at all and 10 represents a very big negative issue, and 5 represents neutral)
   0 1 2 3 4 5 6 7 8 9 10
   1. Decline response

10. Do you think of your circumcision status as a significant part of who you are?
    Answer on a scale of 0-10, where 0 represents my circumcision status is not at all an important part of who I am and 10 represents my circumcision status is a very important part of who I am, and 5 is neutral
    0 1 2 3 4 5 6 7 8 9 10
    1. Decline response

11. How often do you think about your circumcision status?
    1. Always
    2. Sometimes
    3. Rarely
    4. Never
    5. Decline response
12. Do you have any regrets about your circumcision status?
   1. Yes (please specify): ___________________________
   2. No
   3. Decline response

13. Do you ever wish that you were the opposite circumcision status?
   1. Yes (please explain): ___________________________
   2. No
   3. Sometimes (when, please specify___________)
   4. Decline response

*If intact (i.e., if participant has foreskin):*
14. What about having a foreskin do you particularly like or dislike, if anything?
   1. Open-ended response
   2. Nothing: I like it as is
   3. Not applicable
   4. Decline response

*If circumcised (i.e., if participant does not have foreskin):*
15. What about being circumcised do you particularly like or dislike, if anything?
   1. Open-ended response
   2. Nothing: I like it as is
   3. Not applicable
   4. Decline response

16. Have you ever/would you ever take measures to change your circumcision status (e.g. if you are circumcised, foreskin “regrowth”; if you are not circumcised, adult circumcision)
   1. Yes (please specify) : _________________________________________
   2. No
   3. Maybe
   4. I don’t know
   5. Decline response

The next few questions are about your sons, whether you have them or not:

17. Do you have any sons? *If NO, skip to #20*
   1. Yes
   2. No

18. What is the circumcision status of your sons?:
   1. The same circumcision status as you?
   2. Different circumcision status as you?
   3. I have a mix of both circumcised and uncircumcised sons
      i. Son #1:_____________________________________
      ii. Son #2:_____________________________________
      iii. Son #3:_____________________________________
   4. I don’t know
   5. Decline response
19. You indicated that you **did/did not** circumcise your son(s). What were your reasons for this decision? (Select all that apply):
   1. Religious reasons
   2. Social norm
   3. For appearance
   4. Hygiene
   5. To resemble their father (i.e., your circumcision status)
   6. *circ only*: To prevent phimosis
   7. Medical reasons (other than phimosis)
   8. Doctor recommendation
   9. Other (specify)
   10. I don’t know
   11. Decline response

⇒ **If no sons, skip to here:**

20. Imagine that you did have sons. Would you circumcise you son?
   1. Yes
   2. No
   3. I don’t know
   4. It depends (please specify): ___________________

21. You indicated that you **would/would not** circumcise your son(s), if you had them. What would be your reasons for this decision? (Select all that apply):
   1. Religious reasons
   2. Social norm
   3. For appearance
   4. Hygiene
   5. To resemble their father (i.e., your circumcision status)
   6. *circ only*: To prevent phimosis
   7. Medical reasons (other than phimosis)
   8. Doctor recommendation
   9. Other (specify)
   10. I don’t know
   11. Decline response
PART D: RELATIONSHIP AND SEXUAL HISTORY

Now I am going to ask you some questions about your sexuality and about your relationship history. If you are currently involved in a relationship or are dating, you will be asked questions about your partner. If you are in an open or non-monogamous relationship, the questions referring to 'your partner' refer to your main partner.

1) What is your current relationship status?
   1) Single, not dating
   2) Casual sex with one partner
   3) Casual sex with multiple partners
   4) Dating one partner regularly
   5) Dating one partner regularly (long distance)
   6) Living with a partner
   7) Married
   8) Common-law
   9) Separated
   10) Divorced
   11) Widowed
   12) Other: ______________

2) How long have you been in this situation? _____ years _____ months

3) If single, casual, or dating:
   You said that you are ______________ and therefore, do not consider yourself involved in a committed relationship. Please indicate when your most recent committed relationship ended:
   ______________

4) How many long-term committed relationships have you been in? We define this by lasting more than 3 month, and it may or may not include people you have cohabitated with:
   ______________

5) How many casual dating relationships have you been in? We define this by relationships that you did not consider yourself committed to:
   ______________

6) How do you describe your sexual orientation?
   1) Heterosexual
   2) Homosexual
   3) Bisexual
   4) Not sure
   5) Other: ______________

7) At what age did you first have penetrative intercourse? In this context, this refers to penis-in-vagina intercourse: ______________

8) What is the total number of partners you have had penetrative intercourse with? ______________
   Of that number, how many of those people did you engage in penile-vaginal intercourse?
   ______________
   How many of those people did you engage in penile-anal intercourse?
   ______________
9) How aroused do you feel in response to erotica?  
N/A  Decline response

0 1 2 3 4 5 6 7 8 9 10
not at all aroused
the most aroused I’ve ever been

10) How aroused do you become when masturbating alone?  
N/A  Decline response

0 1 2 3 4 5 6 7 8 9 10
not at all aroused
the most aroused I’ve ever been

11) How aroused do you become during foreplay?  
N/A  Decline response

0 1 2 3 4 5 6 7 8 9 10
not at all aroused
the most aroused I’ve ever been

12) Think back over the past 6 months. On average, approximately how many times have you had penetrative intercourse, per month?  
→ If 0, proceed to #14. If > 0, proceed to #16


14) How long has it been since you last had penetrative intercourse? ________ years ________ months

15) In the past, approximately how many times per month were you having penetrative intercourse? ________

* if you have not had sex in the past 6 months, please think of a time when you were having sex on a more regular basis for the following questions:

16) Do you have any difficulty becoming erect or maintaining your erection during penetrative intercourse?  
1) YES
2) NO

If YES, approximately how many times in the past 6 months has this been an issue for you? ________

How much distress did this cause you?  
Answer on a scale of 0-10, where 0 represents no distress and 10 represents the most distress imaginable

0 1 2 3 4 5 6 7 8 9 10
If YES, why do you think you experience difficulty with erections during penetrative intercourse?
________________________________________________________________________

17) Do you have any difficulty with ejaculating with very little sexual stimulation (either before or shortly after penetration) and/or before you wish to ejaculate?
   1) YES
   2) NO

   If YES, approximately how many times in the past 6 months has this been an issue for you?
   __________

   How much distress did this cause you?
   Answer on a scale of 0-10, where 0 represents no distress and 10 represents the most distress imaginable
   0  1  2  3  4  5  6  7  8  9  10

   If YES, why do you think you experience difficulty with erections during penetrative intercourse?
   ___________________________________________________________________________

18) Do you have any difficulty becoming sexually aroused during penetrative intercourse?
   1) YES
   2) NO

   If YES, approximately how many times in the past 6 months has this been an issue for you?
   __________

   How much distress did this cause you?
   Answer on a scale of 0-10, where 0 represents no distress and 10 represents the most distress imaginable
   0  1  2  3  4  5  6  7  8  9  10

   If YES, why do you think you experience difficulty with erections during penetrative intercourse?
   ___________________________________________________________________________

=> End of Interview
Appendix G

Questionnaire (In-Lab Study)

IIEF-15  (Quek, Low, Rasack, Chua & Loh, 2004)

We are now going to ask you to answer some questions about your sexual function. In answering questions about your sexuality in this survey, the following definitions apply:

**Sex, sexual activity, lovemaking, and foreplay** refer to:
- Caressing, kissing, manual stimulation of the genitals/anus/chest by yourself or your partner
- Oral stimulation of the genitals/anus/chest
- Vaginal or anal penetration with fingers, sex toys or penis

**Sexual intercourse** is defined as penetration of your partner's vagina or anus (you entered your partner) with fingers, sex toys or penis, or as receiving anal penetration with fingers, sex toys.

**Sexual stimulation** refers to sexual situations such as the following:
- Foreplay with your partner, stimulating your partner, receiving stimulation from your partner
- Self-stimulation (masturbation), sexual fantasy
- Viewing erotic films, pictures, or reading erotic material

**Ejaculate** is defined as the ejection of semen from the penis (or the feeling of this)

**Instructions:**
These questions ask about the effects erection problems have had on your sex life, over the past 4 weeks. Please answer the following questions as honestly and clearly as possible.

Select only one answer per question.

1. Over the past 4 weeks, how often were you able to get an erection during sexual activity?
   a. No sexual activity
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response

2. Over the past 4 weeks, when you had erections with sexual stimulation, how often were your erections hard enough for penetration?
   a. No sexual stimulation
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response
The next three questions will ask about erections you may have had during sexual intercourse?

3. Over the past 4 weeks, when you attempted sexual intercourse, how often were you able to penetrate (enter) your partner?
   a. Did not attempt intercourse
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response

4. Over the past 4 weeks, during sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?
   a. Did not attempt intercourse
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response

5. Over the past 4 weeks, during sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?
   a. Did not attempt intercourse
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response

6. Over the past 4 weeks, how many times have you attempted sexual intercourse?
   a. No attempts
   b. One to two attempts
   c. Three to four attempts
   d. Five to six attempts
   e. Seven to ten attempts
   f. Eleven + attempts
   g. Decline Response

7. Over the past 4 weeks, when you attempted sexual intercourse, how often was it satisfactory for you?
   a. Did not attempt intercourse
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response
8. Over the past 4 weeks, how much have you enjoyed sexual intercourse?
   a. No intercourse
   b. No enjoyment
   c. Not very enjoyable
   d. Fairly enjoyable
   e. Highly enjoyable
   f. Very highly enjoyable
   g. Decline Response

9. Over the past 4 weeks, when you had sexual stimulation or intercourse, how often did you ejaculate?
   a. No sexual stimulation/intercourse
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response

10. Over the past 4 weeks, when you had sexual stimulation or intercourse, how often did you have the feeling of orgasm or climax (with or without ejaculation)?
    a. No sexual stimulation/intercourse
    b. Almost never/never
    c. A few times (much less than half the time)
    d. Sometimes (about half the time)
    e. Most times (much more than half the time)
    f. Almost always/always
    g. Decline Response

The next two questions ask about sexual desire. Let’s define SEXUAL DESIRE as a feeling that may include wanting to have a sexual experience (for example, masturbation or intercourse), thinking about having sex, or feeling frustrated due to lack of sex.

11. Over the past 4 weeks, how often have you felt sexual desire?
    a. Almost never/never
    b. A few times (much less than half the time)
    c. Sometimes (about half the time)
    d. Most times (much more than half the time)
    e. Almost always/always
    f. Decline Response

12. Over the past 4 weeks, how would you rate your level of sexual desire?
    a. Very low/none at all
    b. Low
    c. Moderate
    d. High
    e. Very high
    f. Decline Response
13. Over the past 4 weeks, how satisfied have you been with your overall sex life?
   a. Very dissatisfied
   b. Moderately dissatisfied
   c. About equally satisfied and dissatisfied
   d. Moderately satisfied
   e. Very satisfied
   f. Decline Response

14. Over the past 4 weeks, how satisfied have you been with your sexual relationship with your partner?
   a. Very dissatisfied
   b. Moderately dissatisfied
   c. About equally satisfied and dissatisfied
   d. Moderately satisfied
   e. Very satisfied
   f. Decline Response

15. Over the past 4 weeks, how do you rate your confidence that you could get and keep an erection?
   a. Very low
   b. Low
   c. Moderate
   d. High
   e. Very high
   f. Decline Response
Male Genital Image Scale (Winter, 1989)

Select responses on the following scale:

a. Very dissatisfied
b. Dissatisfied
c. Neutral
d. Satisfied
e. Very satisfied
f. Decline response

1. Length of my non-erect penis.
2. Length of my erect penis.
3. Circumference of my non-erect penis.
4. Circumference of my erect penis.
5. Appearance of my non-erect penis.
6. Appearance of my erect penis.
7. Size of my testicles.
8. Way my testicles “hang”.
9. Appearance of my scrotum (i.e. sac).
10. Texture of my pubic hair.
11. Appearance of my pubic hair.
12. Smell of my genitals.
13. Overall appearance of my genitals.
14. Overall size of my penis.
15. My foreskin when my penis is erect.
16. My foreskin when my penis is not erect.
Appendix H

Debriefing Sheet (In-Lab Study)

DEBRIEFING FORM

THE EFFECTS OF CIRCUMCISION ON SEXUAL FUNCTIONING AND SENSITIVITY IN MEN

Thank you for your participation in the study “The effects of circumcision on sexual functioning and sensitivity in men”. I sincerely appreciate the time and effort you contributed to helping with this project. The purposes of this pilot study are:

1) To determine the effect that circumcision status has on male genital arousal by measuring penile blood-flow using the Laser Doppler Imager.
2) To determine if male genital sensitivity differs as a function of circumcision status.
3) To explore the effect of circumcision on self-reported sexual functioning, sexual health, and body image

Just a reminder that all information is kept completely confidential and only members of the research team will have access to the information. At no time will you be identified as an individual, as the data will be numerically coded to ensure confidentiality and anonymity. If you would like a general summary of findings from this study, you may obtain them by contacting Jenn Bossio by email at jennifer.bossio@queensu.ca

Should you have any further questions, comments, or concerns, please do not hesitate to contact the Sexual Health Research Laboratory at (613) 533-3276, or SHRL@queensu.ca, or Dr. Caroline Pukall at (613) 533-3200 or caroline.pukall@queensu.ca

If the discussion of your personal experiences leads you to feel distressed, you are encouraged to contact your family physician or mental health professional. Attached is a list of mental health resources in the Kingston and surrounding area, as well as a list of websites related to sexuality.

To thank you for your time and to compensate you for any inconveniences incurred from participating, we will be sending you a cheque for $75 to your home.

Sincerely,

Jenn Bossio, M.Sc.
Ph.D. Candidate in Clinical Psychology, Queen’s University
Resource List

24-Hour Emergency & Crisis Resources:
The following are 24-hour emergency and crisis services available to the public. If you experience distress and require immediate assistance, you may call these numbers at any time to receive guidance and help:

Belleville General Hospital Emergency Dept (24 hours) (613) 969-7400
This telephone number accesses the main switchboard of the hospital.
The switchboard can then direct your call to the Emergency Department.

Brockville General Hospital Emergency Dept (24 hours) (613) 345-5645
This telephone number accesses the main switchboard of the hospital.
The switchboard can then direct your call to the Emergency Department.

Hotel Dieu Hospital Emergency Dept (24 Hours) (613) 544-3310
This telephone number accesses the main switchboard of the hospital.
The switchboard can then direct your call to the Emergency Department.

Frontenac Community Mental Health Services (24 hour crisis line): (613) 544-4229


Lennox & Addington Community Crisis Centre: (613) 354-7388

Telephone Aid Line Kingston (TALK): (613) 544-1771
In addition to a distress and crisis line, provides workshops on active listening skills and crisis response techniques. Available from 7 pm to 3 am every night.

Community Resources for Information on Mental Health and Counseling Services:
The following are professional services and information resources available to the public. If you experience distress and do not require immediate assistance, you may call these numbers to receive guidance and information on counseling and mental health services within your community:

Lanark County Mental Health .................. (613) 283-2170

Frontenac Community Mental Health Services (Information): (613) 544-1356

Leeds and Grenville Rehabilitation and Counseling Services:
Brockville (Toll Free) .............................. (800) 267-4406
Delta.................................................. (613) 928-3460
Gananoque ................................. (613) 382-4016
Kemptville .......................................... (613) 258-7204
Prescott................................................. (613) 925-5940

Kids Help Phone: Parents Help Phone... 1-888- 603-9100
Provides 24-hour confidential support, information and referrals to parents and caregivers of children aged 0-19 years.
Mental Health Services for Hastings and Prince Edward Counties:

Belleville Main Office ........................................ (613) 968-2619 or (613) 967-4734
Prince Edward County ................................. (613) 476-2990
Centre Hastings........................................ (613) 478-9983
North Hastings ....................................... (613) 332-3826
Trenton ............................................. (613) 394-1655

Community Resources for Sexual Health

Sexual Assault Crisis Centre Kingston .. (SACCK) (613) 544-6424 or (877) 544-6424
Provides 24-hour confidential crisis support and information.

Kingston Crisis Pregnancy Centre .......... (613) 545-0425 or 1-800-917-KCPC
Provides confidential counseling and resources. Also offers free pregnancy tests, adoption options, maternity and baby clothes, and other baby needs. Does not provide abortions.

Sexual Health Resource Centre ............ (613) 533-2959
Provides confidential, non-judgmental information and referrals for sexual health, sexually transmitted infections, birth control, and pregnancy alternatives.

Sex Therapy Service ......................... (613) 533-6021
Sex therapy for individuals and couples with a variety of sexual concerns including problems with sexual functioning, desire, arousal, or pain.

Web Links:

Sex Information and Education Council of Canada (SIECCAN) website:
http://www.sieccan.org

Go Ask Alice! is a health question and answer internet service produced by Alice!, Columbia University’s Health Education Program. Its mission is to increase access to, and use of, health information by providing factual, in-depth, straight-forward, and nonjudgmental information to assist readers’ decision-making about their physical, sexual, emotional, and spiritual health:
http://www.goaskalice.columbia.edu/

Canadian website devoted to sexuality education and information and administered by the Society of Obstetricians and Gynecologists of Canada:
http://www.sexualityandu.com/index_e.aspx

Information on circumcision or men’s sexual health:

Circumcision resource center:
http://www.circumcision.org

Circumcision Information and Resources Center:
http://www.CIRP.org

Men’s sexual health resources:
http://www.mens-sexual-health.org
Appendix I

Advertisements for Online Study

Are you a man between 18 and 40 years of age?
We're studying various aspects of male health and sexuality.

Click here to learn more about our studies
Appendix J

Research Ethics Board (REB) Approval (Chapter 5)

October 30, 2012

Ms. Jennifer Bossio
Ph.D. Candidate
Department of Psychology
Queen’s University
Kingston, ON K7L 3N6

GREB Ref #: GPSYC-580-12; Romeo #: 6007415
Title: "GPSYC-580-12 The Effects of Circumcision on Sexuality in Men: An Online Study"

Dear Bossio:

The General Research Ethics Board (GREB), by means of a delegated board review, has cleared your proposal entitled "GPSYC-580-12 The Effects of Circumcision on Sexuality in Men: An Online Study" for ethical compliance with the Tri-Council Guidelines (TCPS) and Queen’s ethics policies. In accordance with the Tri-Council Guidelines (article D.1.6) and Senate Terms of Reference (article G), your project has been cleared for one year. At the end of each year, the GREB will ask if your project has been completed and if not, what changes have occurred or will occur in the next year.

You are reminded of your obligation to advise the GREB, with a copy to your unit REB, of any adverse event(s) that occur during this one year period (access this form at https://eservices.queensu.ca/romeo_researcher/ and click Events - GREB Adverse Event Report). An adverse event includes, but is not limited to, a complaint, a change or unexpeceted event that alters the level of risk for the researcher or participants or situation that requires a substantial change in approach to a participant(s). You are also advised that all adverse events must be reported to the GREB within 48 hours.

You are also reminded that all changes that might affect human participants must be cleared by the GREB. For example you must report changes to the level of risk, applicant characteristics, and implementation of new procedures. To make an amendment, access the application at https://eservices.queensu.ca/romeo_researcher/ and click Events - GREB Amendment to Approved Study Form. These changes will automatically be sent to the Ethics Coordinator, Gail Irving, at the Office of Research Services or irvinggp@queensu.ca for further review and clearance by the GREB or GREB Chair.

On behalf of the General Research Ethics Board, I wish you continued success in your research.

Yours sincerely,

[Signature]

Jean Stevenson, Ph.D.
Professor and Chair
General Research Ethics Board

cc: Dr. Stephen Steele (Urology) and Dr. Caroline Pukall (Psychology), Faculty Supervisors
Dr. Leandre Fabregar, Chair, Unit REB
Marie Tooley, Dept. Admin.
Appendix K

Online Survey

Demographics

Age
1. Year of birth

Ethnicity
2. What is your place of birth?
   a. Canada
   b. United States
   c. Latin/South America
   d. Caribbean
   e. Australian/Oceania
   f. Western Europe
   g. Middle East
   h. Africa
   i. South Asia
   j. East Asia
   k. Other (please specify)
   l. Decline response

3. What culture do you most associate with?
   a. Canadian
   b. Qubécoise
   c. American
   d. Irish/Scottish/Welsh
   e. Native American
   f. Greek/Italian
   g. Eastern European
   h. Western European
   i. African
   j. South Asian
   k. East Asian
   l. Australian
   m. Middle Eastern
   n. Latin/South American
   o. Caribbean
   p. Other (please specify)
   q. Decline Response

SES
4. Highest level of education completed?
   a. Primary/elementary school (grades 1–8)
   b. Some high school completed (grades 9–11)
   c. Graduated from high school, or equivalent
   d. Vocational, trade or business school completed
   e. Community college – currently attending or completed diploma
   f. University – currently attending or completed bachelor's degree
   g. Graduate/professional school (MA, PhD, MBA, MD) - currently attending or completed degree
   h. Other (please specify)
   i. Decline response
5. What is your occupational status?
   a. Employed full-time
   b. Employed part-time
   c. Retired
   d. Student
   e. Full-time parenting
   f. On disability
   g. On Employment Insurance (EI)
   h. On Social Assistance
   i. Unemployed
   j. Other (please specify)
   k. Decline response

6. Approximate individual total annual income (before taxes)?
   a. $0 - $19,999
   b. $20,000 - $39,999
   c. $40,000 - $59,999
   d. $60,000 - $79,999
   e. $80,000 - $99,999
   f. $100,000 - $119,999
   g. $120,000 and over
   h. Decline response

Religion
7. What is your religious upbringing?
   a. Catholic
   b. Jewish
   c. Protestant
   d. Christian
   e. Muslim
   f. Mormon
   g. Jehovah Witness
   h. Hindu
   i. Buddhist
   j. Native
   k. Spiritual, no label
   l. Agnostic
   m. Atheist
   n. None
   o. Other (please specify)
   p. Decline response

8. Do you currently identify with any religious community?
   a. Yes
   b. No
   c. Decline Response

9. Please identify your current religious affiliation
   a. Catholic
   b. Jewish
   c. Protestant
   d. Christian
   e. Muslim
   f. Mormon
   g. Jehovah Witness
   h. Hindu
   i. Buddhist
   j. Native
   k. Spiritual, no label
   l. Agnostic
   m. Atheist
   n. None
   o. Other (please specify)
   p. Decline response

10. Please rate how important your current religious affiliation is to you (on a scale of 0-10, where 0 represents not important at all and 10 represents very important)

11. Please rate how involved you are with your current religious affiliation (on a scale of 0-10, where 0 means involvement less than once per year and 10 means involvement more than once per day)
## Relationship

12. Current relationship status
   a. Single
   b. Dating
   c. Common-law
   d. Engaged
   e. Married
   f. Divorced
   g. Widowed
   h. Other (please specify)
   i. Decline response

*If you are in a relationship, please answer the following questions. If you are not, please skip ahead to question 15:*

13. Nature of your current relationship
   a. My partner is a woman
   b. My partner is a man
   c. My partner is transgendered (Male to Female)
   d. My partner is transgendered (Female to Male)
   e. My partner is transgendered (Other)
   f. I have more than one partner
   g. Other (please specify)
   h. Decline response

14. How long have you been in this relationship situation?
   a. Months (enter)
   b. Years (enter)

15. What sexual orientation do you identify with?
   a. Heterosexual (other-sex attracted)
   b. Gay (same-sex attracted)
   c. Bisexual
   d. Queer
   e. Asexual
   f. Other (please specify)
   g. Decline response

16. What sexual identity do you identify with? (Select all that apply)
   a. Woman
   b. Man
   c. Trans Woman
   d. Trans Man
   e. FTM
   f. MTF
   g. Trans
   h. Transgender
   i. Transsexual
   j. Intersex
   k. Gender-queer
   l. Cross dresser
   m. Drag queen
   n. Drag king
   o. Bi-gender
   p. Pan-gender
   q. Two-spirit
   r. Not exclusively male or female
   s. Human Being
   t. Other (please specify)
   u. Decline response
Circumcision

22. Are you circumcised?  
1. Yes  
2. No  

*If you answered No to question 1, please skip ahead to question 6:*

23. Do you know where the procedure was performed? *If YES, please specify:*  
1. Hospital  
2. Medical clinic  
3. Personal residence  
4. Religious institution (e.g. synagogue, mosque)  
5. Other (please specify)  
6. Decline response

24. Do you know the procedure used for your circumcision? *If YES, please specify:*  
1. Shield and Knife (Scalpel)  
2. Forceps Guided  
3. Sleeve Resection  
4. Plastibell  
5. Tara KLamp  
6. SmartKlamp  
7. Zhenxi Rings  
8. Gomco Clamp  
9. Laser  
10. Other (please specify)  
11. Decline response

25. Do you know the type of anesthesia used? *If YES, please specify:*  
1. Topical  
2. General anesthesia  
3. Some form of pain relief other than formal anesthesia (e.g. wine, oral medication)  
4. Other (please specify)  
5. None  
6. Decline response

26. Do you know what the reasons were for circumcision? *If YES, please select all that apply*  
*If YES, please specify:*  
1. Religious reasons  
2. Social norm  
3. For appearance  
4. Hygiene  
5. To resemble your father  
6. To correct phimosis  
7. Medical reasons (other than phimosis)  
8. Other (specify)  
9. Decline response

27. How happy are you with your circumcision status? Please rate on a scale of 0-10, (where 0 represents very dissatisfied and 10 represents very satisfied)  
1. Decline response

28. How much is your circumcision status a positive issue for you in your every day life? Please rate on a scale of 0-10, (where 0 represents not a positive issue at all and 10 represents a very big positive issue)  
1. Decline response
29. How much is your circumcision status a *negative* issue for you in your every day life? Please rate on a scale of scale of 0-10, (where 0 represents *not a negative issue at all* and 10 represents a *very big negative issue*)
   1. Decline response

30. At what age were you circumcised?
   1. Infant (0–1 years)
   2. Toddler (2–3 years)
   3. Childhood (4-11 years)
   4. Adolescence (12-17 years)
   5. Adulthood (18 years and older)
   6. I don’t know
   7. I was circumcised more than once

31. Have you ever/would you ever take measures to change your circumcision status (e.g. if you are circumcised, foreskin "regrowth"; if you are not circumcised, adult circumcision)
   1. Yes (please specify)
   2. No
   3. Maybe
   4. I don’t know
   5. Decline response

32. Do you know if there were any complications with the circumcision procedure?
   1. If yes, please explain
   2. No
   3. I don’t know
   4. Decline response

33. If you have a son(s), are they:
   1. The same circumcision status as you?
   2. Different circumcision status as you?
   3. I have a mix of both circumcised and uncircumcised sons
   4. I don’t know
   5. Decline response

34. If you would/did circumcise your sons, what reasons would/did you have for this decision (Select all that apply):
   1. Religious reasons
   2. Social norm
   3. For appearance
   4. Hygiene
   5. To resemble their father (i.e., your circumcision status)
   6. To prevent phimosis
   7. Medical reasons (other than phimosis)
   8. Other (specify)
   9. I don’t know
   10. Decline response

35. If you would not/did not circumcise your sons, what reasons would/did you have for this decision (Select all that apply):
   1. Religious reasons
   2. Social norm
   3. For appearance
   4. Hygiene
   5. To resemble their father (i.e., your circumcision status)
   6. Medical reasons
   7. Other (specify)
   8. I don’t know
   9. Decline response
36. Do you think of your circumcision status as a significant part of who you are?
   a. Answer on a scale of 0-10, where 0 represents *my circumcision status is not at all an important part of who I am* and 10 represents *my circumcision status is a very important part of who I am*

37. How often do you think about your circumcision status?
   b. Answer on a scale of 0-10, where 0 represents *I never think of my circumcision status* and 10 represents *I constantly think about my circumcision status*

38. Do you have any regrets about your circumcision status?
   c. Yes (please specify)
   d. No
   e. Decline response

39. Do you ever wish that you were the opposite circumcision status?
   f. Yes (please specify)
   g. No
   h. Decline response

40. If you have foreskin, what about having a foreskin do you not like?
   i. Open-ended response
   j. Not applicable
   k. Decline response

41. If you do not have foreskin, what about being circumcised do you not like?
   l. Open-ended response
   m. Not applicable
   n. Decline response
Additional Genital Questions

To ensure that the measurement of your penis is accurate, please begin at the base of the penis (where your penis meets your pelvis). We would suggest using a piece of paper against your penis (for length) or around your penis (for girth), make a mark on the paper, and measure this mark using a ruler. Please provide measurements in inches.

1. How long is your penis when it is flaccid (non-erect, or "soft")?
   a. How satisfied are you with the length of your flaccid (non-erect, or "soft") penis? (On a scale of 0-10, where 0 represents very unsatisfied and 10 represents very satisfied)
      i. Decline response
   b. How satisfied is/would your partner be with the length of your flaccid (non-erect, or "soft") penis? (On a scale of 0-10, where 0 represents very unsatisfied and 10 represents very satisfied)
      i. Decline response

2. How long is your penis when it is erect ("hard")?
   a. How satisfied are you with the length of your erect ("hard") penis? (On a scale of 0-10, where 0 represents very unsatisfied and 10 represents very satisfied)
      i. Decline response
   b. How satisfied is/would your partner be with the length of your erect ("hard") penis? (On a scale of 0-10, where 0 represents very unsatisfied and 10 represents very satisfied)
      i. Decline response

3. What is the girth of your penis when it is flaccid (non-erect, or "soft")?
   a. How satisfied are you with the girth of your flaccid (non-erect, or "soft") penis? (On a scale of 0-10, where 0 represents very unsatisfied and 10 represents very satisfied)
      i. Decline response
   b. How satisfied is/would your partner be with the girth of your flaccid (non-erect, or "soft") penis? (On a scale of 0-10, where 0 represents very unsatisfied and 10 represents very satisfied)
      i. Decline response

4. What is the girth of your penis when it is erect ("hard")?
   a. How satisfied are you with the girth of your erect ("hard") penis? (On a scale of 0-10, where 0 represents very unsatisfied and 10 represents very satisfied)
      i. Decline response
   b. How satisfied is/would your partner be with the girth of your erect ("hard") penis? (On a scale of 0-10, where 0 represents very unsatisfied and 10 represents very satisfied)
      i. Decline response

5. Please select which of the following 6 pictures looks most like your penis when it is flaccid (non-erect, or "soft")?
a. How satisfied are you with the appearance of your foreskin when your penis is flaccid (non-erect, or “soft”)? (On a scale of 0-10, where 0 represents very unsatisfied and 10 represents very satisfied)
   i. Decline response
b. How satisfied is/would your partner be with the appearance of your foreskin when your penis is flaccid (non-erect, or “soft”)? (On a scale of 0-10, where 0 represents very unsatisfied and 10 represents very satisfied)
   i. Decline response

6. Please select which of the following 6 pictures looks most like your penis when it is erect (“hard”)?
a. How satisfied are you with the appearance of your foreskin when your penis is erect ("hard")? (On a scale of 0-10, where 0 represents very unsatisfied and 10 represents very satisfied)
   i. Decline response
b. How satisfied is/would your partner be with the appearance of your foreskin when your penis is erect ("hard")? (On a scale of 0-10, where 0 represents very unsatisfied and 10 represents very satisfied)
   i. Decline response

Kinsey Scale (Kinsey et al., 1968)

The following questions ask about your romantic and sexual attractions, sexual contacts, and sexual identity, in adulthood (since age 18). Please read each question carefully and read the options presented after each question. Please select the response that best describes you.

1. Please think about the people you have typically been romantically attracted to. By “romantically” attracted, we mean a deep emotional connection that is more than friendship. Would you say that your romantic attractions are toward:

   a. Women only
   b. Women mostly, but men occasionally too
   c. Women mostly, but men frequently (but not more than toward women)
   d. Women and men about equally
   e. Men mostly, but women frequently (but not more than toward men)
   f. Men mostly, but women occasionally too
   g. Men only

2. Please think about the people you have typically been sexually attracted to. By “sexually” attracted, we mean you experience sexual desire or interest in someone. Would you say that your sexual attractions are toward:

   a. Women only
   b. Women mostly, but men occasionally too
   c. Women mostly, but men frequently (but not more than toward women)
   d. Women and men about equally
   e. Men mostly, but women frequently (but not more than toward men)
   f. Men mostly, but women occasionally too
   g. Men only

3. Please think about the people you typically have sexual fantasies about. By a “sexual fantasy”, we mean sexual scenarios or daydreams you think about, and may use when masturbating and/or having sex with a partner. Would you say your sexual fantasies are about:
Below is a list of statements regarding thoughts and behaviors that an individual may experience or engage in during sexual relations. Read each statement carefully and identify how characteristic it is of you and your experiences during sexual activity. Indicate your honest answers by selecting the statement that is most applicable to you using the scale provided below.

NOTE: Scale is:

<table>
<thead>
<tr>
<th>a. Never</th>
<th>d. Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Rarely</td>
<td>e. Always or almost always</td>
</tr>
<tr>
<td>c. Sometimes</td>
<td>f. Decline response</td>
</tr>
</tbody>
</table>

1. During sexual activity I am thinking that my partner will notice something about my body that is a turnoff.
2. During sex I worry that my partner will find aspects of my physique unappealing.
3. During sexual activity I am unaware of how my body looks.
4. During sexual activity something about the way my body looks makes me feel inhibited.
5. I am comfortable while being undressed by my partner.
6. I prefer to keep my body hidden under a sheet or blanket during sex.
7. I am comfortable with my partner looking at my genitals during sexual activity.
8. When we're having sex, I worry that my partner will find my body repulsive.
9. During sexual activity I worry that my partner will think the size or appearance of my sex organs is inadequate or unattractive.
10. When it comes to my partner seeing me naked, I have nothing to hide.
11. During sexual activity I have thoughts that my body looks sexy.
12. I don't like my partner to see me completely naked during sexual activity.
13. I expect my partner to be excited by seeing me without my clothes.
14. I prefer to keep certain articles of clothing on during sex.
15. I am self-conscious about my body during sexual activity.
16. During sex I worry that my partner will find the appearance of odor of my genitals repulsive.
17. During sexual activity I try to hide certain areas of my body.
18. During sexual activity I keep thinking that parts of my body are too unattractive to be sexy.
19. There are parts of my body I don't want my partner to see when we are having sex.
20. During sexual activity I worry about what my partner thinks about how my body looks.
21. During sexual activity I worry that my partner could be turned off by how parts of my body feel to his/her touch.
22. During sexual activity it's hard for me not to think about my weight.
23. I feel self-conscious if the room is too well lit when I am having sex.
24. I am generally comfortable having parts of my body exposed to my partner during sexual activity.
25. During sex I enjoy having my partner look at my body.
26. During sex there are certain poses or positions I avoid, because of the way my body would look to my partner.
27. During sexual activity I am distracted by thoughts of how certain parts of my body look.
28. Prior to or following sex, I am comfortable walking naked in my partner’s view.

If you are circumcised, please answer the following questions. If you are not circumcised, please skip to number 34.

29. During sex, I am thinking about not having a foreskin.
30. During sex, I am worried that my partner may find my not having a foreskin unattractive.
31. During sex, I am worried that my partner is distracted by my not having a foreskin.
32. During sex, I think that my partner would enjoy sex more if I was not circumcised.
33. During sex, I think that I would enjoy sex more if I was not circumcised.

If you are uncircumcised, please answer the following questions. If you are circumcised, please skip to the next questionnaire.

34. During sex, I am thinking about my foreskin.
35. During sex, I am worried that my partner may find my foreskin unattractive.
36. During sex, I am worried that my partner is distracted by my foreskin.
37. During sex, I think that my partner would enjoy sex more if I were circumcised.
38. During sex, I think that I would enjoy sex more if I were circumcised.
BISS (Cash et al., 2002)

For each of the items below check the one statement that best describes how you felt IN THE LAST FOUR WEEKS. Read the items carefully to be sure the statement you choose accurately and honestly describes how you felt in the last four weeks.

1. In the last four weeks I have felt:
   a. Extremely dissatisfied with my physical appearance
   b. Mostly dissatisfied with my physical appearance
   c. Moderately dissatisfied with my physical appearance
   d. Slightly dissatisfied with my physical appearance
   e. Neither dissatisfied nor satisfied with my physical appearance
   f. Slightly satisfied with my physical appearance
   g. Moderately satisfied with my physical appearance
   h. Mostly satisfied with my physical appearance
   i. Extremely satisfied with my physical appearance
   j. Decline Response

2. In the last four weeks I have felt:
   a. Extremely dissatisfied with my body size and shape
   b. Mostly dissatisfied with my body size and shape
   c. Moderately dissatisfied with my body size and shape
   d. Slightly dissatisfied with my body size and shape
   e. Neither dissatisfied nor satisfied with my body size and shape
   f. Slightly satisfied with my body size and shape
   g. Moderately satisfied with my body size and shape
   h. Mostly satisfied with my body size and shape
   i. Extremely satisfied with my body size and shape
   j. Decline Response

3. In the last four weeks I have felt:
   a. Extremely dissatisfied with my weight
   b. Mostly dissatisfied with my weight
   c. Moderately dissatisfied with my weight
   d. Slightly dissatisfied with my weight
   e. Neither dissatisfied nor satisfied with my weight
   f. Slightly satisfied with my weight
   g. Moderately satisfied with my weight
   h. Mostly satisfied with my weight
   i. Extremely satisfied with my weight
   j. Decline Response
4. In the last four weeks, I have felt:
   a. Extremely physically attractive
   b. Very physically attractive
   c. Moderately physically attractive
   d. Slightly physically attractive
   e. Neither attractive nor unattractive
   f. Slightly physically unattractive
   g. Moderately physically unattractive
   h. Very physically unattractive
   i. Extremely physically unattractive
   j. Decline Response

5. In the last four weeks I have felt:
   a. A great deal worse about my looks than I usually feel
   b. Much worse about my looks than I usually feel
   c. Somewhat worse about my looks than I usually feel
   d. Just slightly worse about my looks than I usually feel
   e. About the same about my looks as usual
   f. Just slightly better about my looks than I usually feel
   g. Somewhat better about my looks than I usually feel
   h. Much better about my looks than I usually feel
   i. A great deal better about my looks than I usually feel
   j. Decline Response

6. In the last four weeks I have felt:
   a. A great deal better than the average person looks
   b. Much better than the average person looks
   c. Somewhat better than the average person looks
   d. Just slightly better than the average person looks
   e. About the same as the average person looks
   f. Just slightly worse than the average person looks
   g. Somewhat worse than the average person looks
   h. Much worse than the average person looks
   i. A great deal worse than the average person looks
   j. Decline Response
Male Genital Image Scale (Winter, 1989)

Select responses on the following scale:

- g. Very dissatisfied
- h. Dissatisfied
- i. Neutral
- j. Satisfied
- k. Very satisfied
- l. Decline response

17. Length of my non-erect penis.
18. Length of my erect penis.
20. Circumference of my erect penis.
22. Appearance of my erect penis.
23. Size of my testicles.
24. Way my testicles "hang".
25. Appearance of my scrotum (i.e. sac).
26. Texture of my pubic hair.
27. Appearance of my pubic hair.
28. Smell of my genitals.
29. Overall appearance of my genitals.
30. Overall size of my penis.
31. My foreskin when my penis is erect.
32. My foreskin when my penis is not erect.

IIEF-15 (Quek, Low, Rasack, Chua & Loh, 2004)

We are now going to ask you to answer some questions about your sexual function. In answering questions about your sexuality in this survey, the following definitions apply:

Sex, sexual activity, lovemaking, and foreplay refer to:
- Caressing, kissing, manual stimulation of the genitals/anus/chest by yourself or your partner
- Oral stimulation of the genitals/anus/chest
- Vaginal or anal penetration with fingers, sex toys or penis

Sexual intercourse is defined as penetration of your partner’s vagina or anus (you entered your partner) with fingers, sex toys or penis, or as receiving anal penetration with fingers, sex toys.

Sexual stimulation refers to sexual situations such as the following:
• Foreplay with your partner, stimulating your partner, receiving stimulation from your partner
• Self-stimulation (masturbation), sexual fantasy
• Viewing erotic films, pictures, or reading erotic material

**Ejaculate** is defined as the ejection of semen from the penis (or the feeling of this)

**Instructions:**
These questions ask about the effects erection problems have had on your sex life, over the past 4 weeks.

Please answer the following questions as honestly and clearly as possible.

Select only one answer per question.

16. Over the past 4 weeks, how often were you able to get an erection during sexual activity?
   a. No sexual activity
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response

17. Over the past 4 weeks, when you had erections with sexual stimulation, how often were your erections hard enough for penetration?
   a. No sexual stimulation
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response

The next three questions will ask about erections you may have had during sexual intercourse?

18. Over the past 4 weeks, when you attempted sexual intercourse, how often were you able to penetrate (enter) your partner?
   a. Did not attempt intercourse
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response

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19. Over the past 4 weeks, during sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?
   a. Did not attempt intercourse
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response

20. Over the past 4 weeks, during sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?
   a. Did not attempt intercourse
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response

21. Over the past 4 weeks, how many times have you attempted sexual intercourse?
   a. No attempts
   b. One to two attempts
   c. Three to four attempts
   d. Five to six attempts
   e. Seven to ten attempts
   f. Eleven + attempts
   g. Decline Response

22. Over the past 4 weeks, when you attempted sexual intercourse, how often was it satisfactory for you?
   a. Did not attempt intercourse
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response

23. Over the past 4 weeks, how much have you enjoyed sexual intercourse?
   a. No intercourse
   b. No enjoyment
   c. Not very enjoyable
   d. Fairly enjoyable
   e. Highly enjoyable
   f. Very highly enjoyable
   g. Decline Response
24. Over the past 4 weeks, when you had sexual stimulation or intercourse, how often did you ejaculate?
   a. No sexual stimulation/intercourse
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response

25. Over the past 4 weeks, when you had sexual stimulation or intercourse, how often did you have the feeling of orgasm or climax (with or without ejaculation)?
   a. No sexual stimulation/intercourse
   b. Almost never/never
   c. A few times (much less than half the time)
   d. Sometimes (about half the time)
   e. Most times (much more than half the time)
   f. Almost always/always
   g. Decline Response

The next two questions ask about sexual desire. Let’s define SEXUAL DESIRE as a feeling that may include wanting to have a sexual experience (for example, masturbation or intercourse), thinking about having sex, or feeling frustrated due to lack of sex.

26. Over the past 4 weeks, how often have you felt sexual desire?
   a. Almost never/never
   b. A few times (much less than half the time)
   c. Sometimes (about half the time)
   d. Most times (much more than half the time)
   e. Almost always/always
   f. Decline Response

27. Over the past 4 weeks, how would you rate your level of sexual desire?
   a. Very low/none at all
   b. Low
   c. Moderate
   d. High
   e. Very high
   f. Decline Response

28. Over the past 4 weeks, how satisfied have you been with your overall sex life?
   a. Very dissatisfied
   b. Moderately dissatisfied
   c. About equally satisfied and dissatisfied
   d. Moderately satisfied
   e. Very satisfied
   f. Decline Response
29. Over the past 4 weeks, how satisfied have you been with your sexual relationship with your partner?
   a. Very dissatisfied
   b. Moderately dissatisfied
   c. About equally satisfied and dissatisfied
   d. Moderately satisfied
   e. Very satisfied
   f. Decline Response

30. Over the past 4 weeks, how do you rate your confidence that you could get and keep an erection?
   a. Very low
   b. Low
   c. Moderate
   d. High
   e. Very high
   f. Decline Response
Appendix L

Research Ethics Board (REB) Approval (Chapter 6)

December 04, 2013

Ms. Jennifer Bossio
Ph.D. Candidate
Department of Psychology
Queen’s University
Humphrey Hall
Kingston, ON, K7L 3N6

GREB Ref #: GPSYC-641-13; Romeo # 6011307
Title: “GPSYC-641-15 Circumcision and Men’s Sexual Partners”

Dear Ms. Bossio:

The General Research Ethics Board (GREB), by means of a delegated board review, has cleared your proposal entitled "GPSYC-641-15 Circumcision and Men’s Sexual Partners" for ethical compliance with the Tri-Council Guidelines (TCPS) and Queen’s ethics policies. In accordance with the Tri-Council Guidelines (article D.1.6) and Senate Terms of Reference (article G), your project has been cleared for one year. At the end of each year, the GREB will ask if your project has been completed and if not, what changes have occurred or will occur in the next year.

You are reminded of your obligation to advise the GREB, with a copy to your unit REB, of any adverse event(s) that occur during this one year period (access this form at https://eservices.queensu.ca/romeo_researcher/ and click Events - GREB Adverse Event Report). An adverse event includes, but is not limited to, a complaint, a change or unexpected event that alters the level of risk for the researchers or participants or situation that requires a substantial change in approach to a participant(s). You are also advised that all adverse events must be reported to the GREB within 48 hours.

You are also reminded that all changes that might affect human participants must be cleared by the GREB. For example you must report changes to the level of risk, applicant characteristics, and implementation of new procedures. To make an amendment, access the application at https://eservices.queensu.ca/romeo_researcher/ and click Events - GREB Amendment to Approved Study Form. These changes will automatically be sent to the Ethics Coordinator, Gail Irving, at the Office of Research Services or irvingg@queensu.ca for further review and clearance by the GREB or GREB Chair.

On behalf of the General Research Ethics Board, I wish you continued success in your research.

Yours sincerely,

[Signature]

Joan Stevenson, Ph.D.
Chair, General Research Ethics Board

c: Dr. Caroline Pukall, Faculty Supervisor
Ms. Katie Bartley, Co-investigator
Dr. Stanka Fimeva, Chair, Unit REB
Ms. Marie Tooley, Dept. Admin.
Appendix M

Advertisements for Partner Study

Are you in a Sexual Relationship with a Man?

Queen’s University Department of Psychology needs male and female sexual partners of men to participate in a research study about circumcision status and partner sexual functioning.

Participant Criteria:

- Over the age of 18
- Fluent in English
- Access to the Internet
- In a sexual relationship with a male partner for the past 3 months minimum

Study Procedures:

- Completion of online questionnaires asking about partner circumcision status, sexual health, and relationship functioning.
- Participation will take approximately 30 minutes and all information is strictly confidential

***Prize Draws Available***

(613) 533-3276 or shrl@queensu.ca
Appendix N

Online Partner Survey

Demographic Questionnaire

Age
1. Year of Birth
   ____________________

Gender
5. With what gender do you identify?
   O Woman
   O Man
   O Not exclusively male or female
   O Other, please specify: ____________________
   O Decline Response

Ethnicity
2. What is your place of birth?
   O Canada
   O United States
   O Latin/South America
   O Caribbean
   O Australia
   O Western Europe
   O Middle East

3. What culture do you most associate with?
   O Canadian
   O Québécois/Québécois
   O American
   O Irish
   O Scottish
   O Welsh
   O Native American
   O Greek
   O Italian
   O Latin
   O South American
   O Eastern European
   O Western European
   O African
   O South Asian
   O East Asian
   O Australian
   O Middle Eastern
   O Latin/South American
   O Caribbean
   O Decline Response
   O Other
SES
5. What is the highest level of education you have completed?
   O Primary/elementary school (grades 1–8)
   O Some high school completed (grades 9–11)
   O Graduated from high school, or equivalent
   O Vocational, trade or business school completed
   O Community college – currently attending or completed diploma
   O University – currently attending or completed bachelor’ degree
   O Graduate/professional school (MA, PhD, MBA, MD) -- currently attending or completed degree
   O Decline Response
   O Other ________________________

6. What is your occupational status?
   O Employed full–time
   O Employed part–time
   O Retired
   O Student
   O Full–time parenting
   O On disability
   O On Employment Insurance (EI)
   O On Social Assistance (workfare/welfare)
   O Unemployed
   O Decline Response
   O Other

7. Approximate individual total annual income (before taxes)?
   O $0 -- $19,999
   O $20,000 -- $39,999
   O $40,000 -- $59,999
   O $60,000 -- $79,999
   O $80,000 -- $99,999
   O $100,000 -- $119,999
   O $120,000 and over
   O Decline Response

Religion
8. What is your religious upbringing?
   O Catholic
   O Jewish
   O Protestant
   O Christian
   O Muslim
   O Mormon
   O Jehovah Witness
   O Hindu
   O Buddhist
   O Native
   O Spiritual, no label
   O Agnostic
   O Atheist
   O None
   O Decline Response
   O Other

9. Do you currently identify with any religious community?
   O Yes
   O No
   O Decline Response
10. Please identify your current religious affiliation.

- Catholic
- Jewish
- Protestant
- Christian
- Muslim
- Mormon
- Jehovah Witness
- Hindu
- Buddhist
- Native
- Spiritual, no label
- Agnostic
- Atheist
- None
- Decline Response
- Other

11. Please rate how important your current religious affiliation is to you on a scale of 0–10 (where 0 represents not important at all and 10 represents very important).

Not important
Very important

1 2 3 4 5 6 7 8 9 10 N/A

12. Please rate how involved you are with your current religious affiliation on a scale of 0–10 (where 0 means involvement less than once per year and 10 means involvement more than once per day).

Less than once per year
More than once per day

1 2 3 4 5 6 7 8 9 10 no religious involvement

Relationship
27. What is your current relationship status?

- Single
- Dating one partner
- Dating (non-monogamous/more than one partner)
- Common-law
- Engaged
- Married
- Divorced
- Widowed
- Decline Response
- Other

4. What sexual orientation do you identify with?

- Heterosexual (opposite-sex attracted)
- Homosexual (same-sex attracted)
- Bisexual
- Pansexual
- Queer
5. With what gender identity do you identify? (Select all that apply)
   O  Asexual
   O  Decline Response
   O  Other ________________________

28. What is the gender identity of your current (primary) partner?
   O  My partner is a man
   O  My partner is transgender (Male to Female)
   O  My partner is transgender (Female to Male)
   O  Decline Response
   O  Other ________________________

29. How would you describe the status of your current relationship?
   O  Exclusive (monogamy by partners agreement)
   O  Nonexclusive (open relationship by partners’ agreement and partners have knowledge about the relationships)
   O  Nonexclusive (open relationship by partners’ agreement and partners do not have knowledge about the relationships)
   O  Nonexclusive (open relationships in which, sometimes, a third person joins the partners in a relationship)
   O  Nonexclusive (open relationship without the knowledge or agreement between the partners)
   O  Decline Response
   O  Other ________________________

30. How long have you been in this relationship situation?
   O  Months ________________________
   O  Years ________________________

31. What is your current partner’s year of birth?
   O  ________________________

32. What is your current partner’s circumcision status?
   O  My current partner is circumcised
   O  My current partner is intact (not circumcised)
   O  I don’t know my current partner’s circumcision status
   O  Decline response
Kinsey Scale  (Kinsey et al., 1968)

1. Please think about the people you have typically been romantically attracted to. By “romantically” attracted, we mean a deep emotional connection that is more than friendship. Would you say that your romantic attractions are toward:
   O Women only
   O Women mostly, but men occasionally too
   O Women mostly, but men frequently (but no more than towards women)
   O Women and men about equally
   O Men mostly, but women frequently (but no more than toward men)
   O Men mostly, but women occasionally too
   O Men only

2. Please think about the people you have typically been sexually attracted to. By “sexually” attracted, we mean you experience sexual desire or interest in someone. Would you say that your sexual attractions are towards:
   O Women only
   O Women mostly, but men occasionally too
   O Women mostly, but men frequently (but no more than towards women)
   O Women and men about equally
   O Men mostly, but women frequently (but no more than toward men)
   O Men mostly, but women occasionally too
   O Men only

3. Please think about the people you have typically been sexual fantasies about. By a “sexual fantasy”, we mean sexual scenarios or daydreams you think about, and may use when masturbating and/or having sex with a partner. Would you say that your sexual fantasies are about:
   O Women only
   O Women mostly, but men occasionally too
   O Women mostly, but men frequently (but no more than towards women)
   O Women and men about equally
   O Men mostly, but women frequently (but no more than toward men)
   O Men mostly, but women occasionally too
   O Men only
Sexual Behavior

1. What was your age at first intercourse?
   O ________________________

2. What was the circumcision status of your first sexual partner?
   O Circumcised
   O Intact (uncircumcised)
   O I don’t know
   O Decline response

2. What was the circumcision status of the first sexual partner to give you an orgasm?
   O Circumcised
   O Intact (uncircumcised)
   O I don’t know
   O N/A (I’ve never had an orgasm with/without a sexual partner)
   O Decline response

* Only women will see this question

3. What was the circumcision status of the first sexual partner to give you a vaginal orgasm (that is, an orgasm during penetrative intercourse without manual stimulation of your clitoris)?
   O Circumcised
   O Intact (uncircumcised)
   O I don’t know
   O N/A (I’ve never had a vaginal orgasm with a sexual partner)
   O Decline response

4 How many sexual partners have you had in your life? In this context, we are referring to people with whom you have had penetrative intercourse with.
   O ________________________

* If >1 sexual partners
4.1 Of these, how many of your sexual partners were female?
   O ________________________

4.2 How many of your sexual partners were male?
   O ________________________

* Only women will see this question

1. How many male partners in total have you had penile-vaginal intercourse with across your life?
   O ________________________
   O Decline Response
* Only women will see this question
2. How many intact (i.e., uncircumcised) male partners have you had penile-vaginal intercourse with across your life?
   O ______________________
   O Decline Response

* Only women will see this question
3. How many circumcised male partners have you had penile-vaginal intercourse with across your life?
   O ______________________
   O Decline Response

* Only women will see this question
2. What was the circumcision status of the first person you had penile-vaginal intercourse with?
   O Circumcised
   O Intact (uncircumcised)
   O I don’t know
   O Decline response

* Only men will see this question
4. How many male partners have you had penile-anal intercourse with across your life?
   O ______________________
   O Decline Response

5. How many intact (uncircumcised) male partners have you had penile-anal intercourse with across your life?
   O ______________________
   O Decline Response

6. How many circumcised male partners have you had penile-anal intercourse with across your life?
   O ______________________
   O Decline Response

2. What was the circumcision status of the first person you had penile-anal intercourse with?
   O Circumcised
   O Intact (uncircumcised)
   O I don’t know
   O Decline response

* Both men and women will see this question
7. How many male partners have you performed fellatio on across your life (i.e., a “blowjob”)?
   O ______________________
   O Decline Response
8. How many intact (uncircumcised) male partners have you performed fellatio on across your life (i.e., a “blowjob”)?
   O __________________________
   O Decline Response

9. How many circumcised male partners have you performed fellatio on across your life (i.e., a “blowjob”)?
   O __________________________
   O Decline Response

2. What was the circumcision status of the first person you performed fellatio on?
   O Circumcised
   O Intact (uncircumcised)
   O I don’t know
   O Decline response

10. How many male partners have you given penile-manual stimulation to across your life (i.e., a “handjob”)?
    O __________________________
    O Decline Response

11. How many intact (uncircumcised) male partners have you given penile-manual stimulation to across your life (i.e., a “handjob”)?
    O __________________________
    O Decline Response

12. How many circumcised sexual partners have you given penile-manual stimulation to across your life (i.e., a “handjob”)?
    O __________________________
    O Decline Response

2. What was the circumcision status of the first person you performed penile-manual stimulation on?
   O Circumcised
   O Intact (uncircumcised)
   O I don’t know
   O Decline response

13. Are you currently sexually active?
    O Yes
    O No
    O Decline Response

* If participant is a woman:

17.1 With respect to orgasms, I prefer:
    O Vaginal orgasms (i.e., orgasms during penetrative penile-vaginal intercourse, without manual stimulation of the clitoris, or g-spot orgasms)
Anal orgasms (i.e., orgasms during penile-anal intercourse, without manual stimulation of
the clitoris)
Oral orgasms (i.e., orgasms received though oral sex, without penetrative intercourse)
Manual/clitoral orgasms (i.e., orgasms received though manual stimulation of my clitoris)
Does not matter
Decline response

* If participant is a man:
17.1 With respect to orgasms, I prefer:
Anal orgasms (i.e., orgasms during penile-anal intercourse, without manual stimulation of
your genitals, or prostate orgasms)
Oral orgasms (i.e., orgasms received though oral sex, without penetrative intercourse)
Manual orgasms (i.e., orgasms received though manual stimulation of my genitals)
Does not matter
Decline response

Partner Circumcision Status Questionnaire

The next section makes reference to your partner’s "circumcision status". Circumcision status refers to
whether your partner is circumcised or not. If your partner’s penile foreskin was surgically removed
(either totally or partially), then your partner’s circumcision status is circumcised. If your partner’s
penile foreskin is still intact, than your circumcision status is intact (uncircumcised).

1. What is your partner’s circumcision status?
Intact (uncircumcised)
Circumcised
Decline Response

If you answered intact (uncircumcised) to question 1, please skip ahead to question 6:

2. At what age was your partner circumcised?
Neonate (before 3 months)
Infant (4 months – 1 year)
Toddler (2 – 3 years)
Childhood (4 – 11 years)
Adolescence (12 – 17 years)
Adulthood (18 years and older)
I don’t know
He was circumcised more than once specify ages:
Decline Response

3. What were the reasons for your partner’s circumcision?
Please select all that apply:
Religious reasons
Social norm (other people do it)
For appearance
Hygiene
Ethical reasons
To resemble his father
To correct phimosis
Medical reasons (other than phimosis): specify
Doctor’s Recommendation
Religious reasons
I don’t know
Decline Response
Other
4. Do you know if there were any problems with your partner’s circumcision procedure?
   O Yes  
   O No  
   O I don’t know  
   O Decline Response

5. If you answered yes to the above questions, please explain the complications that occurred with the circumcision procedure. If you did not answer yes please write “NA” in the response box. If you do not want to answer this question, please write “DR” in the response box.

* Only men will see this question

6. What is your circumcision status?
   O Circumcised  
   O Intact (uncircumcised)  
   O Decline Response  

If you answered intact (uncircumcised) to question 6, please skip ahead to question 11:

* Only men will see this question

7. At what age were you circumcised?
   O Neonate (before 3 months)  
   O Infant (4 months—1 year)  
   O Toddler (2-3 years)  
   O Childhood (4—11 years)  
   O Adolescence (12—17 years)  
   O Adulthood (18 years and older)  
   O I was circumcised more than once: Specify ages  
   O I don’t know  
   O Decline Response

* Only men will see this question

8. What were the reasons for your circumcision?
   Please select all that apply:
   O Religious reasons  
   O Social norm (other people do it)  
   O For appearance  
   O Hygiene  
   O To resemble my parent  
   O To correct phimosis  
   O Medical reasons (other than phimosis) : specify  
   O Doctor’s Recommendation  
   O I don’t know  
   O Decline Response  
   O Other

* Only men will see this question

9. Do you know if there were any problems with your circumcision procedure?
   O Yes  
   O No  
   O I don’t know  
   O Decline Response

* Only men will see this question

10. If you answered yes to the above questions, please explain the complications that occurred with the circumcision procedure. If you did not answer yes please write “NA” in the response box. If you do not want to answer this question, please write “DR” in the response box.
11. How happy are you with your partner’s circumcision status? Please rate on a scale of 0-10 (where 0 represents very dissatisfied, 10 represents very satisfied, and 5 represents I am neither satisfied nor dissatisfied)

<table>
<thead>
<tr>
<th>Very dissatisfied</th>
<th>Very satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>O O O O O O O O O O</td>
<td></td>
</tr>
</tbody>
</table>

1 2 3 4 5 6 7 8 9 10  Decline Response

12. How much is your partner’s circumcision status a positive issue for you in your everyday life? Please rate on a scale of 0-10 (where 0 represents not at all and 10 represents very much, and 5 represents it is neither positive or negative)

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>O O O O O O O O O O</td>
<td></td>
</tr>
</tbody>
</table>

1 2 3 4 5 6 7 8 9 10  Decline Response

13. How much is your partner’s circumcision status a negative issue for you in your everyday life? Please rate on a scale of 0-10 (where 0 represents not at all and 10 represents very much, and 5 represents it is neither positive or negative)

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>O O O O O O O O O O</td>
<td></td>
</tr>
</tbody>
</table>

1 2 3 4 5 6 7 8 9 10  Decline Response
14. Please select which of the following 6 pictures looks most like your partner’s penis when it is flaccid (i.e., non–erect, or “soft”)?

O A  O E
O B  O F
O C  O Decline Response
O D

15. How satisfied are you with the appearance of your partner’s foreskin when your partner’s penis is flaccid (i.e., non–erect, or “soft”)? Please answer on a scale of 0—10 (where 0 represents very unsatisfied and 10 represents very satisfied, and 5 represents neither satisfied or unsatisfied).

<table>
<thead>
<tr>
<th>Very unsatisfied</th>
<th>Very satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>O O O O O O O O O O</td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
</tbody>
</table>

Decline Response
16. Please select which of the following 6 pictures looks most like your partner’s penis when it is erect (i.e., “hard”)?

- A
- B
- C
- D
- E
- F

17. How satisfied are you with the appearance of your partner’s foreskin when your partner’s penis is erect (“hard”)? Please answer on a scale of 0—10 (where 0 represents very unsatisfied and 10 represents very satisfied, and 5 represents neither satisfied or unsatisfied).

<table>
<thead>
<tr>
<th>Very unsatisfied</th>
<th>Very satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>O O O O O O O O O</td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
</tbody>
</table>

18. How often do you think about your partner’s circumcision status? Please answer on a scale of 0—10 (where 0 represents I never think about my partner’s circumcision status and 10 represents I constantly think about my partner’s circumcision status)

<table>
<thead>
<tr>
<th>Never</th>
<th>Constantly</th>
</tr>
</thead>
<tbody>
<tr>
<td>O O O O O O O O O</td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
</tbody>
</table>

19. What about your partner’s circumcision status do you like?

If there is nothing about your partner’s circumcision status that you like please write “NA” in the response box. If you do not want to answer this question, please write “DR” in the response box.
22. What about your partner’s circumcision status do you not like?
If there is nothing about your partner’s circumcision status that you dislike please write “NA” in the response box. If you do not want to answer this question, please write “DR” in the response box.

23. Do you ever wish that your partner was the opposite circumcision status?
   O Yes
   O No
   O Decline Response

24. If you answered yes to the above question, please specify why you wish your partner was the opposite circumcision status.
If you did not answer yes please write “NA” in the response box. If you do not want to answer this question, please write “DR” in the response box.

* Only women will see this question

**Female Sexual Function Index (FSFI)** (Rosen, Brown, Heiman, Leiblum, Meston, Shabsigh, Ferguson, & D’Agostino Jr., 2000)

**INSTRUCTIONS:** These questions ask about your sexual feelings and responses during the past 4 weeks. Please answer the following questions as honestly and clearly as possible. Your responses will be kept completely confidential. In answering these questions the following definitions apply:

**Sexual activity** can include caressing, foreplay, masturbation and vaginal intercourse.

**Sexual intercourse** is defined as penile penetration (entry) of the vagina.

**Sexual stimulation** includes situations like foreplay with a partner, self-stimulation (masturbation), or sexual fantasy.

**CHECK ONLY ONE BOX PER QUESTION.**

**Sexual desire** or **interest** is a feeling that includes wanting to have a sexual experience, feeling receptive to a partner's sexual initiation, and thinking or fantasizing about having sex.

1. Over the past 4 weeks, how often did you feel sexual desire or interest?
   O Almost always or always
   O Most times (more than half the time)
   O Sometimes (about half the time)
   O A few times (less than half the time)
   O Almost never or never
   O Decline Response
2. Over the past 4 weeks, how would you rate your level (degree) of sexual desire or interest?
   O Very high
   O High
   O Moderate
   O Low
   O Very low or none at all
   O Decline Response

Sexual arousal is a feeling that includes both physical and mental aspects of sexual excitement. It may include feelings of warmth or tingling in the genitals, lubrication (wetness), or muscle contraction.

3. Over the past 4 weeks, how often did you feel sexually aroused (“turned on”) during sexual activity?
   O No sexual activity
   O Almost always or always
   O Most times (more than half the time)
   O Sometimes (about half the time)
   O A few times (less than half the time)
   O Almost never or never
   O Decline Response

4. Over the past 4 weeks, how would you rate your level of sexual arousal (“turn on”) during sexual activity or intercourse?
   O No sexual activity
   O Very high
   O High
   O Moderate
   O Low
   O Very low or none at all
   O Decline Response

5. Over the past 4 weeks, how confident were you about becoming sexually aroused during sexual activity or intercourse?
   O No sexual activity
   O Very high confidence
   O High confidence
   O Moderate confidence
   O Low confidence
   O Very low or no confidence
   O Decline Response

6. Over the past 4 weeks, how often have you been satisfied with your arousal (excitement) during sexual activity or intercourse?
   O No sexual activity
   O Almost always or always
   O Most times (more than half the time)
   O Sometimes (about half the time)
7. Over the past 4 weeks, how often did you become lubricated ("wet") during sexual activity or intercourse?
   - No sexual activity
   - Almost always or always
   - Most times (more than half the time)
   - Sometimes (about half the time)
   - A few times (less than half the time)
   - Almost never or never
   - Decline Response

8. Over the past 4 weeks, how difficult was it to become lubricated ("wet") during sexual activity or intercourse?
   - No sexual activity
   - Extremely difficult or impossible
   - Very difficult
   - Difficult
   - Slightly difficult
   - Not difficult
   - Decline Response

9. Over the past 4 weeks, how often did you maintain your lubrication ("wetness") until completion of sexual activity or intercourse?
   - No sexual activity
   - Almost always or always
   - Most times (more than half the time)
   - Sometimes (about half the time)
   - A few times (less than half the time)
   - Almost never or never
   - Decline Response

10. Over the past 4 weeks, how difficult was it to maintain your lubrication ("wetness") until completion of sexual activity or intercourse?
    - No sexual activity
    - Extremely difficult or impossible
    - Very difficult
    - Difficult
    - Slightly difficult
    - Not difficult
    - Decline Response

11. Over the past 4 weeks, when you had sexual stimulation or intercourse, how often did you reach orgasm (climax)?
    - No sexual activity
12. Over the past 4 weeks, when you had sexual stimulation or intercourse, how difficult was it for you to reach orgasm?
   O No sexual activity
   O Extremely difficult or impossible
   O Very difficult
   O Difficult
   O Slightly difficult
   O Not difficult
   O Decline Response

13. Over the past 4 weeks, how satisfied were you with your ability to reach orgasm?
   O No sexual activity
   O Very satisfied
   O Moderately satisfied
   O About equally satisfied and dissatisfied
   O Moderately dissatisfied
   O Very dissatisfied
   O Decline Response

14. Over the past 4 weeks, how satisfied have you been with the amount of emotional closeness during sexual activity between you and your partner?
   O No sexual activity
   O Very satisfied
   O Moderately satisfied
   O About equally satisfied and dissatisfied
   O Moderately dissatisfied
   O Very dissatisfied
   O Decline Response

15. Over the past 4 weeks, how satisfied have you been with your sexual relationship with your partner?
   O No sexual activity
   O Very satisfied
   O Moderately satisfied
   O About equally satisfied and dissatisfied
   O Moderately dissatisfied
   O Very dissatisfied
   O Decline Response
16. Over the past 4 weeks, how *satisfied* have you been with your overall sexual life?
   O No sexual activity
   O Very satisfied
   O Moderately satisfied
   O About equally satisfied and dissatisfied
   O Moderately dissatisfied
   O Very dissatisfied
   O Decline Response

17. Over the past 4 weeks, how *often* did you experience discomfort or pain during vaginal penetration?
   O Did not attempt intercourse
   O Almost always or always
   O Most times (more than half the time)
   O Sometimes (about half the time)
   O A few times (less than half the time)
   O Almost never or never
   O Decline Response

18. Over the past 4 weeks, how *often* did you experience discomfort or pain following vaginal penetration?
   O Did not attempt intercourse
   O Almost always or always
   O Most times (more than half the time)
   O Sometimes (about half the time)
   O A few times (less than half the time)
   O Almost never or never
   O Decline Response

19. Over the past 4 weeks, how would you rate your *level* (degree) of discomfort or pain during or following vaginal penetration?
   O Did not attempt intercourse
   O Very high
   O High
   O Moderate
   O Low
   O Very low or none at all
   O Decline Response
*Only men will see this question*

**International Index for Erectile Function: Adapted Tool for Men who have Sex with Men (IIEF-MSM)** (Coyne, MandaliaMcCullough, Catalan, Noestlinger, Colebunders, & Asboe, 2010)

**INSTRUCTIONS:** These questions ask about your sexual feelings and responses **during the past 4 weeks**. Please answer the following questions as honestly and clearly as possible. Your responses will be kept completely confidential. In answering these questions the following definitions apply:

**Sexual activity** can include caressing, foreplay, masturbation and vaginal intercourse.

**Sexual intercourse** is defined as penile penetration (entry) of the anus.

**Sexual stimulation** includes situations like foreplay with a partner, self-stimulation (masturbation), or sexual fantasy.

**Active anal intercourse** is defined as taking the “top” role in anal intercourse (penetrating your partner)

**Passive anal intercourse** is defined as taking the receptive, or “bottom” role in anal intercourse (being penetrated by your partner)

**CHECK ONLY ONE BOX PER QUESTION.**

1. **Over the past 4 weeks, how often were you able to get an erection during sexual activity?**
   - O No sexual activity
   - O Almost always or always
   - O Most times (more than half the time)
   - O Sometimes (about half the time)
   - O A few times (less than half the time)
   - O Almost never or never
   - O Decline Response

2. **Over the past 4 weeks, when you had erections with sexual stimulation, how often were your erections hard enough for penetration?**
   - O No sexual activity
   - O Almost always or always
   - O Most times (more than half the time)
   - O Sometimes (about half the time)
   - O A few times (less than half the time)
   - O Almost never or never
   - O Decline Response
3. Over the past 4 weeks, have you had, or attempted to have, active anal intercourse?
   O Yes – go to question 4
   O No – go to questions 7
   O Decline Response

4. Over the past 4 weeks, when you attempted active anal intercourse, how often were you able to penetrate (enter) your partner?
   O Almost always or always
   O Most times (more than half the time)
   O Sometimes (about half the time)
   O A few times (less than half the time)
   O Almost never or never
   O Decline Response

5. Over the past 4 weeks, during active anal intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?
   O Almost always or always
   O Most times (more than half the time)
   O Sometimes (about half the time)
   O A few times (less than half the time)
   O Almost never or never
   O Decline Response

6. Over the past 4 weeks, have you had, or attempted to have, passive anal intercourse?
   O Yes – go to question 8
   O No – go to questions 10
   O Decline Response

7. Over the past 4 weeks, during passive anal intercourse, how often were you able to maintain your erection after you had been penetrated by your partner?
   O Almost always or always
   O Most times (more than half the time)
   O Sometimes (about half the time)
   O A few times (less than half the time)
   O Almost never or never
   O Decline Response

8. Over the past 4 weeks, during non-intercourse sexual activity, e.g., masturbation/oral sex, how often were you able to maintain your erection until completion of sexual activity?
   O No sexual activity
   O Almost always or always
   O Most times (more than half the time)
   O Sometimes (about half the time)
   O A few times (less than half the time)
   O Almost never or never
   O Decline Response
9. Over the past 4 weeks, when you attempted sexual intercourse or other sexual activity, how often was it satisfactory for you?
   O No sexual activity
   O Almost always or always
   O Most times (more than half the time)
   O Sometimes (about half the time)
   O A few times (less than half the time)
   O Almost never or never
   O Decline Response

10. Over the past 4 weeks, how much have you enjoyed sexual intercourse or other sexual activity?
    O No sexual activity
    O No enjoyment
    O Not very enjoyable
    O Fairly enjoyable
    O Highly enjoyable
    O Very highly enjoyable
    O Decline Response

11. Over the past 4 weeks, when you had sexual stimulation or intercourse, how often did you ejaculate?
    O No sexual activity
    O Almost always or always
    O Most times (more than half the time)
    O Sometimes (about half the time)
    O A few times (less than half the time)
    O Almost never or never
    O Decline Response

12. Over the past 4 weeks, when you had sexual stimulation or intercourse, how often did you have the feeling of orgasm with or without ejaculation?
    O No sexual activity
    O Almost always or always
    O Most times (more than half the time)
    O Sometimes (about half the time)
    O A few times (less than half the time)
    O Almost never or never
    O Decline Response

13. Over the past 4 weeks, how often have you felt sexual desire?
    O No sexual activity
    O Almost always or always
    O Most times (more than half the time)
    O Sometimes (about half the time)
    O A few times (less than half the time)
    O Almost never or never
    O Decline Response
14. Over the past 4 weeks, how would you rate your level of sexual desire?
   O Very low or not at all
   O Low
   O Moderate
   O High
   O Very High
   O Decline Response

15. Over the past 4 weeks, how satisfied have you been with your overall sex life?
   O Very satisfied
   O Moderately satisfied
   O About equally satisfied and dissatisfied
   O Moderately dissatisfied
   O Very dissatisfied
   O Decline Response

16. Over the past 4 weeks, when you masturbated, how often could you get an erection?
   O No masturbation
   O Almost always or always
   O Most times (more than half the time)
   O Sometimes (about half the time)
   O A few times (less than half the time)
   O Almost never or never
   O Decline Response
Circumcision Preference Questionnaire

For the following questions, please indicate what circumcision status you would prefer for your partner when you are engaging in the each of the sexual activities indicated, using a scale of 0—10 (where 0 represents complete preference for an intact (uncircumcised) penis, 5 represents no preference for a specific circumcision status, and 10 represents complete preference for a circumcised penis).

* Only women will see this question

1. What circumcision status would you prefer for your partner, and how completely would you prefer your partner to have this specific circumcision status, for when you are having penile-vaginal intercourse with your partner?

<table>
<thead>
<tr>
<th>Complete preference for intact (uncircumcised) penis</th>
<th>Complete preference for circumcised penis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>O</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>O Decline Response</td>
<td></td>
</tr>
</tbody>
</table>

* Only women will see this question

2. Why do you prefer an intact (uncircumcised) partner for penile-vaginal intercourse?

If you responded to the previous question by filling in one of the bubbles from 1-4 this question applies to you. If you filled in one of the bubbles from 5-10 please write “NA” in the response box. If you do not want to answer this question, please write “DR” in the response box.

* Only women will see this question

3. Why do you prefer a circumcised partner for penile-vaginal intercourse?

If you responded to the previous question by filling in one of the bubbles from 6-10 this question applies to you. If you filled in one of the bubbles from 1-5 please write “NA” in the response box. If you do not want to answer this question, please write “DR” in the response box.

4. What circumcision status would you prefer for your partner, and how completely would you prefer your partner to have this specific circumcision status, for when you are having penile-anal intercourse with your partner?

<table>
<thead>
<tr>
<th>Complete preference for intact (uncircumcised) penis</th>
<th>Complete preference for circumcised penis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>O</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>O Decline Response</td>
<td></td>
</tr>
</tbody>
</table>

5. Why do you prefer an intact (uncircumcised) partner for penile-anal intercourse?

If you responded to the previous question by filling in one of the bubbles from 1-4 this question applies to you. If you filled in one of the bubbles from 5-10 please write “NA” in the response box. If you do not want to answer this question, please write “DR” in the response box.
6. Why do you prefer a circumcised partner for penile-anal intercourse?
   If you responded to the previous question by filling in one of the bubbles from 6-10 this question
   applies to you. If you filled in one of the bubbles from 1-5 please write “NA” in the response box. If
   you do not want to answer this question, please write “DR” in the response box.

7. What circumcision status would you prefer for your partner, and how completely would you
   prefer your partner to have this specific circumcision status, for when you are giving your
   partner fellatio (i.e. a “blowjob”)?

   Complete preference
   for intact (uncircumcised)
   Complete preference
   for circumcised
   penis
   No preference
   penis
   0 0 0 0 0 0 0 0 0 0
   1 2 3 4 5 6 7 8 9 10
   O Decline Response

8. Why do you prefer an intact (uncircumcised) partner for when you are performing
   fellatio?
   If you responded to the previous question by filling in one of the bubbles from 1-4 this question
   applies to you. If you filled in one of the bubbles from 5-10 please write “NA” in the response box. If
   you do not want to answer this question, please write “DR” in the response box.

9. Why do you prefer a circumcised partner for when you are performing fellatio?
   If you responded to the previous question by filling in one of the bubbles from 6-10 this question
   applies to you. If you filled in one of the bubbles from 1-5 please write “NA” in the response box. If
   you do not want to answer this question, please write “DR” in the response box.

10. What circumcision status would you prefer for your partner, and how completely would you
    prefer your partner to have this specific circumcision status, for when you are giving your
    partner penile-manual stimulation (i.e. a “handjob”)?

    Complete preference
    for intact (uncircumcised)
    Complete preference
    for circumcised
    penis
    No preference
    penis
    0 0 0 0 0 0 0 0 0 0
    1 2 3 4 5 6 7 8 9 10
    O Decline Response

11. Why do you prefer an intact (uncircumcised) partner for when you are giving penile-
    manual stimulation?
    If you responded to the previous question by filling in one of the bubbles from 1-4 this question
    applies to you. If you filled in one of the bubbles from 5-10 please write “NA” in the response box. If
    you do not want to answer this question, please write “DR” in the response box.

12. Why do you prefer a circumcised partner for when you are giving penile-manual
    stimulation?
    If you responded to the previous question by filling in one of the bubbles from 6-10 this question
    applies to you. If you filled in one of the bubbles from 1-5 please write “NA” in the response box. If
    you do not want to answer this question, please write “DR” in the response box.
13. What circumcision status would you prefer for your partner, and how completely would you prefer your partner to have this specific circumcision status, overall?

<table>
<thead>
<tr>
<th>Complete preference for intact (uncircumcised)</th>
<th>Complete preference for circumcised penis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 O O O O O O O O O O O O O O O O O O O O O</td>
<td>0 O O O O O O O O O O O O O O O O O O O</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9 10</td>
<td>O Decline Response</td>
</tr>
</tbody>
</table>

**Beliefs About Circumcision Status**

For the following questions, please indicate what circumcision status best fits the description.

14. This circumcision status is the most hygienic
   - O Intact (uncircumcised) penis
   - O Circumcised penis
   - O I don’t find a difference
   - O Decline Response

15. This circumcision status is the social norm
   - O Intact (uncircumcised) penis
   - O Circumcised penis
   - O I don’t find a difference
   - O Decline Response

16. This circumcision status is cleaner
   - O Intact (uncircumcised) penis
   - O Circumcised penis
   - O I don’t find a difference
   - O Decline Response

17. This circumcision status is more erotic
   - O Intact (uncircumcised) penis
   - O Circumcised penis
   - O I don’t find a difference
   - O Decline Response

18. This circumcision status is more natural
   - O Intact (uncircumcised) penis
   - O Circumcised penis
   - O I don’t find a difference
   - O Decline Response
19. This circumcision status is more attractive
   O Intact (uncircumcised) penis
   O Circumcised penis
   O I don’t find a difference
   O Decline Response

20. This circumcision status provides greater pleasure during penile-vaginal intercourse
   O Intact (uncircumcised) penis
   O Circumcised penis
   O I don’t find a difference
   O Decline Response

21. This circumcision status provides greater pleasure during penile-anal intercourse
   O Intact (uncircumcised) penis
   O Circumcised penis
   O I don’t find a difference
   O Decline Response

22. This circumcision status feels nicer to touch
   O Intact (uncircumcised) penis
   O Circumcised penis
   O I don’t find a difference
   O Decline Response

23. This circumcision status is more interesting
   O Intact (uncircumcised) penis
   O Circumcised penis
   O I don’t find a difference
   O Decline Response

24. This circumcision status is more likely to reduce STI transmission
   O Intact (uncircumcised) penis
   O Circumcised penis
   O I don’t think there is a difference
   O Decline Response

25. This circumcision status is the most common in my country
   O Intact (uncircumcised) penis
   O Circumcised penis
   O I don’t think there is a difference
   O Decline Response

26. This circumcision status is the most common for my age group
   O Intact (uncircumcised) penis
   O Circumcised penis
   O I don’t think there is a difference
   O Decline Response
27. This circumcision status is most preferred by men

O Intact (uncircumcised) penis
O Circumcised penis
O I don’t think there is a difference
O Decline Response

28. This circumcision status is most preferred by female sexual partners of men

O Intact (uncircumcised) penis
O Circumcised penis
O I don’t think there is a difference
O Decline Response

29. This circumcision status is most preferred by male sexual partners of men

O Intact (uncircumcised) penis
O Circumcised penis
O I don’t think there is a difference
O Decline Response