

Social isolation has made COVID-19 especially difficult for us.

There's an evolutionary reason why.

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For the past year, the world has struggled to combat the COVID-19 pandemic. To deter the spread of the virus, public health officials have encouraged strategies including mask wearing, social distancing, and the most effective of all, avoiding in-person social gatherings altogether. This time of increased social isolation has brought heightened attention to another, more insidious epidemic that many researchers have been studying for years: the detrimental effects of loneliness on our health and wellbeing. Humans are hardwired to be social and experience loneliness when socially isolated, which has made life during COVID-19 especially difficult. But throughout our evolutionary history, the loneliness we feel when away from others may have actually been adaptive by driving us to find mates and to be part of a protective community. The pandemic era of increased loneliness presents an opportunity for us to more clearly see the ways that our evolutionary roots affect us today.

To understand why humans experience loneliness, we need to understand how we evolved. Evolution, in the biological sense, refers to the changes in the proportions of traits in a population over time, rather than in one individual over the course of their lifetime [1]. Traits can become more or less prevalent through the process of natural selection, or survival of the fittest. This means that the members of the population that are most 'fit,' or best suited to their environment, are typically the ones that will survive long enough to have children and pass on their genetic material, and the cycle will continue in the subsequent generations. In this way, a species can evolve to accumulate traits that better allow them to survive and thrive in their environment.

Because the individuals that survive long enough to reproduce are the ones that will pass traits on to future generations of their species, it follows that genetic traits that make individuals more likely to survive and reproduce will become more prevalent in subsequent generations of the species. In species that live longer or raise more offspring when they are social – like humans – it makes sense that traits that discourage social isolation would be advantageous and become common.

We have an instinct to be social because forming and maintaining social bonds is adaptive at all stages of life. If parents were not motivated to nurture and protect their infant children, the infants would perish (along with the genetic legacy of the parents) [2]. If children and adolescents were not motivated to stay with their caretakers, they would be more likely to die from extreme environmental events or attacks from external predators [3]. Our ancestors who were inclined to communicate and work together and share food and defense were more likely to survive together. Those who had the genetic traits that led them to experience social pain from social separation may have been more likely to reconnect with their family or allies by

sharing their food, shelter, or defense to diminish the pain of loneliness, which in turn increased the well-being of the group overall [2].

This has led some evolutionary biologists to suggest that the pain of loneliness that comes when we feel isolated actually may have adaptive value. It signals to us that our social bonds may have weakened, and it motivates us to repair and maintain our connections to others that are needed for our health and well-being and for the survival of our genes [4]. Social pain operates internally in a similar way to physical pain. Both act as unpleasant signals that motivate us to change our behavior to alleviate the unpleasantness [4]. Because humans do not like the feelings that come with loneliness, we do something to change our situation and try to find more social connection. And in addition to emulating physical pain when feeling socially isolated, loneliness operates by eliciting feelings of social reward, which co-opt the appetitive system, when we repair connections with others. With this logic, the hurt that comes with loneliness and the feelings of reward after reconnecting can be seen as an evolutionary push for us to enhance chances of living and reproducing by becoming socially integrated.

Not all loneliness is created equal. Transient feelings of loneliness, which usually last minutes, hours, or even days occasionally, are experienced by most people at some points and are usually mild [5]. Sadness and anxiety motivate us to reestablish a sense of connectedness, and those feelings are usually quick to fade away when we do so. Transient loneliness can come with brief negative effects on our body, such as an increase in the body's main stress hormone, cortisol, but these effects do not have long-lasting consequences for health and functioning [5]. In contrast, long-lasting or chronic feelings of loneliness happen when individuals are incapable of reconnecting with others and satisfying their social needs [5]. This type of loneliness can happen as a result of events that make connecting with people on a deep level difficult, such as moving to a new location, a spouse passing away, or being forced to stay isolated because of a global pandemic. Chronic loneliness can contribute to psychosocial problems as well as changes in bodily functioning that can lead to clinical disease, disabilities and mortality [5].

Many researchers have looked into the effect of long-term social isolation and loneliness on health. For example, one study found that people who are less socially integrated have notably shorter lives compared to people with stronger social relationships [6]. This represents a more significant health risk than obesity, alcoholism, sedentary living, and smoking [7]. More specifically, one study found that loneliness can be as damaging to one's health as smoking 15 cigarettes a day [8]! Other researchers reported that people with poor social relationships had a 29 percent increased risk of coronary heart disease and a 32 percent increased risk of stroke compared to people with stronger social ties [8].

Humans are not alone in experiencing harmful effects of social isolation. Research has shown that social isolation in mammals has adverse consequences that may give us insights into the effects of inadequate social relationship quality or quantity in humans [5]. Studies of various social animal species at various stages in life have revealed that keeping animals socially isolated results in altered behavior, such as anxiety, depression, aggression, and impaired cognitive

processing and memory. In addition, they found changes in blood pressure, inflammation, and immune responses, as well as increased mortality [5].

Clearly, research on social isolation is not a new phenomenon, but because being socially isolated has become practically ubiquitous because of the stay-at-home guidelines of the COVID-19 pandemic (to varying degrees, of course), the detrimental effects that come with loneliness have received increased attention. One study found that from January 2020 (before widespread COVID-19 cases in the United States) to April and May 2020 (when COVID-19 cases were more prevalent) loneliness increased among study participants and was predicted to continue to increase as the pandemic continued [9]. Another study found that 65 percent of study participants in the United States reported increased feelings of loneliness since the declaration of COVID-19 as a pandemic [10]. But even before COVID-19 shut social gatherings down, loneliness received attention as a public health issue, termed the “loneliness epidemic” [8]. Countries such as Japan and the United Kingdom have even appointed “Ministers of Loneliness” to try to combat the issue.

A major population of concern for public health officials is senior citizens, for which feelings of loneliness are incredibly common: 43 percent of elderly Americans feel lonely on a regular basis [8]. The feelings are likely exacerbated due to more elderly people living alone and having close friends, family, and spouses pass away. Alarming, one study found that an estimated \$6.7 billion in annual federal spending is attributable to the health effects of social isolation among older adults, and the financial and public health impacts will likely continue to increase as America’s population ages [8].

The loneliness epidemic is not isolated within the elderly. In the general population, 20 percent of adults in both the United States and the United Kingdom say they always or often feel lonely, lack companionship, or feel left out or isolated [11]. Another survey of Americans found that 54 percent of Americans said they always or sometimes feel that no one knows them well [11]. Notably, these questions do not ask for purely objective statistics on social behavior, such as how many people you see on a regular basis. This reflects research that delineates the effects of *perceived* social isolation from that of objective social isolation. It turns out that perceived social isolation predicts outcomes beyond what objective social isolation can.

Researchers have used different measures to assess social interactions. Some have looked at what are called “structural” measures, which involve things like one’s objective number of social ties, and some have assessed “functional” measures, such as bond strength, consistency, or the relative frequency of interactions [7]. The functional measures result in a picture of the subject’s perceived levels of social support or isolation. The studies that assessed perceived social isolation rather than objective measures of isolation found more significant associations between social isolation and adverse health effects [6].

This key distinction may give us insight into better coping with life in the time of corona. How socially connected we *feel* (perceived social support from our connections) contributes more than how socially connected we are on paper (mere number of social connections) to our levels of loneliness and likelihood of experiencing adverse health effects. This means that we should all

make an effort to preserve high quality social interactions in the ways that we can, whether through Zoom calls, texts, or socially distanced and masked interactions.

But even with arduous efforts to maintain solid social relationships, our evolutionary roots make social isolation difficult, whether during a pandemic or otherwise. In time, the spread of the virus will slow, social connection will be more possible, and hopefully, the increase in loneliness will subside. However, we know that the loneliness epidemic was prevalent before March 2020, so in the post-pandemic future, let's all make more of an effort to take the effects of social isolation seriously. When COVID-19 no longer plagues us, loneliness still will.

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