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Health Benefits of Longer Post-reproductive Life in Women

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INTRODUCTION

Multidisciplinary research on the lifespan limits of humans has been stimulated by recent developments in medicine and increases in life expectancy. In the end, selection favouring increased life in our evolutionary past may determine how long humans can live. Human females have a remarkably long post-reproductive lifetime, which has been attributed to the fitness advantages of raising grandchildren after menopause. Formal studies examining whether these advantages of grand mothering diminish with advancing grandmother age and account for the length of post-reproductive lifespan are lacking.

This is crucial for comprehending current pressures on longevity due to selection, but it hasn't been considered as a potential mechanism up until now [1,2]. Here, we demonstrate that fitness advantages from grand mothering are dependent on grandmother age, altering selection on the post-reproductive lifespan. To do this, we used substantial data from pre-industrial people. While the risk of death for women increased significantly in their late 60s and early 70s compared to menopausal ages, we find that both opportunities and capacity to assist grandkids reduced with age, suggesting that selection on subsequent longevity was decreasing.

The presence of maternal grandmothers 50 to 75 years old boosted the survival of the grandchildren after weaning, demonstrating the fitness benefit of post-reproductive ageing. Co-residence with paternal grandmothers who were 75 years or older, however, was adverse to grandchild survival, with the grandmothers who were near death and likely in worse health being notably connected with reduced grandchild survival. According to the age restrictions on acquiring inclusive fitness through grand mothering, grand mothering can only select for post-reproductive lifespan thus far [3].

DISCUSSION

Extended post-reproductive lifespan is an uncommon characteristic that is only known to exist in a small number of wild mammals, and its elucidation remains a significant mystery. While helping kin raise children offers a different path to greater lifelong fitness and is well-documented in humans, post-reproductive adults can no longer boost their direct fitness [4]. According to the "grandmother hypothesis," which is based on these indirect fitness reasons, post-reproductive life is the result of the adaptive advantages earned from supporting offspring's reproductive efforts (i.e., providing for grand offspring). Even if these supportive advantages are probably insufficient on their own to fully account for the evolution of reproductive cessation in the first place, it is still possible that they contributed to the selection of post-reproductive life span. According to theory, after a certain age, when fewer close relatives are born and there is less selection for continuing survival, there should be less opportunities to provide grandchildren. Previous research has indicated those maternal and paternal grandmothers' effects on grandchild survival varied by grandchild age, demonstrating that support might vary contextually [5].

However, despite the significance of age-specific grandmother assistance to the evolution of longevity, grandmother age has not yet been specifically examined as a potential modulator of assisting effects on grandchild survival. Here, we first quantify the age at which the number of grandchildren in need of grandmother care drops and contrast this with the acceleration in the mortality rate of grandmothers using long-term life-history data from pre-industrial Finnish church registers. After that, we investigate the potential effects of selection on longevity and extended post-reproductive lifespan as well as whether grandchild survival is related to (1) the presence of grandmothers of different ages and (2) different remaining lifespans (implemented as time until grandmother death as a proxy for health) [6].

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Age-specific availability

First, we demonstrate that the number of grandchildren that older women can aim their care toward increases from their 40s onward, peaks in their early 60s, and then rapidly drops until by age 75, the majority of grandkids have already been born. Each grandchild contributes half as much to fitness as the birth of a child, and great-grandchildren contribute even less. This suggests that opportunities to increase fitness by extending longevity to care for kin wane from the 1970s onwards in this population simply because there are fewer grandchildren who need assistance.

Each grandchild contributes half as much to fitness as the birth of a child, and great-grandchildren contribute even less. This shows that in this population, opportunities to increase fitness by extending longevity to care for kin dwindle after the age of 70 due to a decrease in the number of grandchildren who need assistance.

The age-specific changes in the risk of death for women were therefore the second area we looked into. An increase in mortality suggests that senescence rates are spreading throughout the population and that selection pressure on lifespan is waning. Old age, frailty, stroke, and tuberculosis were the most typical reasons of death mentioned in the parish registers for grandmothers [7].

CONCLUSION

The fitness advantages that grandmothers gain by enhancing grandchild survival lend support to the idea that post-reproductive longevity of women is under positive selection.

Importantly, we also discover that the positive benefits of grandparents on their grandchildren diminish as the grandmothers get older and/or get sicker. However, it is important to emphasise that we are unable to distinguish between the importances of age per se and time to death, and it is very likely that the outcomes for one are influenced by the other. Once possibilities and abilities to help grandkids wane, grandmother mortality increases significantly.

Given that there are currently few genes known to have highly specific age effects beyond development and that ageing trajectories are typically believed to be influenced by lifelong processes, these findings are noteworthy. The favourable impacts of grandmothers encourage the evolution of post-reproductive lifetime, but the negative effects of older and/or weaker paternal grandmothers imply that selection may also be limiting the evolution of additional increases in lifespan, which is why our results call for more study. Given that this lifespan cap applies to a wide range of pre-industrialized human groups living in various environments, it's possible that the development of modern medicine to treat age-related health problems has overridden the lifespan cap on post-reproductive humans.

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