


2-19-2019

## Menopause from an integrative historical and evolutionary perspective

Alison M. Moore

Western Sydney University, [alison.moore@westernsydney.edu.au](mailto:alison.moore@westernsydney.edu.au)

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### Recommended Citation

Moore, Alison M. (2019) "Menopause from an integrative historical and evolutionary perspective," *Journal of Evolution and Health*: Vol. 3: Iss. 1, Article 4.  
<https://doi.org/10.15310/2334-3591.1097>

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# Menopause from an integrative historical and evolutionary perspective

**Keywords**

menopause, reproductive evolution, medical history of women

The concept of menopause appears only to be found in the modern world. Is menopause then purely a cultural invention? Perhaps women ancestrally did not live long enough to have to worry about it? In fact, humans, like orcas and short-finned pilot whales, have always had substantial female populations living well beyond reproductive age. The possible evolutionary advantage of non-reproductive older females in hunter-gatherer contexts has been referred to as the ‘grandmother hypothesis’ and has been substantiated in several extant hunter-gatherer cultures. But other studies have been unable to find a greater reproductive fitness in the offspring of grandmothers among historical agrarian populations. It appears that ancient and early-modern medical sources first began to see menopause as inherently pathological in the context of its lost evolutionary advantage with substantial agrarian settlement. On the other hand, the modern view of menopause as a distinct set of inflammatory symptoms emerged only in the context of nineteenth-century industrialization and urbanization. What is the truly ancestral way for a woman to pass through this phase of life? In this paper I suggest a few lines of inquiry that might help us to think this through.

Menopause was a term invented by French doctors in the early 1800s. They were aiming to de-pathologize normal reproductive ageing in women, but instead produced a symptomology that increased expectations of the end of menses as a period of ill health, while also framing menopause symptoms as a unique form of female hypochondria. This was a moment of important change in the life-ways of bodies in European societies, with large migrations from rural to urban contexts due to industrialization and the growth of cities. Reflecting on these evolutionary and historical observations, it is hypothesized here that menopause symptomology is a complex bio-psycho-cultural phenomenon produced through the combination of evolutionary mismatch and medical etiology. Its widely reported inflammatory effects from the nineteenth century to today may be the product of super-normal stimuli acting upon women’s bodies in modern lifeways. However, these effects may also be exacerbated by the nocebo effect of the concept itself.

Most female animals do not live long past their reproductive age, the notable exceptions being humans, orcas and short-finned pilot whales. Chromosomal defects are common in the offspring of older females, and yet for most animals, reproduction in later life still infers greater reproductive fitness. For human females, reproduction ceasing long before the end of the lifespan appears to have inferred an evolutionary advantage for long enough in our history to become a stable feature of female physiology [1]. Much anthropological and biological thought has sought to explain the possible advantage of menopause in terms of the greater survival of children in contexts where non-reproductive older females are able to share accumulated knowledge of the environment and care for grandchildren [2]. It seems likely that menopause is so rare throughout animal life because the evolutionary advantage it may infer is only relevant for highly intelligent social mammals, for whom survival is specifically increased by the accumulated collective knowledge and memory of experienced adults. Orcas are clearly animals of precisely this kind, as are humans.

[Figure 1: Orcas jumping, photographed by Robert Pittman: <http://www.afsc.noaa.gov/Quarterly/amj2005/divrptsNMML3.htm>. Open domain.]



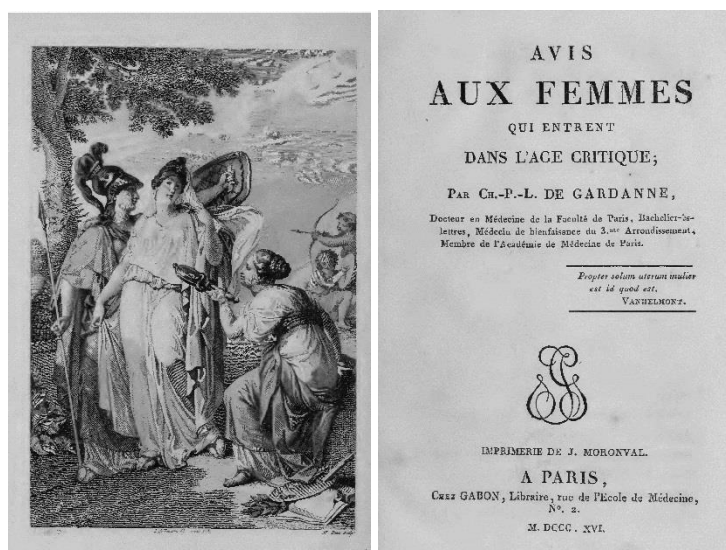
There is indeed a substantial body of anthropological evidence indicating that post-reproductive human females help increase child survival among hunter-gatherers, supporting the ‘grandmother hypothesis’ of menopause as an evolutionary adaptation. A 2018 study of stunted childhood growth in Sub-Saharan Africa found that co-resident grandparents inferred a protective effect [3]. Anthropologist Kristen Hawkes’ study of Hadza hunter-gatherers in northern Tanzania found that grandmothers’ tuber foraging indeed resulted in higher numbers of grandchildren surviving [4, 5]. Frank Marlow’s 2010 book on the Hadza notes his observation that grandmothers, particularly maternal grandmothers, both provide considerable child-care and gather large amounts of food [6, p.178] Ethiopian grandmothers have been found to increase survival of children, with the mechanism of protection identified in grandmothers’ participation in physically-demanding domestic work [7]. Himba grandmothers of northern Namibia have also been found to increase child survival [8]. And kin arrangement patterns studied in Thailand have shown cohabitation with grandmothers to increase child survival. [9]

However, several studies of historical population data sets have failed to replicate these findings among agrarian populations of the past. One study of birth and death records during the late agrarian period of Norway’s history (those born between 1704–1876) found that reproductive grandmothers had greater grandchild survival than non-reproductive ones (referring to women who cared for their own children while also being grandmothers) [10]. Another empirical test of the ‘grandmother hypothesis’ in Utah residents of the nineteenth century also produced a negative finding [11]. It has been theorized that whatever caused us to evolve menopause in hunter-gather contexts was already no longer advantageous to grandchild survival in advanced agrarian development just prior to widespread industrialization [2]. This may be because the advantageous effects of grandmothers on child survival are most acute in subsistence survival contexts [3, p.91].

The long history of ancient and early modern medicine occurred in the context of organized agrarian civilizations less technologically developed than those historical populations described above, but also surplus-based and complex. Throughout this pre-modern textual corpus we find the end of menses in women referred to minimally, with most medical texts relating to women emphasizing child-bearing [12]. Purgative medications were commonly recommended to older women and appear to have been widely abused among European elites at the end of the eighteenth century, possibly themselves triggering some of the unique menopause symptoms that began to be described at this time, namely uterine hemorrhages [13].

However, the big turning-point was in the early decades of the 1800s, when French doctors first began detailing a complex symptomology of inflammation experienced by elite women in urban environments [14]. These symptoms included unexplained weight-gain, insomnia, oedema, abdominal pain and bloating, masculinization, anxiety and depression, joint pain, constipation, indigestion, headaches, dizziness and fainting, and occasionally hot-flushes (though much less commonly than today). Most doctors denied that menopause need necessarily cause illness, and indeed the new word was actually intended to insist on it as a normal phenomenon of ageing. Nonetheless, they also prescribed intense ‘hygienic’ management of this time of life, which included restriction of diet, alcohol, coffee, activity, study, sex, sociability and gambling! [15] Some doctors, such as Charles-Victor Harreaux argued that fear of the change was actually what made women sick: Hypochondria was the menopausal symptom *par excellence!* [16]

[Figure 2: The front pages of Charles-Paul-Louis de Gardanne’s 1816 book on menopause, also referred to as “the critical age”. Author copy.]



Most scholarship on this medical history has tended to view the sudden ‘invention’ of menopause as a purely cultural phenomenon. But bodily lifeways were also undergoing sudden marked changes in this time as urban affluence produced both new physiological stressors and new ‘supernormal stimuli’ [17]. Women were more commonly lacing themselves into tight corsets that compressed their abdominal organs and produced core-muscle atrophy with chronic use. Many doctors at the time considered this to be a major source of abdominal symptoms among menopausal women [18, 19]. There was also a sudden marked increase in the availability of alcoholic beverages with the construction of railway networks in the nineteenth century that enabled rapid transport of agricultural products from far afield (20). Greater possibilities of night-time entertainment in cities meant that urban elites spent more time with their circadian rhythms not synchronized to diurnal light; and they were now continuously exposed to hypercaloric diets that included a large percentage of calories derived from refined carbohydrates (flour and sugar) [21]. Elite women were also relegated to the private sphere, spending much of their time indoors and engaged only in sedentary pursuits [22]

[Figure 3: Photograph of Hermoine Wilhelmina Fitzgerald (né Duncombe), Duchess of Leinster (1864-1895) in a corseted gown in the year of her death from tuberculosis. She did not survive to experience menopause]. Public Domain.



Numerous doctors identified these stressors as precisely the culprits in many women's complaints in menopause during the nineteenth century. One doctor, L.J.S. Jallon claimed to have asked many peasant women if they suffered any such problems after their menses ended, receiving blank stares and mystified responses. He attributed this, as well as their generally superior health and wellbeing to their high activity levels, time outdoors in the fresh air, early-to-bed sleep patterns, high consumption of fresh fruits and vegetables, and the bearing of multiple children [23]. Was this, as some have suggested, just a romantic fantasy of the ideal agrarian bliss in the model of Jean-Jacques Rousseau? [13. p.8] Recent studies have suggested that exercise alone relieves symptoms of menopause in women today [24, 25], and that high soluble fibre intake (of the kind derived from vegetable and legume consumption) regulates estrogen metabolism and reduces hot flushes in menopausal women [26]. It seems likely that elite urban women in this time were indeed experiencing novel menopausal symptoms resulting from metabolic, digestive and endocrine derangement, in addition to the broadly inflammatory effects of high alcohol consumption, low physical activity and sleep dysregulation. The shift from agrarian to urban elite lifeways produced a loss of ancestral health through evolutionary mismatch, causing menopause to manifest pathologically, as it does still often today.

The concept of evolutionary mismatch, originally proposed by Nicholas Tinbergen, has been explained in relation to modern human health problems by psychologist Deidre Barrett and by biologist George Diggs [17, 27]. Here I am using it to consider that the conditions in which human menopause evolved were unique to hunter-gatherer lifeways, while both agrarian settlement and industrial contexts have produced successive "supernormal stimuli" that have impacted women's experience of reproductive ageing. The first step in this shift resulted from the caloric abundance of the agricultural revolution relative to the regular fasting and caloric restriction of hunter-gatherer experience, which resulted in the capacity to store dried and preserved food. This in turn created a relatively constant high reproductive capacity as

evidenced by historical records indicating that peasant women in the European past habitually had between 8-12 children [28]. In this context, the evolutionary advantage of non-reproductive older females appears to have vanished. But urban living in early industrialization produced a novel range of physiological stressors in addition to this, making menopause not only lose its advantageous edge for reproductive fitness, but possibly also producing new inflammatory symptoms in menopausal women. The work of anthropologist Mwenza Blell has shown that rural Pakistani women experience greater negative effects of menopause following migration to metropolitan England [29]. But more research is needed to verify if different lifeways and state structures indeed generally result in greater or lesser menopause symptoms.

So now we might see menopause symptoms as purely physiological instead. But wait! Concepts too can be physiological stressors. Could one of the triggers for menopausal symptoms be in fact, as Dr Harreaux had claimed, the expectation of the suffering menopause might produce? While his claim that menopause was hypochondria denied women's bodily experiences and denigrated their intelligence, it also hinted at the very way in which the new medical category itself contributed to the negative effects of the change. As the research of Harvard Medical School scholar Ted J. Kaptchuk shows, placebos are effective even when we know they are being used; this is referred to as "open-label placebos" [30]. Could nocebo also work this way? Even if women consider that menopause is a much-burdened concept, making us more likely to experience the change negatively, are we still likely to suffer unnecessarily because of it? This is indeed the concern of several renowned feminist scholars who have written about menopause [31, 32].

Here we might consider the parallel of the prostate cancer drug Finasteride. This androgenic antagonist has been found to lower libido and cause mild erectile dysfunction in 15% of men who take it without being warned of any possible side effects. But with prior warning of the potential effect on libido, the percentage of those experiencing this side-effect rises to 44% [33]. This is a most interesting example to consider in relation to menopause symptoms, since numerous researchers have noted that a large percentage of women indeed experience no major negative effects from the change, while another significant number experience highly troubling ones whatever their expectations beforehand [34]. Might there be another group who fall into the untroubled category, but is suggestible to the nocebo effect of the concept of menopause? I conclude that we should be cognizant of its capacity to act in this way, while also addressing the greater inflammatory impact on women's sexual ageing in the modern loss of ancestral lifeways. We may not wish to have ten children as premodern ancestors mostly did, but we need not pressure our bodies by starving our microbial commensals, or by overloading our insulin receptors, or by inflaming ourselves with excessive alcohol, sedentary behavior, sleep deprivation and lack of outdoor time. We may indeed want to acknowledge the changes of ageing as they occur, but we need not add to this the suffering of worry and the priming of negative expectation.

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