

Male genital mutilation: an adaptation to sexual conflict

Christopher G. Wilson*

Department of Neurobiology and Behavior, Cornell University, Ithaca, NY, USA

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Abstract

Male genital mutilation (MGM) takes several forms and occurs in about 25% of societies. This behavior has puzzled anthropologists, doctors and theologians for centuries, and presents an evolutionary challenge since it involves dangerous and costly surgery. I suggest that MGM is likely to reduce insemination efficiency, reducing a man's capacity for extra-pair fertilizations by impairing sperm competition. MGM may therefore represent a hard-to-fake signal of a man's reduced ability to challenge the paternity of older men who are already married. Men who display this signal of sexual obedience may gain social benefits if married men are selected to offer social trust and investment preferentially to peers who are less threatening to their paternity. Clitoridectomy and vaginal infibulation serve a parallel signaling function in women, increasing a husband's paternity certainty and garnering his increased investment. Especially in societies where paternity uncertainty and reproductive conflict are high, the social benefits of MGM as a signal may outweigh its costs. This 'sexual conflict' hypothesis predicts that MGM should be associated with polygyny, particularly when co-wives reside far apart, and that MGM should reduce the frequency of extramarital sex. MGM rituals should facilitate access to social benefits; they should be highly public, watched mainly by men, and performed by a nonrelative. I found support for these six predictions in two cross-cultural samples. I also examined an alternative hypothesis suggesting that MGM signals group commitment for collective action, particularly inter-societal warfare. Although other forms of male scarification fit this model, the distribution of MGM is not predicted by frequency of inter-societal warfare.

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1. Introduction

Male genital mutilation (MGM) is any permanent modification of the external genitalia that involves the ablation of tissue and is normative for all males within a society (Murdock, 1967). MGM is present in a substantial minority of pre-industrial human societies and predates recorded history (Dunsmuir & Gordon, 1999). The form of the prescribed mutilation varies among societies. The least extreme is *superincision*: a longitudinal bisection of the dorsal foreskin. Superincision occurs in Southeast Asia and the insular Pacific (e.g., Shapiro, 1930). The most widespread is *circumcision*: the ablation of the entire foreskin. Circumcision occurs in societies throughout Africa, Australia, the Middle East and the Insular Pacific (e.g., Beckett,

1967; Dunsmuir & Gordon, 1999; Kennedy, 1970). A more extensive operation is *subincision*, which exposes the internal urethra ventrally with a longitudinal slit and is practiced in several Australian societies (Ashley-Montagu, 1937). The most extreme mutilation is *testicular ablation*: extirpation or crushing of one testis. This mutilation is documented historically in the Sidama, Beja and Khoisan cultures of Africa (al Adawi, 1954; Lagercrantz, 1938; Raven-Hart, 1967), and the Ponapeans of Micronesia (Finsch, 1880). These diverse mutilations seem to represent a behavioral syndrome rather than miscellaneous curiosities: they overlap in geographic distribution and often share other features including the presence of sanctions against the unutilated and social benefits contingent on mutilation; a highly public rite; and observance primarily at adolescence (Schlegel & Barry, 1979). Some societies explicitly equate different forms of MGM. According to Guma (1965), the Sotho of southern Africa view testicular ablation as the original 'method' of MGM, and circumcision is held to be a

* Corresponding author.

E-mail address: cgw8@cornell.edu.

recent adoption from other societies. The Sotho consider ancestral testicular ablation and the more recent practice of circumcision as variants of the *lebollo* ritual, whose declared purpose by either ‘method’ is to make the boy “strong, fearless, valorous and respectful” (p. 241). Shapiro (1930) describes an interchangeable mosaic of superincision and circumcision in certain Polynesian societies, and indigenous Australians who practice subincision also perform circumcision as a prerequisite (Ashley-Montagu, 1937). The interlinked forms of MGM are well documented, but their function remains unresolved despite discourse in several disciplines. Here, I develop an evolutionary hypothesis suggesting a common function for the various mutilations and test it using comparative ethnographic data.

An evolutionary approach to MGM may complement efforts in other fields. Medical doctors have given considerable attention to circumcision, debating the ethics and effects of performing this mutilation neonatally, but they have tended to overlook the other forms of MGM (e.g., Hutson, 2004; Short, 2004). Several doctors have suggested that circumcision arose to improve hygiene by removing skin in which dirt or sand could accumulate (e.g., Hutson, 2004; Winberg et al., 1989). Darby (2005) offered the most recent challenge to this ‘hygiene hypothesis,’ but his conclusion that “health had nothing to do with it” had been noted at least 70 years earlier by anthropologists such as Bryk (1934), who observed that imagined health complications of sand or dirt under the foreskin could hardly match the often fatal risks of hemorrhage and sepsis that arise when boys are universally mutilated under nonsterile conditions by individuals with little or no training, using crude tools or even fingernails. Forty-five men arrived at an African hospital with sepsis following ritual circumcision in December 1988 alone, resulting in a 9% mortality rate (Crowley & Kesner, 1990). Between 1995 and 2004, 243 deaths and 216 genital amputations occurred at traditional ‘circumcision schools’ in a single province of South Africa (Sidley, 2006). Several societies have specific customs governing death during initiation rites, suggesting this has not been historically uncommon (e.g., Guma, 1965). The hygiene hypothesis also fails to explain why circumcision is limited to a minority of societies despite the universality of dirt and sand, and it is unclear why a supposedly protective mutilation is almost always delayed until adolescence. Most importantly, evolutionary theory does not predict fitness benefits from extirpating normal tissue. Genital anatomy is extremely variable, and if the mammalian prepuce were detrimental to overall fitness, selection would presumably have reduced it over evolutionary time. If sand or dirt represented a selective pressure to expose the glans, we would surely observe this outcome frequently in desert-dwelling mammals, yet we do not. As one example, the Arabian camel (*Camelus dromedarius*) retains a ‘voluminous’ prepuce (Mobarak, ElWishy, & Samira, 1972).

Recent medical studies have confirmed a protective effect of circumcision against HIV infection for adult males in high

seroprevalence regions of Africa (Auvvert et al., 2005; Gray et al., 2007). However, a ‘prophylactic’ hypothesis is unlikely to represent the adaptive function of MGM behavior, as it shares many weaknesses of ‘hygienic’ explanations. Circumcision obviously predates HIV itself, and the degree to which the prophylaxis generalizes to other STDs is unclear. The currently suggested mechanism of protection is relatively specific, involving a reduction in the preputial mucosa which contains vulnerable CD4 and CCR5 cell-surface receptors (Szabo & Short, 2000). If the result did generalize to other sexual infections, it would remain unclear under a prophylactic hypothesis why natural selection should have retained the foreskin despite millennia of selection in populations suffering from STDs. If exposing and keratinizing the glans by reducing sexual mucosa brought overall fitness benefits through prophylaxis, we would expect selection to have produced this outcome not only in humans, but especially in promiscuous primates with the highest STD loads (Nunn, Gittleman, & Antonovics, 2000). Contrary to this prediction, promiscuous taxa actually have the most elaborate penises, including a well-developed prepuce and other structures with high surface areas of mucosa (Dixon, 1987, 1998). This suggests that primate STDs may not have been a sufficiently important selective pressure to drive evolutionary or cultural ablation of otherwise adaptive sexual tissue, although prophylaxis may be an incidental effect of reductions undertaken for other reasons. If circumcision functions to reduce STDs, it is also curious that it should be followed by subincision in Australian societies: subincision permanently exposes the internal urethral mucosa and is associated with recurrent penile bleeding (Ashley-Montagu, 1937), which would certainly tend to counteract any prophylactic benefits of circumcision. Testicular ablation is similarly inexplicable as STD prophylaxis.

Anthropologists have also given considerable attention to MGM, with a similar focus on circumcision. Silverman (2004) stated that circumcision “dramatizes unease over separation-individuation through a symbolism that affirms yet blurs the normative boundaries between masculinity and motherhood” (p. 423); Paige and Paige (1981) suggested it represents “a ceremonial solution to the dilemma of fission in strong fraternal interest group societies” (p. 166); Whiting, Kluckhohn, and Anthony (1958) concluded that it resolves a gender-identity conflict caused by a boy’s underexposure to males and “excessively strong dependence upon the mother” that would otherwise manifest as “open rivalry with his father [and] incestuous approaches to his mother” (p. 370). The validity of their cross-cultural evidence for this oedipal interpretation is disputed by Korotayev and de Munck (2003). These psychodynamic hypotheses have value as proximate explanations of the psychology that may drive MGM. However, it is vital to address the selective pressures that ultimately underpin such psychology itself. At the functional level of analysis, we must seek complementary hypotheses that share the predictions of existing proximate

explanations, but whose premises are supported by evolutionary theory in addition to psychodynamic thought.

2. Hypothesis

The signaling theory of ritual (Irons, 2001; Rappaport, 1999; Sosis, 2004) was developed as an evolutionary explanation for ritual behavior that is physically or financially costly. Irons (2001) noted that the considerable costs incurred by many ritual behaviors may allow them to function as honest signals of commitment to a social group. Only truly committed individuals are prepared to pay the costs, which can be recouped through the increased willingness of group members to trust and cooperate with the signaler. Cheating is prevented because the benefits of trust and cooperation extend only to those who have conformed with the costly ritual. Sosis and colleagues have provided empirical support for this view (Sosis, 2000; Sosis, Kress & Boster, 2007; Sosis & Ruffle, 2003). I propose a hypothesis that integrates the signaling theory of ritual with principles of sexual selection.

2.1. Genital morphology in primates is adapted for sperm competition

Natural selection shapes male genital morphology to increase the probability of fertilization (Eberhard, 1985). Dixon (1987, 1998) and Verrell (1992) linked interspecific variation in primate genital morphology to differences in mating system and level of sperm competition. In primate taxa where females mate monogamously, males have small testes relative to body weight and a short penis with simple morphology. Coitus is brief with few intromissions. In primate taxa where females are promiscuous, males have large testes relative to body weight; a long penis with elaborations including spines, plungers, labile scoops, flexible ridges and other distal structures; and multiple or protracted intromissions during copulation. These adaptations increase the probability that a male's sperm will achieve fertilization and decrease this probability for rival sperm. Sperm competition has also played a role in human evolution, driven by moderate rates of female extra-pair copulations (EPCs) even though the marriage system is either polygynous or monogamous (Goetz & Shackelford, 2006). Sperm competition is in evidence because (1) human testes are relatively large for a monogamous primate, although smaller than in primates with truly promiscuous mating systems (Gomendio, Harcourt, & Roldan, 1998); (2) human coitus involves multiple intromissions; and (3) the penis is long and wide relative to stature, compared to other primates (Short, 1979; Smith, 1984). Human penile elaboration consists of a uniquely developed prepuce that is anchored close to the glans, rather than at the proximal base of the penis as in *Gorilla* and *Pongo* (Dahl, 1994; Hill & Matthews, 1949; Taves, 2002). The distal attachment of this 'foreskin' makes it more than a protective cover: the

entire structure deeply enters the female during copulation, and in common with the labile distal elaborations of more promiscuous primates, it has dynamic interactions both mechanical and neuronal with the glans, vagina and clitoris during intercourse (Cold & Taylor, 1999; Immerman & Mackey, 1997).

2.2. Sperm competition causes paternity uncertainty, suspicion and conflict

The consequence of sperm competition is paternity uncertainty: a source of inter- and intrasexual conflict in human societies. Even populations presumed to be highly genetically monogamous show evidence of paternity uncertainty, as matrilineal kin seem to invest significantly more in offspring than do patrilineal kin (Gaulin, McBurney, & Brakeman-Wartell, 1997; McBurney, Simon, Gaulin, & Geliebter, 2002; Pollet, Nettle, & Nelissen, 2007). To attempt to prevent EPCs and increase paternity certainty, men practice a suite of behaviors including mate-guarding, sexual coercion, biased parental investment and aggression toward suspected sexual rivals or unfaithful spouses (Goetz & Shackelford, 2006). Daly and Wilson (1988) reviewed cross-cultural evidence indicating that men respond with 'extreme violence' to extra-pair activity, including murder of adulterous wives or sexual rivals. Sexual rivalry is typically ranked among the top three motives for homicide, accounting for up to 25% of murders. In some traditional societies, violent revenge against adulterers is not only legally tolerated but mandated by custom, and in at least 15 societies "adulterous conception was offered as grounds for infanticide" (Daly & Wilson 1988: 47). There are clearly strong advantages if a man can reduce uncertainty about the paternity of his own offspring and ameliorate suspicions of other males that he is mounting challenges to their paternity.

2.3. MGM is likely to impair sperm competition

Male genitalia vary considerably among closely related primate taxa and represent a critical target of sexual selection for fertilization efficiency and sperm competition (Eberhard, 1985). It is improbable that ablating substantial amounts of this mechanically, neurally and endocrinologically specialized sexual tissue can be neutral with respect to its evolved function. MGM is likely to impair the capacity for sperm competition and fertilization. *Testicular ablation* has the most obvious effect, since loss of a testicle causes a significant reduction in sperm count (Woodhead, Pohl, & Johnson, 1973). *Subincision* results in the emission of semen at the base of the penis instead of the glans, with greatly reduced pressure. Although ejaculate still enters the vagina (Ashley-Montagu, 1937), it will fall short of the cervix, reducing the probability of conception as well as the potential to dilute or displace viable prior sperm, which are stored higher in the reproductive tract (Suarez & Pacey, 2006). *Circumcision* permanently denudes the glans by ablating between 20% and 51% of the penile skin and

mucosa, including the highly innervated and vascularized ‘ridged band’ and often the frenulum (Taylor, Lockwood, & Taylor, 1996). From a cross-taxonomic perspective, monogamous primates with low capacities for sperm competition typically possess a naked glans with no labile distal accessory structures, whereas most species with high capacities for sperm competition possess well-developed distal structures which, like the foreskin, interact mechanically with the glans and vagina during copulation (Dixson, 1987: his Figs. 2–4). Some promiscuous primates have such highly developed accessory distal structures that the glans itself is barely distinguishable except during the deepest penetration (Ib. Fig. 2). Ablating the uniquely distal foreskin of the human penis destroys its labile mechanics and increases its morphological and mechanical resemblance to the simple penis of monandrous primates. This suggests, that a circumcised man’s efficacy at sperm competition is likely to be correspondingly reduced toward the lower level seen in monandrous primate taxa. The same argument applies to a lesser extent for the related procedure of *superincision*.

Although the effect of circumcision on self-reported sexual function in industrial societies has frequently been investigated, no consensus has been reached, perhaps due to limitations of self-report methodology (O’Hara & O’Hara, 1999; Fink, Carson, & DeVellis, 2002; Richters, Smith, de Visser, Grulich, & Rissel, 2006; Senkul et al., 2004; Sorrells et al., 2007). In any case, self-report cannot reliably assess an impact on sperm competition, since this phenomenon is subtle and inaccessible to the reporting individual. Miscellaneous findings can be used to suggest potential mechanisms by which circumcision may impact competition for fertilizations. These include increased effort required to overcome friction during intromission (Taves, 2002); desensitization of the penis, raising the threshold for sexual arousal (Immerman & Mackey, 1997; Sorrells et al., 2007); increased latency to ejaculation (Senkul et al., 2004), which would especially hinder hasty covert copulations; decreased stimulation of the female, potentially impacting cryptic choice (O’Hara & O’Hara, 1999); an 8-mm decrease in mean length of the erect penis associated with circumcision (Richters, Gerofi, & Donovan, 1995); elimination of sex pheromones produced by the preputial mucosa (Immerman & Mackey 1997); and disruption of neural feedback involved in adaptive modulation of copulation dynamics (Cold & Taylor, 1999). These mechanisms are wholly speculative, based on limited observations. The primary effect could be due to any one of them, or the interaction of several. However, isolation of mechanism is not necessary for the further development of this hypothesis, as comparative evidence from the morphology of other primates is sufficient to suggest an association of circumcision with limited sperm competition (Dixson, 1987, 1998). The idea that substantial amounts of male sexual tissue can be ablated without this effect is hard to reconcile with our understanding of sexual selection for genitalia, and any such argument must bear the burden of

proof. Gallup and Burch (2004) suggest that circumcision improves ‘semen displacement’ by the coronal ridge. This idea is not derived from biological observation, but from experiments with a plastic vagina and latex phalluses, commercially manufactured as sex toys. It must be doubted for several other reasons: (1) circumcision has no effect on the height of the coronal ridge, which is fully exposed during deep penetrations in any case; (2) the vagina is a highly hostile acidic environment: viable prior spermatozoa can survive only in the cervical mucus, uterus and Fallopian tubes, well beyond the reach of the coronal ridge (Suarez & Pacey, 2006); (3) the coronal ridge actually is more pronounced in monandrous primates; promiscuous species favor a weakly differentiated glans with labile accessory structures (Dixson, 1987, 1998).

2.4. *MGM may be a hard-to-fake signal of reduced ability to challenge paternity*

If, as I have argued, MGM impairs a man’s capacity for sperm competition and effectiveness in mounting paternity challenges, it could represent a hard-to-fake signal of his trustworthiness (Irons, 2001; Sosis, 2004; Cronk, 2005). MGM would be an especially reliable signal with regard to sexual conduct, because once the mutilation is complete, cuckoldry will necessarily be less successful even if a man does try to copulate with married women. MGM could therefore function as a physically mediated signal of compliance with the social assignment of reproduction. Married men would be selectively favored to trust and invest preferentially in a young male who undergoes MGM, because he poses a decreased threat to their paternity. It is important to note that no knowledge of reproductive biology is required on the part of the men involved: the hypothesis posits that selection will favor men who demand and value genital mutilations when paternity uncertainty is high, though they will lack psychological access to the ultimate reason. Older men are certainly well placed to offer access to resources, status and socially sanctioned reproductive opportunities in exchange for a signal of sexual compliance. Once young men gain wives of their own, they will be favored to protect their paternity in turn by offering similar benefits to the next generation contingent upon the same costly signal. In this system, it would be adaptive for all men to regard un mutilated males with suspicion and mistrust, as they represent a greater continuing threat to paternity. The decreased suspicion and increased cooperation experienced by a mutilated individual may be sufficient to outweigh the cost of MGM itself, particularly in societies where the risks of cuckoldry, and therefore the levels of reproductive conflict and suspicion, are high. In addition to these individual-level benefits, societies and groups suffer significant internal conflict and violence arising from sexual jealousy and paternity uncertainty. Behavior that limits the success and frequency of EPCs is likely to reduce this internal conflict and may spread as a group-beneficial norm (Boyd & Richerson, 2002).

Since MGM is universal and uniform within societies, one might initially imagine that the competitive ability of every male is reduced to the same extent. At first glance, it seems that the fertilization impairment is not specific to extra-pair activity, but simply raises the ‘playing field’ for all men. However, closer examination reveals that MGM disproportionately reduces EPCs. This follows from the observation that EPCs are strongly sanctioned, and so there is a higher marginal cost for additional EPCs than additional within-pair copulations. Thus, if MGM increases the ratio of copulations to fertilizations, married men can readily compensate for the fertility impairment by increasing their frequency of copulation. This option is much costlier for would-be-cuckolders because additional EPCs are more risky than additional within-pair copulations, so the payoff to EPCs is disproportionately lowered. It is also possible that MGM primarily affects sperm competition rather than overall fertility. This scenario also entails disproportionately large costs for cuckolders, as they depend heavily on physical adaptations for sperm competition to compensate for socially restricted sexual access to married women. By contrast, a married man can copulate regularly and simply flood a wife with his sperm, rendering more subtle physical adaptations for sperm competition relatively less important. In either scenario, MGM decreases the relative payoff of risky EPC tactics, with little impact on the fitness of married males who have unrestricted sexual access to their wives. Following this cost–benefit analysis, MGM is expected to decrease the frequency of EPCs for two reasons. First, individual men would be favored to reduce their use of cuckoldry tactics if the benefits are curtailed by genital mutilation while the risks remain unchanged. Such adaptive changes in mating tactics could be mediated by several potential cues consequent on MGM and do not require conscious reasoning about reproductive morphology. Second, even if mutilated individuals show no adaptive changes in mating tactics, cuckolders in societies practicing MGM will contribute fewer offspring to the next generation due to the physically reduced efficacy of EPCs in achieving fertilizations. Over time, this may reduce the representation of genes predisposing males to EPC-seeking behavior in such societies.

Under this ‘sexual conflict’ hypothesis, MGM functions in a parallel context to female genital mutilation (FGM). Women who undergo vaginal infibulation or clitoridectomy experience sexual sequelae that would tend to limit EPCs, including restriction of intromission and a reduced capacity to experience sexual pleasure. This reduces the paternity uncertainty of a husband, increasing the trust and investment he is selected to offer. These benefits to a woman and her children seem to outweigh the heavy cost of the mutilation itself in societies with high paternity uncertainty (Mackie, 1996; Reason, 2004). In sum, conflict over paternity may favor men who invest preferentially in spouses with FGM and cooperate preferentially with peers who submit to

MGM. This hypothesis frames MGM and FGM jointly as costly and hard-to-fake signals of sexual compliance that counteract paternity uncertainty, reducing reproductive conflict and increasing social trust and investment in the mutilated individual.

3. Predictions

3.1. Sexual conflict hypothesis

Suspicion and conflict caused by paternity uncertainty are likely to be higher in polygynous societies than in monogamous societies. This is because some men have many wives, but others have either one wife or no wife. In particular, young men may experience considerable delay in finding a wife, due to sexual monopoly by older men (Ember, 1984). Copulating with married women may sometimes be the only reproductive option available, and successful polygamists will find it difficult to guard all their wives against such cuckoldry. Therefore, the trust gained by signaling sexual compliance should be greater in more polygynous societies, and such societies should be more likely to practice MGM. The distribution of FGM should follow the same pattern. Whiting et al. (1958) and Strauss and Orans (1975) found associations between polygyny and MGM while testing the proximate oedipal gender-identity hypothesis for MGM. This result is encouraging, but the authors were only able to consider polygyny as ‘present’ or ‘absent,’ and they did not use one of the standard cultural samples. Their conclusions have recently been criticized by Korotayev and de Munck (2003). A well-resolved codification of incremental polygyny frequency is now available (White, 1988); it is thus appropriate to revisit this equivocal relationship in more detail using an ordinal measure of polygyny in a standard cultural sample. This not only offers a test of the novel sexual conflict hypothesis, but also addresses the concerns of Korotayev and de Munck regarding earlier work.

In some polygynous societies, co-wives occupy one dwelling. This makes it relatively easy for their husband to guard them against extra-pair activity, and they can also police one another. In other polygynous societies, co-wives live in separate dwellings and can neither be guarded nor watch each other so easily. Polygynous societies in which co-wives live further apart may thus be more prone to EPCs, paternity uncertainty and reproductive conflict, and they should be especially likely to practice MGM and FGM.

Counterintuitively, the sexual conflict hypothesis does not predict that societies practicing MGM will have fewer EPCs on average than societies in which MGM is not practiced. Although MGM is indeed predicted to *reduce* the frequency of EPCs by reducing their payoff and desirability, it is also predicted to arise disproportionately in societies with an inherently *high underlying expectation* of EPCs due to frequent polygyny and distantly residing co-wives. It is

likely that these two opposed predictions will be mutually negating, resulting in no overall relationship between MGM and EPCs across cultures. However, if the underlying risk of EPCs can be held constant by considering societies with comparable polygyny and marital residence patterns, the hypothesis does indeed predict that MGM should be associated with reduced extramarital activity.

Finally, under a costly signaling hypothesis it would benefit a man to gain the increased trust and status associated with MGM without actually having to be mutilated. He could ‘cheat’ either by falsely claiming to have undergone the mutilation or by securing a less severe mutilation for himself than for his peers. Other men would be unlikely to discover deceit subsequently, since the genitals are almost always concealed by clothing. One way to police such a system is to conduct the mutilation publicly, ensuring that the signal is directly observed. The sexual conflict hypothesis predicts that MGM rites should have public onlookers who are predominantly male, since the signal is directed at other men. To reduce the chance of collusion in arranging biased or selective mutilations, the MGM operator should be impartial and unrelated to the initiate. Unmutilated males should be subject to suspicion, sanctions and restrictions until the operation is complete, at which point they should gain social trust and status. By contrast, FGM cannot easily be cheated, because the signal is aimed at the woman’s social mate, who will always be intimately aware of her true mutilation status (Paige & Paige, 1981). FGM is thus expected to require less publicity and less social enforcement than MGM, and I use it as a control, specifically predicting greater publicity for male than for female genital mutilation. Hypotheses that propose direct individual benefits to MGM (e.g., health benefits) might not predict extensive social oversight and sanctions, because a nonconformist would primarily be harming his own health rather than breaking a social contract. There would be little need for the community to observe and police the procedure or to provide additional social incentives; or to waste effort punishing the uncut. Social enforcement of the surgeon’s kinship impartiality would be particularly curious because kin would have no incentive to ‘cheat’ by performing a more lenient mutilation.

In summary, the sexual conflict hypothesis makes six predictions:

1. More polygynous societies should be more likely to practice MGM than more monogamous societies.
2. MGM should increase with increasing distance that co-wives reside apart.
3. MGM should be associated with reduced extramarital sex, if we compare societies with the same underlying level of EPC risk due to frequency of polygyny and co-wife residential distance.
4. MGM should be performed more publicly than FGM, and public MGM audiences should be more

frequently male-biased than public FGM audiences are female-biased.

5. Unmutilated men should be subject to social and sexual sanctions and mistrust, whereas mutilated men should gain increased trust, including social and sexual privileges.
6. The operator should be unrelated to the male undergoing MGM.

3.2. ‘Scars for war’ hypothesis

Recently, Sosis et al. (2007) proposed and tested the hypothesis that costly male rituals signal increased cooperation and solidarity among men who must organize for warfare. They reported a cross-cultural association between the costliness of male ritual in a society and the overall frequency of warfare. MGM, scarification and piercing were classified as “rituals that leave permanent markers,” and the authors noted their particular association with inter-societal (*external*) warfare. Sosis et al. suggested that the high cost and visibility of these ‘scars for war’ might be especially effective at preventing men from defecting to another group when inter-societal conflict is high. However, the association they found with external warfare was not as strong for MGM as for piercing and scarification. Moreover, MGM may not be a very good identifier because the permanent mark is neither specific to one group within a locality, nor obviously displayed. Nevertheless, in addition to testing the predictions of the sexual conflict hypothesis, I considered the alternative hypothesis that MGM may provide a costly signal of cooperation and a hard-to-fake identification for inter-group warfare, as do scarification and piercing. This hypothesis predicts that MGM should be more likely in societies with a higher frequency of external warfare.

4. Methods

To test Predictions 1–4, I used the Standard Cross-Cultural Sample (SCCS) of Murdock and White (1969): a global sample of 186 pre-industrial societies selected for cultural independence. MGM codes were originally published by Murdock (1967) for societies in his *Ethnographic Atlas*, and I obtained them for the SCCS from the *World Cultures* electronic journal (Divale, 2007), as SCCS Variable 241 (‘Male genital mutilations’). Three societies (Abkhaz, Ajie, Bogo) had no data on MGM and were excluded from all analyses. Although MGM is coded absent for the Kwoma and Mbundu in the *World Cultures* database, Murdock (1967) noted for the Kwoma that “slashing of the boy’s penis” occurs at 11–15 years of age, and Mbundu circumcision is well described in multiple cultural reports (e.g., Hambly, 1934). I therefore followed Schlegel and Barry (1979) in considering MGM present in both societies. In total, MGM was considered present in 49 societies (27%) and absent in 134. For female genital mutilation, Schlegel and Barry (1979) and Ericksen (1989) provided surveys of

SCCS societies. Unless FGM was coded as present by one of these authors (15 societies), I conservatively coded it as ‘no data/absent’ (171 societies). Two ordinal polygyny codes for the SCCS were taken from White (1988): SCCS Variables 860 (‘Frequency of polygyny’) and 863 (‘Distance between co-wives’). For the latter, I collapsed Codes 5 and 6 (only two societies are coded as 6), and Codes 3 and 4.

To test Prediction 3, I required a single measure of underlying EPC risk due to marital conditions, in order to control for these factors. I therefore combined ‘Frequency of polygyny’ (4-point scale) with ‘Distance between co-wives’ (5-point scale) by taking the mean of the two. I operationalized this mean by coding it back into three ordinal categories: (0–1.5=1; 1.51–3.0=2; 3.01–4.5=3). I called this new three-point measure the polygyny risk factor (PRF): the degree to which the marital practices of society are expected to predispose them to extramarital sex. Extramarital sex itself has been coded for the SCCS by Broude and Green (1976) as SCCS Variables 170 (‘Frequency of Extramarital Sex—Male’) and 171 (‘Frequency of Extramarital Sex—Female’). I inverted their counterintuitive scale so that a higher value now indicates higher frequency of EPCs and then took the mean of the male and female codes, calling this continuous variable ‘Extramarital sex frequency (SCCS)’. I was then able to construct an interaction plot of extramarital sex frequency (SCCS) vs. MGM, grouped by polygyny risk factor in order to control for underlying EPC risk. This permitted a test of Prediction 3 at three constant levels of PRF.

Schlegel and Barry (1979) coded MGM and FGM rituals in SCCS societies for publicity and gender of participants, providing sufficient data to test Prediction 4 across 27 societies. I used SCCS Variables 537/538 (‘Number of participants’), combining Codes 3 and 4 (‘Local group’; ‘Large group’); and SCCS Variable 539/540 (‘Sex of participants’). Predictions 5 and 6 involve variables that are usually beyond the resolution of available ethnographic reports and would be impossible to code in a satisfactory manner for the SCCS. Instead, I searched materials in the Human Relations Area Files (eHRAF) for evidence of rights, privileges and sanctions associated with MGM status, and any rules regarding the involvement of relatives in MGM rituals. I considered only eHRAF materials from societies in the Probability Sample File (PSF): a commonly used cross-cultural sample of 60 societies (Ember & Ember, 1998), of which 17 practice MGM. I located textual evidence from these societies and either quoted directly or paraphrased from eHRAF documents. Considerable parsing effort was expended, a broad selection of societies was represented, and it is unlikely that a significant source of potentially contradictory data was overlooked.

I also tested the hypothesis of Sosis et al. (2007), who reported an association between costly male rites and warfare in the PSF. I used the larger SCCS to reexamine the relationship between frequency of warfare and MGM, attempting to replicate their coding schema as exactly as possible. They rated warfare following Ember and Ember

(1992), so I took my SCCS warfare codes from that publication (SCCS Variable 1650: ‘Frequency of external warfare’). I also examined the effect of external warfare on male scarification in the SCCS as a control to ensure that the SCCS and PSF produce consistent results. If MGM were indeed a ‘scar for war’, then both scarification and MGM would be expected to increase with frequency of external warfare in the SCCS. If neither scarification nor MGM increased with frequency of external warfare, then the decision to use the SCCS might be suspected of obscuring the ‘scars for war’ effect previously identified in the PSF. However, if scarification were to increase with frequency of external warfare whereas MGM did not, then sample choice could not be blamed and MGM might not be a ‘scar for war’ after all. Scarification has been coded for the SCCS by Ludvico and Kurland (1995), and is available as Variable 1692 (‘Scarification: Males’) (Divale, 2007). I scored scarification as either present or absent by combining Categories 2 and 3 (‘tattooing and cicatrization’; ‘scarification includes removal of skin’).

In addition to replicating the methodology of Sosis et al. (2007) to test the warfare hypothesis in the SCCS, I tested the sexual conflict hypothesis in their chosen sample, the PSF, to check that my own results were robust across the slightly different samples. To ensure that I changed only the sample and not the coding scheme, I limited my analyses to societies that the PSF shares with the SCCS. Fortunately, 36 of the 60 PSF groups are SCCS societies or their synonyms. For each of the remaining 24 societies in the PSF, I searched the *Ethnographic Atlas* (Murdock, 1967) to see whether a closely related society existed in the SCCS that could serve as their representative. Eight PSF societies have an SCCS society in the same culture cluster, which I used in their place (Blackfoot: Gros Ventre; Highland Scots: Irish; Hopi: Zuni; Iroquois: Huron; Lau Fijians: Mbau Fijians; Lybian Bedouins: Rwala Bedouins; Shluh: Riffians; Tlingit: Haida). The remaining 16 PSF societies were excluded because they are neither present in the SCCS, nor does any SCCS society occur in their culture cluster. I refer to the matched 44 societies as the reduced PSF (rPSF). I validated this sample by replicating the main result of Sosis et al. with respect to external warfare and male scarification, and then examined the explanatory power of polygyny, co-residence and external warfare with respect to MGM, just as I had for the SCCS. Finally, I was also able to test the robustness of Prediction 3 in the PSF, because Huber, Linhartova and Cope (2004) recently coded these societies for frequency of extramarital sex. Just as described above for the SCCS, I constructed an operational polygyny risk factor (PRF) for PSF societies by taking the mean of polygyny level and distance between co-wives and recoding this to a three-point scale. I then produced an interaction plot of Huber et al.’s extramarital sex frequency vs. MGM, grouped by PRF in order to control for underlying EPC risk.

Statistical analyses were performed in MINITAB v. 14. Most data were categorical but ordinal, so Spearman’s rho

was appropriate. Warfare frequency was treated as a continuous variable and analyzed using the Mann–Whitney–Wilcoxon statistic. The SCCS and PSF are each carefully designed to maximize cultural independence and limit internal pseudoreplication. Full data tables listing all relevant coded variables for SCCS, PSF and rPSF societies are provided as supplementary material online.

5. Results

5.1. Polygyny, co-wife residence and genital mutilation

For 183 SCCS societies, frequency of polygyny significantly predicts incidence of MGM (Fig. 1A; Spearman's $\rho=0.297$, $n=183$, $p<.001$). Each stepwise increase in frequency of polygyny is matched by a rise in MGM.

Societies with higher levels of polygyny are also much more likely to practice female genital mutilation (Spearman's $\rho=0.188$, $n=184$, $p=.011$; data not shown), although FGM is a rarer operation overall. When all SCCS societies are considered together, MGM and FGM have an overall incidence of 27% and 8%, respectively. However, in that subset of societies where polygyny is prevalent and preferred by most men of sufficient age or wealth, MGM and FGM have incidences of 48% and 20%, respectively. Fig. 1B shows that increasing distance between co-wives is also associated with a rise in MGM (Spearman's $\rho=0.388$, $n=156$, $p<.001$). MGM is present in 48% of all highly polygynous societies, but in that subset where every wife has separate housing, the incidence increases to 63%. FGM occurs in only 15 SCCS societies, and in 12 (77%) of these, every wife has a separate residence. Separate housing for co-wives may be the

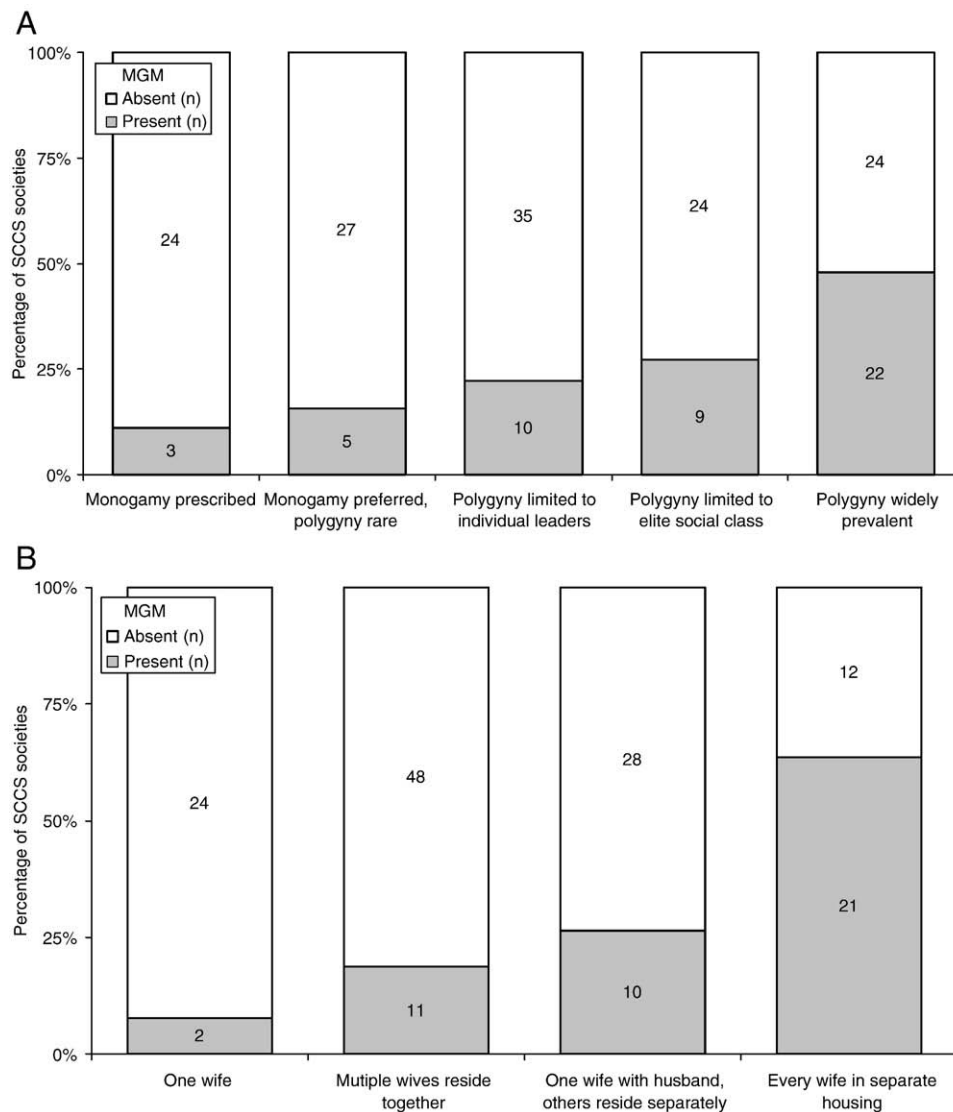


Fig. 1. (A) Incidence of MGM in SCCS societies is predicted by frequency of polygyny (Spearman's $\rho=0.297$, $n=183$, $p<.001$). (B) Incidence of MGM in SCCS societies increases with greater residential distance between co-wives (Spearman's $\rho=0.388$, $n=156$, $p<.001$).

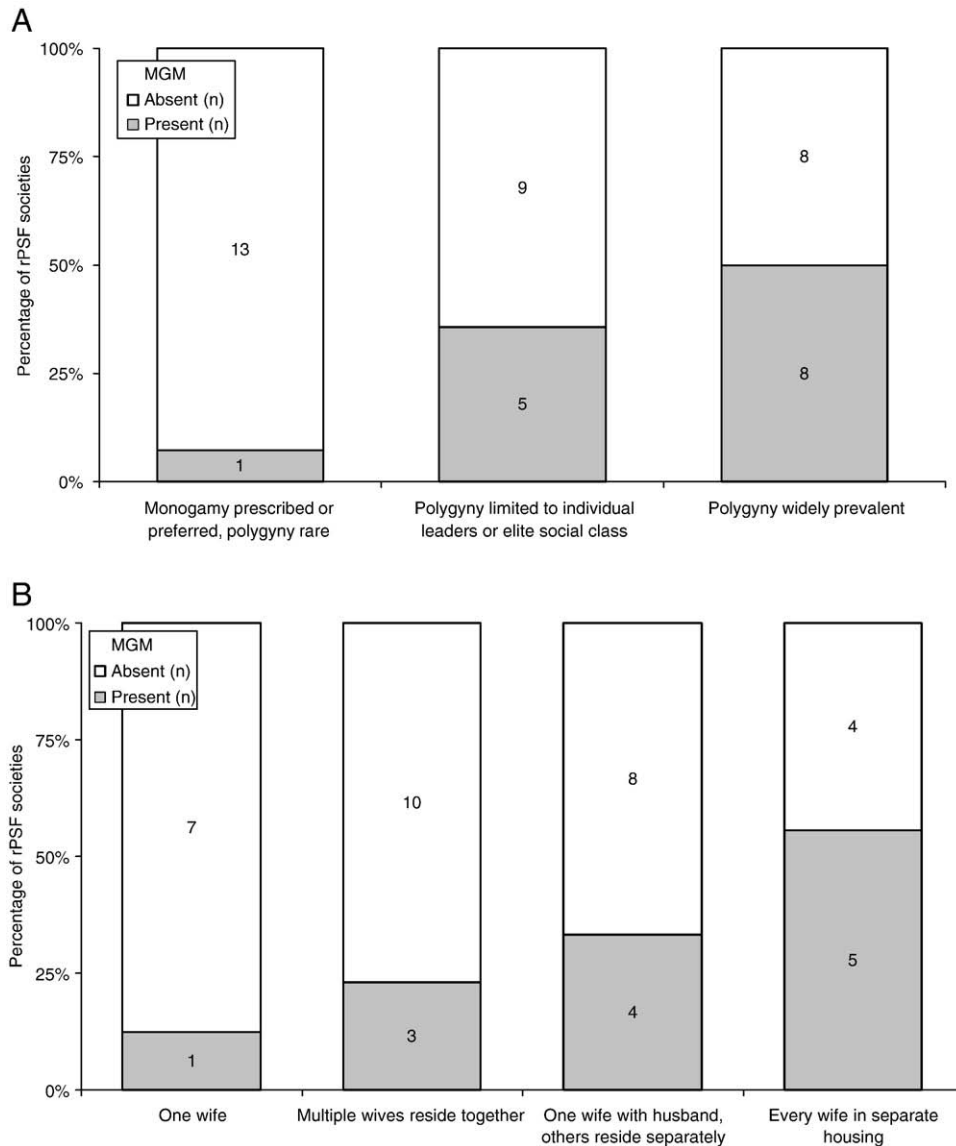


Fig. 2. (A) Incidence of MGM in rPSF societies is predicted by frequency of polygyny (Spearman's $\rho=0.375$, $n=44$, $p<.012$). (B) Incidence of MGM in rPSF societies increases with greater residential distance between co-wives (Spearman's $\rho=0.308$, $n=42$, $p=.047$).

strongest predictor of MGM and FGM. The relationship between polygyny and MGM was also evident for societies of the rPSF (Fig. 2A: Spearman's $\rho=0.375$, $n=44$, $p<.012$), as was the effect of distance between co-wives (Fig. 2B: Spearman's $\rho=0.308$, $n=42$, $p=.047$). Predictions 1 and 2 are supported in both samples.

5.2. Extramarital sex frequency vs. MGM by PRF

Data were available for 60 SCCS societies (Fig. 3A) and 42 PSF societies (Fig. 3B). Extramarital sex increases in frequency significantly with increasing polygyny risk factor [Fig. 3, right panel: ordinal logistic regression coefficient (\pm S.E.) for SCCS=0.83 (0.39), $p=.033$; for PSF=0.85 (0.38), $p=.023$], supporting the assertion that polygyny frequency and co-residence are reasonable proxies for cuckoldry risk.

For societies with comparable levels of PRF (Fig. 3, left panel), MGM seems to be associated with a *reduction* in extramarital sex. It would be inappropriate to add MGM to the ordinal logistic regression model because the small sample sizes of MGM cells would violate its asymptotic assumptions, and collapsing categories does not help (Murad, Fleischman, Sadetzki, Geyer, & Freedman, 2003). Therefore, I have not attempted to offer a statistical interpretation of the effect of MGM, and this result is qualitative. However, it does hold at all three levels of PRF and is stable in both the SCCS and the PSF samples, so it may be considered reasonable evidence consistent with Prediction 3. More extensive codification of extramarital sex in SCCS societies (68% remain uncoded) would be necessary to test this finding more rigorously.

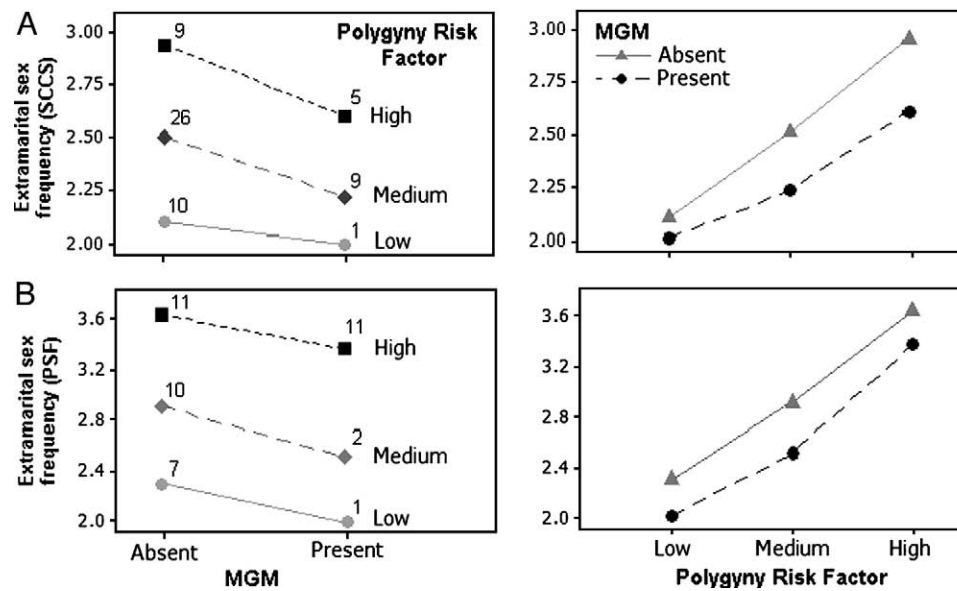


Fig. 3. Polygyny risk factor is a three-level measure of cuckoldry risk that takes both frequency of polygyny and distance between co-wives into account. Increasing PRF is associated with increasing frequency of extramarital sex in both the SCCS [ordinal logistic regression coefficient=0.83 (S.E.=0.39); $p=.033$] and PSF [regression coefficient=0.85 (S.E.=0.38), $p=.023$]. At all three levels of PRF, mean frequency of extramarital sex appears to be lower in societies where MGM is present. This relationship holds for societies of the SCCS (A: $n=60$) and the PSF (B: $n=42$). The number of societies composing each data point is indicated on the left panel.

5.3. Publicity, social benefits and kinship

For 19 societies with available data, MGM is always performed in public. It does not seem to be the case that all genital mutilations simply attract public interest, because FGM is not public in three (43%) of the seven practicing societies for which there are data, which is a significant departure from the male result (Fisher's exact test, $n=26$, $p=.013$). Public MGM onlookers are exclusively male in 9 (47%) of 19 societies for which appropriate data are available. By contrast, public onlookers to FGM are exclusively female in one (25%) of four societies. In the remaining cases of MGM and FGM, the onlookers are predominantly, but not exclusively, of the same sex as the initiate. These results suggest that it is important for many males to publicly observe MGM, but this does not seem to apply so strongly for females observing FGM. Prediction 4 is supported.

A sufficiently detailed account of MGM customs was available to examine Prediction 5 for 14 of the 17 PSF societies practicing MGM, and Table 1 summarizes the relevant eHRAF materials. In 13 (93%) of 14 societies, MGM brings immediate social benefits that may include respect, status and access to weapons, shelter or tribal lore. In the remaining society, MGM is performed at birth. In 9 (75%) of 12 societies, MGM is required before marriage is permitted. In 10 (71%) of 14 societies, any male remaining intact is treated with derision or suspicion, placing social pressure on him to submit to MGM. In the remaining four societies, either no males remain uncut, or there are no

data concerning their treatment. Prediction 5 is supported in the societies examined.

In only 10 PSF societies could the kinship status of the MGM 'surgeon' be ascertained with certainty (Table 2). In eight (80%) of these, it is clear that the operator is not related: either he always comes from a different tribe or ethnic group, or there is an explicit rule that relatives may not operate. This is not necessarily because relatives lack surgical expertise: even specialist practitioners of genital mutilation appear to be restricted from operating on their close kin among the Dogon and Wolof. Furthermore, although Masai mothers are reported to perform FGM on their own daughters (Bagge, 1904), the surgically less extensive MGM operation may only be performed by unrelated outsiders. Only in the Tikopia is there evidence that MGM is performed by a relative (the senior mother's brother). However, the same source suggests this is a recent change, because the very presence of this close relative was ritually forbidden in prior times (see Table 2). Various conflicting accounts of MGM are given for the Eastern Toraja, varying by region and religious context. In one account, an uncle may perform superincision. However, only an uncle who is a highly respected warrior may perform this unusual exception to the standard public ceremony, and the same source also explains that parents must never be present, no matter who performs MGM. Similar restrictions on the very presence of relatives are evident in other PSF societies. For instance, Bagge (1904) reports that Masai parents must remain within their hut for the duration of their son's circumcision, or risk being beaten. These results are consistent with Prediction 6.

Table 1

Evidence from eHRAF materials on societies practicing MGM suggests that (1) MGM is often a prerequisite for marriage; (2) MGM brings social status and resources; and (3) the unutilated may suffer social and sexual sanctions

PSF Society	MGM required for access to marriage or sexual relations	MGM increases social status, resources or influence	Unutilated men attract suspicion, punishment or derision
Amhara	No specific data (occurs within days of birth)	No specific data (occurs within days of birth)	Uncircumcised men from other areas called “insulting names”; seen as “almost on a level” with slaves
Aranda	“One of the most important ceremonies which must be passed through before any youth is allowed a wife”	Required for access to tribal secrets and full membership, and to be “worthy of a man’s estate”	No specific data
Azande	After MGM, male is “recognized as a person old enough to have sex”	“Marks an increase in status...brings about new sets of social relationships”	“Public opinion...makes it to all intents and purposes obligatory”; ‘uncircumcised’ is a ‘scornful epithet’
Dogon	Required for marriage and necessary even to learn the name of a future wife	Makes one “a member of the society of men” with access to the exclusive men’s shelter	In a ritual game, men “rush upon the uncircumcised whom they rightly or wrongly suspect of having stolen the fruits of the sa tree”
Eastern Toraja	Not required, but girls “show an aversion for an uncircumcised boy”	Recognized as “brave”; superincision allows “the true spirit” to come over him	Taunted as “weakling, coward”; teased. This leads to “fighting” until he finally submits to the operation.
Hausa	Prerequisite “for marriage or any sexual activity”	Boy “receives a hut and field of his own”...MGM “marks his entry into the community”	“An uncircumcised boy who dared court a girl would be laughed at”
Kanuri	Required for betrothal to a young girl; boys may be given a concubine after MGM	Boy is “socially regarded as attractive in a male sense”... “A mark of approaching manhood”	No specific data
Lau Fijians	No specific data	Boy receives a “bachelor’s house” and is “called a man”	No specific data
Masai	Required for marriage; required for sexual relations	Required to be regarded as an adult, to carry weapons and to join a male age-set group	Uncircumcised boys were “severely punished by the warriors if they had sexual intercourse”
Mbuti	MGM is an acquisition from Bantu villagers; some uncircumcised Mbuti do marry within their own group	MGM initiates youth into the society of archers or net-hunters; required for social acceptance by Bantu villagers	Following Bantu villager custom, “any uncircumcised youth is a laughing stock”... may even be considered a “source of evil”
Somali	Required for marriage	MGM gives access to the highest social ‘grade’	Considered “ritually impure”
Tikopia	Women may “prefer superincised persons”, but there is no sexual ban on the unincised: “it is regarded primarily as a social disability not as a sexual one”	Allowed to “participate with the adults freely”, sit among men and participate in formal gatherings and rituals	An unincised male is “apt to be taunted openly by boys of his own age” and laughed at.
Tiv	Required for marriage and sexual relations	“A symbol of adult male status” required to be allowed to participate in rituals as a “full member of the community”	May be ordered around by any circumcised person; laughed and jeered until he submits to mutilation
Wolof	Required for marriage	Institutionalized male friendships are “formed in the circumcision shed”; males circumcised together “owe each other aid and assistance”	No specific data

5.4. Warfare and scarification

I replicated the finding of Sosis et al. (2007) with respect to scarification and external warfare in the SCCS. For 121 societies with available data, scarification is significantly associated with presence and frequency of external warfare (Fig. 4A: Mann–Whitney $W=5241.5$, $n=121$, $p=.0096$), readily demonstrating the ‘scars for war’ effect in the SCCS. However, I found no association between MGM and frequency of external warfare in the SCCS (Fig. 4B: Mann–Whitney $W=3053.0$, $n=153$, $p=.58$; ns). The relationship between scarification and external warfare is clearly present

in the rPSF (Fig. 4C: Mann–Whitney $W=117.0$, $n=32$, $p=.0013$). However, although there is a trend for MGM to increase with external warfare among rPSF societies, it is not significant (Fig. 4D: Mann–Whitney $W=464.0$, $n=38$, $p=.17$; ns). Sosis et al. (2007) did find a significant association in the full PSF ($\chi^2=4.12$, $n=59$, $p=.043$), but the absence of a relationship in the large SCCS raises the possibility that the PSF and rPSF trends may be spurious, perhaps resulting from a confounding association between warfare and polygyny in these smaller samples. Indeed, a further ANOVA for the PSF reveals that the relationship between MGM and external warfare loses significance ($F_{1, 57}=0.018$, $p=.89$) if polygyny

Table 2

Evidence from eHRAF materials on PSF societies suggests that relatives of a boy do not normally perform the MGM operation and may even be banned from the ceremony. MGM is performed either by a hired professional from an unrelated tribe, or an unrelated professional from his own tribe

PSF Society	Kinship restrictions on performing or observing MGM
Aranda	“Fathers-in-law are also important figures in the initiation of their sons-in-laws, often being the men who actually perform the operation.”
Azande	Among some southern tribes, parents may not be present at the circumcision.
Dogon	MGM is performed by blacksmiths, but “the daughters of blacksmiths...are not themselves excised, their brothers are not circumcised”
Eastern Toraja	Superincision may be performed at a feast by a tribal leader, or in the smithy [<i>presumably by a blacksmith — CGW</i>]. Although “the boy’s parents must not watch their son’s circumcision”, sometimes “older boys who are ashamed to have themselves circumcised before the eyes of many ask an uncle or a blood relative to perform this operation on them; in any case this must be someone who has slain one or more enemies.”
Hausa	Operation is performed by “a Mohammedan barber.”
Maasai	A member of a different tribe or ethnic group performs the operation, for “no Maasai would normally accept the task.” “During the circumcision itself the parents of the boy remain in their hut, for if the latter moans or cries out from the pain, they are punished with abusive words and blows by the assembled warriors.”
Mbuti	A Bantu villager performs the operation, for the “old rule” is that “Mbuti must have no part in the actual ritual and hold no ritual office.”
Somali	The operation is performed by a <i>midgan</i> : a hired member of a low-caste pariah tribe.
Tikopia	Modern operation is performed by the senior maternal uncle. However, “of olden days it was taboo for the <i>tuatina maori</i> (senior maternal uncle) to touch the lad. He sat in the house and did not go out; the expert had to be a distant mother’s brother” [<i>it is unclear whether this refers to the uncle of an unrelated boy; a distant cousin; or an uncle of the boy who lives far away — CGW</i>].
Wolof	“At circumcision, the operator cannot be just any person in a ‘servant’ position, but must be a smith. Since circumcision, unlike childbirth, involves a group of boys from several families, the operator must be someone in an inferior position to <i>all</i> the families — a casted person. For circumcision, someone who was a nephew of just one individual or family would not do; the smith, however, is in a position of client-ship to everyone present.”

($F_{1,57}=17.166, p<.001$) is included in the model as a covariate (R. Sosis, personal communication). This result brings both samples into agreement: unlike scarification, MGM is not

significantly associated with external warfare. The PSF trend is best explained as an artifact of a polygyny confound that disappears in a larger sample.

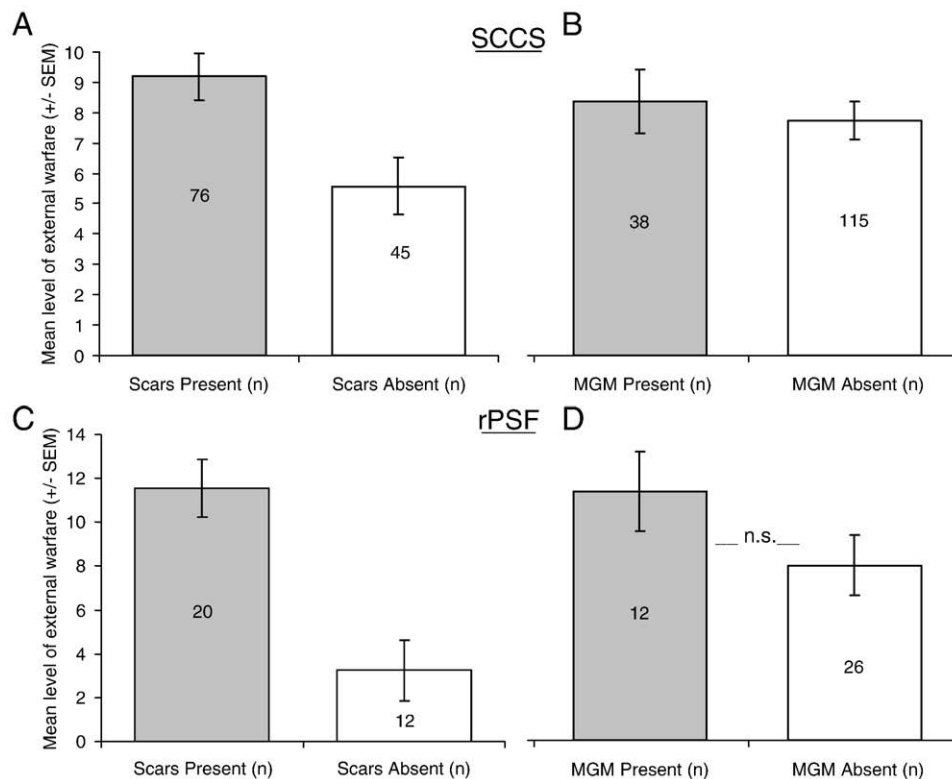


Fig. 4. (A) Frequency of external warfare in SCCS societies significantly predicts the incidence of male scarification rituals (Mann–Whitney $W=5241.5, n=121, p=.0096$). (B) Frequency of external warfare in SCCS societies does not significantly predict the incidence of MGM rituals (Mann–Whitney $W=3053.0, n=153, p=.58; ns$). (C) Frequency of external warfare in rPSF societies significantly predicts the incidence of male scarification rituals (Mann–Whitney $W=117.0, n=32, p=.0013$). (D) Frequency of external warfare in rPSF societies does not significantly predict the incidence of MGM rituals (Mann–Whitney $W=464.0, n=38, p=.17; ns$). The apparent trend in (D) is explained by a confound between external warfare and polygyny in the small rPSF sample (see text).

6. Discussion

There is no evidence that any ablation of genital tissue has direct or intrinsic reproductive benefits that have outweighed its costs over evolutionary time. If this were the case, humans and other mammals would presumably have evolved to show the reduced morphology from birth. The existence of the necessary genetic and developmental variation is apparent in medical conditions such as aposthia, hypospadias and monorchism, and genital morphology is the most responsive of all morphological traits to selection (Eberhard, 1985), yet the observed morphology persists. In societies that practice MGM, the operation must be performed by a nonrelative in the public view of other men, implying underlying conflict and an incentive to cheat. These observations could be explained if MGM acts as a hard-to-fake signal rather than conferring a direct personal advantage. I argue that MGM impairs sperm competition, signaling compliance with the social assignment of reproduction by reducing the capacity for extra-pair fertilizations. In societies whose marriage patterns promote paternity uncertainty and reproductive conflict, MGM is a more reliable indicator of trustworthiness than any other costly rite because it physically reduces a man's capacity to mount paternity challenges. Once the man is mutilated under appropriately policed conditions, he is released from various restrictions and gains social status, conferring access to resources, weapons and women. These social benefits may outweigh both the impaired sperm competition and the considerable risks of the mutilation trauma itself, so that the signal increases fitness overall. As predicted by this hypothesis, MGM is practiced most frequently in societies with high levels of polygyny, particularly when multiple wives live far apart and cannot simultaneously be guarded from EPCs. Once these underlying marital risk factors are controlled for, societies practicing MGM do indeed seem to have a reduced incidence of extramarital sex, providing reasonably direct evidence that MGM may have the hypothesized effect. I have argued that MGM reduces the payoff to EPCs by impairing either overall fertilization efficiency or sperm competition, or both. However, the sexual conflict hypothesis is silent with respect to the precise mechanism involved, and is applicable whether the primary effect of MGM is mechanical, neuronal, hormonal, behavioral, or psychosomatic in origin. Some speculative mechanisms were discussed in Section 2.3, but the hypothesis is agnostic and does not fall with the elimination of any given suggestion.

A relationship between MGM and polygyny is not a novel finding: Whiting et al. (1958) and Strauss and Orans (1975) reported a similar association while testing the proximate psychological gender-identity hypothesis using a binary classification of polygyny. However, this evidence has recently been challenged by Korotayev and de Munck (2003). My results suggest their criticism may not be well founded, as I have supported and extended the original findings using for the first time a standard sample and well-

resolved incremental polygyny codes. The predictions of at least one proximate psychological hypothesis now appear to interdigitate well with the novel and complementary sexual conflict hypothesis.

A relationship in both the SCCS and the rPSF between external warfare and male scarification provides further support for the 'scars for war' hypothesis of Sosis et al. (2007). However, there is no significant association between external warfare and MGM, suggesting that MGM is neither a 'scar for war' nor an arbitrary maladaptive by-product of belligerent societies. My own results cannot be explained by some general trend for polygynous societies to brutalize young men more than monogamous societies, because Sosis et al. found no significant relationship between polygyny and costliness of male ritual after controlling for warfare. Polygyny does not cause increased brutalization of young men in general, but is associated specifically with a tendency to demand mutilation of the genitals rather than other rites of apparently comparable cost. This trend is independent of warfare, but very sensitive to distance between co-wives. These observations are explained by the sexual conflict hypothesis: a direct impediment to sperm competition decreases the profitability of EPCs and provides a more reliable indicator of cooperation than any other costly rite in societies where reproduction is highly skewed.

Finally, certain aspects of the global distribution of MGM may be explained by the sexual conflict hypothesis. Genital mutilations are less common in Asia and the Americas than in Africa and Oceania. This may be because polygyny is rarer in Asian and American societies than in African and Oceanian societies, and seldom involves separate residences for co-wives. Nevertheless, the absence of MGM in any coded American society is puzzling. MGM was not 'forgotten' during the migration to the New World: Columbus found circumcision among certain natives (Dunsmuir & Gordon, 1999), and the Totonacs of Central America practiced it aboriginally (Murdock, 1967). Intriguingly, exclusive social cults open only to those with no foreskins are also reported amongst the highly polygynous Pawnee and Assiniboine (Denig, 1961; Murie, 1914). However, MGM was not common in the New World, even in South American societies with very high levels of polygyny. This is due in part to the cultural influence of Catholic conquistadors (Schendel, 1968), but there may be a more interesting factor. Ucko (1969) reviews the customs of sheathing the penis and binding up the foreskin, which seem to be disproportionately represented in extremely polygynous South American societies. Yanomamo men, for instance, "tie the penis up by means of the hip cord, which is done before donning it by tying a knot and drawing the foreskin through it...it would be the most flagrant offense against good form to walk about without the hip cord" (Becher, 1960: 60). Could binding the foreskin or wearing a penis sheath parallel MGM by providing a hard-to-fake signal of impaired sperm competition? Ucko (1969)

mentions consequences including “a great elongation of the foreskin, sometimes to twice its original length...general swelling of the penis, the impossibility of erection while such a sheath is worn...inflamed penis tips, chaffed skin...” (p. 45). Cultural requirements to jam the penis into a tight sheath or stretch the foreskin to unnatural lengths may be as harmful to sperm competition as MGM. None of the eight South American societies in the SCCS with the most extreme level of polygyny practices MGM, but Ucko mentions foreskin binding or sheathing in 50% of them (Amahuaca; Jivaro; Warrau; Yanomamo). Intriguingly, this fraction concords with the global incidence of MGM in all 46 SCCS societies with extreme polygyny: 48%. Perhaps polygynous South American societies developed a parallel signaling behavior to serve the same ultimate function.

7. Conclusion

Kennedy (1970) observed that “attempts to formulate a theory that can account for all customs of genital operations seem doomed to failure” (p. 189). The sexual conflict hypothesis could challenge this view. The hypothesis proposes that MGM and FGM both function as hard-to-fake signals of compliance with the social assignment of reproduction. Genital mutilations may impair the evolved capacity for extra-pair fertilizations, decreasing paternity uncertainty and reproductive conflict, and garnering trust and social investment from powerful married men. As predicted by the sexual conflict hypothesis, MGM is associated with polygynous societies at high risk for extramarital sex, and it appears to reduce this risk. MGM is performed by a nonrelative in the public view of other men, and a mutilated male gains immediate access to social and sexual privileges that are suggested to outweigh the cost of the mutilation itself. The sexual conflict hypothesis may have value for anthropologists, doctors and theologians pursuing future studies of this ancient problem.

Acknowledgments

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.evolhumbehav.2007.11.008.

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