Female warblers live longer when they have help raising offspring

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The Seychelles Warbler (Acrocephalus sechellensis). Credit: Martijn Hammers, Author provided

Death is, unfortunately, an inevitable consequence of life. In most animals growing old is accompanied by progressive deterioration in

health and vitality, leading to an increasing likelihood of death with age.

However, within populations of a single species there is lots of variation in when individuals start to deteriorate in later life. Why some individuals of the same species age faster than others is one of the biggest unanswered questions in biology. It's also one that has massive implications for healthcare and society. Understanding why individuals age differently may allow us to promote longer and healthier lifespans in humans and other animals.

The environment that an individual experiences as it strives to survive and reproduce appears to be a major driver of individual variation in ageing. We are all familiar with the idea that some people look like they have "had a hard life", while others are "young for their age". Scientists and medics sometimes refer to an individual's biological age. An individual has a biological age of 70 if their health and condition resembles that which we would expect of a 70 year old – whatever their actual age is.

It's thought that a lot of this variation in ageing originates because individuals experience different levels of physiological stress as they go through life. We now need to figure out which factors explain these differences, at what point they have an effect in the course of a life, and how they can be avoided or mitigated.

Research on a small bird could help us understanding this process of ageing – and the unlikely benefits of childcare.

How our cells record ageing

Investigating the causes of ageing within natural populations – where individuals are exposed to realistic variation in stresses and do not benefit from any intervention or medication – is important, but very

tricky. Wild living individuals have to be tracked throughout their lives to assess the environmental and social conditions they experience, and their subsequent health and survival.

Our long-term study of the Seychelles warbler – a small, tropical songbird – on the island of Cousin in the Indian Ocean is a useful case study for understanding the ageing process. Since the 1990s, all the warblers on this tiny island – just 40 football fields in size – have been fitted with coloured leg rings so they can be tracked and identified. Birds don't disperse on or off this isolated island so we were able to follow them from birth to death. We also monitored their health, reproduction and survival, which all decline rapidly in elderly individuals.

We also measured the warbler's telomeres – repetitive DNA sequences which protect the ends of chromosomes but shorten in response to physiological stress. Telomere shortening has been shown to be a useful marker of biological condition and ageing in various animals, including humans. In the Seychelles warbler, telomere length predicts future survival. By measuring the telomere shortening that occurs in response to any given experience we can determine the impact that specific factors have on ageing.

Our previous studies on the Seychelles warbler have already found that certain factors influence the rate at which individuals age. For example, having a territory surrounded by unrelated and unfamiliar neighbours leads to more territorial fights, and hence more rapid telomere shortening. Growing up in a territory with limited food availability also has a detrimental impact on later ageing.

Our recent paper in Nature Communications has focused on how raising offspring is stressful and may lead to premature ageing – something that may not surprise many parents. Due to a lack of space on Cousin, many adults can't find a territory in which to pair up and breed. Instead, these

individuals may join up as subordinates to a dominant breeding pair within an already established territory – often the one in which they were born. They then sometimes help the dominant breeding pair raise their next batch of offspring—a process known as "cooperative breeding".

Our analyses showed that the dominant birds that receive help have less telomere shortening than those that are left to do all of the parenting work themselves. This help also results in better survival of the dominant females. Therefore, we can see that the help that the dominant breeding birds received reduced the stress of breeding and delayed ageing, at least in females. The dominant males don't appear to benefit from receiving help as much, probably because in the Seychelles warbler males invest much less energy in raising chicks than females do.

Our study confirms a long-held hypothesis that cooperative breeding – which is the norm in humans – can reduce the health costs to parents of raising young and may, therefore, slow down ageing. This could explain why more social species tend to have longer lifespans.

Our findings in the Seychelles warbler have identified the costs of more rapid ageing in overworked parents. These costs, and how individuals differ in what they experience and when, can help explain why there is so much variation in how individuals age in later life.

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