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'Real men wear kilts'. The anecdotal evidence that wearing a Scottish kilt has influence on reproductive potential: how much is true?

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Abstract

Background and aims: There are anecdotal reports that men who wear (Scottish) kilts have better sperm quality and better fertility. But how much is true? Total sperm count and sperm concentration reflect semen quality and male reproductive potential. It has been proven that changes in the scrotal temperature affect spermatogenesis. We can at least affirm that clothing increases the scrotal temperature to an abnormal level that may have a negative effect on spermatogenesis. Thus, it seems plausible that men should wear skirts and avoid trousers, at least during the period during which they plan to conceive children.

Methods and results: Analysis of literature concerning scrotal temperature and spermatogenesis and fertility. Wearing a Scottish kilt in a traditional ('regimental') way may have clear health-related benefits. Kilt wearing likely produces an ideal physiological scrotal environment, which in turn helps maintain normal scrotal temperature, which is known to be beneficial for robust spermatogenesis and good sperm quality.

Conclusion: Based on literature on scrotal temperature, spermatogenesis and fertility, the hypothesis that men who regularly wear a kilt during the years in which they wish to procreate will, as a group, have significantly better rates of sperm quality and higher fertility.

Keywords

Scottish kilt, sperm quality, reproduction, masculinity, Scotland

> 'How many of the Scots to wear kilts and thereby allow the pertinent parts of their anatomy to sway in the cooling highland breezes instead of suffering the restrictions and temperature of the ordinary male's hot pants.' Marion B. Sulzberger, 1974

Introduction

There are anecdotal reports that men who wear (Scottish) kilts have better sperm quality and better fertility. But how much of the hypothesis is true? Total sperm count and sperm concentration reflect semen quality and male reproductive potential. Recent meta-analyses of human sperm count data have shown a global downward trend over the last 50 years.[1] A review of 101 heterogeneous observational studies on human semen quality published between 1934 and 1996 showed that the mean sperm quality is significantly decreasing.[2,3] Several authors have reported major problems in the interpretation of these results, which have been recently discussed in this journal;[4] however, a negative trend remains obvious. Additionally, a remarkable decline in fertility rates has been observed in the industrialised world.[5] This study suggested that poor semen quality among men could be an important contributing factor to low fertility rates. Furthermore, it has been suggested that human fecundity (the capacity of couples to conceive children) is declining in

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Western countries.[4] The reasons for this decline appear to be complex and speculative and could include widespread environmental pollution and life-style changes that have subsequently led to decreased sperm quality and quantity (lower sperm concentration and lower sperm count).

In many mammal species, including humans, adequate spermatogenesis requires the temperature of the scrotum to be 3°C lower than the body temperature. Moore and Quick[6] first demonstrated that the temperature on the inside of the scrotum is decidedly lower than that of the peritoneal cavity at the same time. It has been proven that changes in the scrotal temperature affect spermatogenesis. Scrotal temperature, which is affected by factors such as body position, physical activity and clothing, has been found to be the lowest for a naked man in the standing position.[7–9]

Moore and Oslund[10] demonstrated that externally wrapping a ram's scrotum for 80 days resulted in the loss of all spermatozoa and considerable degeneration of the tubular epithelium. They concluded that an animal could be sterilised by its own body heat. MacLeod and Hotchkiss[11] demonstrated the same effect in men. Robinson and Rock[12] found that spermatogenesis was negatively affected by scrotal insulation in euspermic men. From the early 1980s, both scientists and laypersons began to believe that the fit of a man's underwear could affect spermatogenesis.[8,13,14] Researchers have shown that tight and isolating clothing (not only tight underwear) has a negative effect on the deep scrotal temperature. Sanger and Friman[15] demonstrated that semen parameters gradually decreased when tight underwear was worn and gradually increased when loose underwear was worn. The tightness of clothing and its insulating effect appear to be more important than the type of undergarment worn. Mieusset et al.[9] found that the ambient, rectal, axillary and thoracic temperatures did not differ between naked or clothed men but that scrotal temperatures were significantly higher in the latter. They reasoned that clothing isolates a layer of air between the skin and the clothing, forming an air space under the clothing, in lightly clothed, resting men, with a temperature 3.5°C higher on average than that of the ambient air. The reduced air exchange and the increase in temperature of the air space under clothing are responsible for the rise in scrotal temperature.[16] The question remains as to whether these observations can be linked to semen quality and, consequently, male infertility. Some authors have concluded that tight underwear and trousers may be associated with dyspermia. In a recent review, Setchell[17] pointed to evidence that there are much greater long-term medical effects of scrotal hyperthermia than previously thought. These effects may not be confined to cell death in the testis and to the consequent reduction in sperm numbers in the semen, but they may also include a reduction in the ability of sperm to fertilise eggs and to produce normal embryos. The impact of raised temperature on the developing testis of male infants has not been thoroughly studied. The deleterious effect of cryptorchidism on later spermatogenesis is believed to be related to increased scrotal temperature during early years. Partsch et al.[18] found that scrotal temperature is increased in boys wearing disposable plastic-lined nappies.

Sperm motility and sperm concentration are still the best predictors of fertility. Both factors seem to be negatively affected by increased scrotal temperature.

We can at least affirm that clothing increases the scrotal temperature to an abnormal level that may have a negative effect on spermatogenesis. Normal air exchange around the scrotum should be promoted for a more physiologically normal environment. Thus, it seems plausible that men should wear skirts and avoid trousers, at least during the period during which they plan to conceive children.

The hypothesis

The Scottish kilt is a male garment that resembles (but is not!) a knee-length, pleated skirt. It is typically made from tartan fabric and traditionally worn without any underwear. Seventeenth-century depictions show men wearing the belted plaid, 'Breacan feile', or great kilt. The modern, small kilt with sewn pleats is known as the 'Feileadh beag'.[19] The latter was a common article of clothing at the beginning of the 18th century, but depictions of contemporary clothing throughout the 18th century also show the great kilt. In August 1746, after the dramatic battle of Culloden, wearing a tartan kilt was prohibited by the English Dress Act (Abolition and Proscription of the Highland Dress 19 George II, Chap. 39, Sec 17, 1746), which was part of the Act of Proscription. The Act was repealed in July 1782 (Repeal of the Act Prescribing the wearing of Highland Dress 22 George III, Cap. 63, 1782), and the kilt has since become firmly fixed as a characteristic Highland garment. Moreover, it has become the national garment for Scotland as a whole. Currently, it is typically a formal male garment for special occasions, such as weddings or the Highland games, but there are movements to reintroduce the kilt as casual clothing, even outside Scotland.

The modern kilt covers the body of the wearer from the waist down to the middle of the knees. It displays a unique construction and design.

Wearing a kilt has strong psychological benefits. A kilt will get you noticed no matter where you are. Research indicates that men wearing a kilt experience

a strong sense of freedom and masculinity and that many women are attracted to men in kilts.[20–22] The Scottish kilt is an immediately recognisable garment and a particularly national icon; it is a highly masculine article of clothing that is seen by some as the only male garment left untouched and unadopted by women. Even in its more traditional form, kilt wearing invites varied reactions and expectations, especially from women.[20] The kilt gives a man a sensuous awareness of his own body and how it will be seen by others. A man in a kilt is a representation, even a symbol, of good health. This was best expressed in the British Medical Journal in 1885 by the physician Brunton after he cured his patient: 'Under the use of massage and forced feeding, his muscles enlarged, until now he might perfectly well join a Highland regiment, and wear a kilt, without being shamed'.[23] Logan[24] quotes the 116-year-old Alexander Campbell as saying that he walked 11 miles 'uniformly dressed in kilt and short hose, leaving his breast and neck exposed to the blast, however cold'. According to Campbell,[25] the kilt is 'capital dress for a healthy man, and tends to preserve health'. The kilt is a powerful symbol of masculinity, connecting the wearer with constructions of the Scottish Highlander, who embodies various aspects of masculinity, including toughness, stoicism, courage and embracing a life outdoors.[20,22]

Searching Medline and the Cochrane Library (using terms 'kilt', 'sperm', 'fertility') failed to locate any evaluation of therapeutic kilt wearing in relation to sperm quality. I am not aware of any randomised controlled trials in which the health benefits of kilt wearing have been studied, but there are some old anecdotic publications that mention many benefits and some disadvantages of wearing a kilt.

A common question and mystery is the following: 'What do men wear under their kilt?' Traditionally, Scots do not wear anything under their kilts, or at least they are not supposed to. The modern kilt was developed at a time when neither men nor women wore underwear. The modern tradition is thought to have its origins in the Scottish military, and this is most probably where the term 'going regimental' stems from. The vast majority (approximately 70%) of Scotsmen still choose to wear nothing beneath their kilt, according to recent surveys. Leak,[26] in discussing testicular temperature, mentions that 'the 'hardy Scots' may owe more to their kilts than some are aware'. Moynahan[27] is of the opinion that 'the wearing of kilts in the middle and high latitudes, by lowering scrotal temperatures to levels below those which are optimal for a tropical mammal, would reduce the mutation rate in those males who habitually wear them; whereas the wearing of trews would merely keep the mutation rate at its optimal level by maintaining subtropical or tropical temperatures in the vicinity of the scrotum'.

However, it is likely that the greatest benefit of frequently wearing a kilt is the cooling of the testicles to physiologically normal levels, which, however, highly hypothetical, disposes the wearer to increased spermatogenesis and improved sperm quality. The hypothetical idea that trousers and (tight) underwear would reduce a man's reproductive abilities while wearing the kilt has been promoted, making the kilt a powerful (and even stylish) symbol of fertility and masculinity.

Do modern Scots have better sperm quality than men in other countries? Do they have fewer problems concerning fertility? The answer is 'no'. Irvine et al.[28] conducted a retrospective review of data on semen quality for 500 Scottish men born between 1951 and 1973. They found that semen quality deteriorated during that period of time, with a later year of birth being significantly associated with a reduced number of sperm in adult life. Spipada et al.[29] investigated trends in semen parameters between 1994 and 2005 in a cohort of 4832 Scottish men. They also found a decreasing trend with respect to sperm density over time.

If the hypothesis is correct, this deterioration of semen quality in young Scottish men can be explained by the reduction in the frequency of kilt wearing since the 1950s. The intensity and frequency of young Scottish males wearing trousers and tight underwear as normal daily clothing are currently comparable with those of other European countries. Scots only wear a kilt occasionally as formal wear and not as every-day clothing, as it was meant to be worn. Selling kilts as casual wear has become a niche market in Scotland.[30] There are only few young men in Scotland who wear the kilt on a daily basis.

As the supposed positive effect is still not supported with scientific evidence, further research is needed to prove the hypotheses put forth here. A randomised controlled trial with a cross-over design in which the scrotal temperature and the semen quality of men wearing a kilt for a certain period of time is compared with the scrotal temperature and the semen quality of their peers wearing tight trews can determine whether men who wear kilts have better quality semen. Several devices for the long-term monitoring of scrotal temperatures are available for this purpose.[31,32]

Conclusions

Wearing a Scottish kilt in a traditional ('regimental') way may have clear health-related benefits. Kilt wearing likely produces an ideal physiological scrotal environment, which in turn helps maintain normal scrotal temperature, which is known to be beneficial for robust spermatogenesis and good sperm quality.

Wearing a kilt also allows the cremaster muscle to function physiologically. If the hypothesis is true, then men who wear a kilt regularly during the years in which they wish to procreate will, as a group, have significantly lower rates of low sperm quality and infertility.

There are strong psychological benefits associated with kilt wearing, most notably (a) a feeling of masculinity and pride and (b) positive attention from sexual admirers. Masculinity and health have been shown to be strongly related.[33] Kilt wearing represents, especially to the kilt wearer, healthy masculinity. Because the kilt is a purely masculine garment, men need not be ashamed of or reticent about the therapeutic wearing of a kilt for a certain period of time to possibly improve sperm quantity and quality. But further research is needed to prove this hypothesis.

Declaration of conflicting interests

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