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Spotlight Article

Is Old Age or Aging a Disease, in a Literal or a Metaphorical Sense?

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In the book, *Metaphors We Live By*, linguists George Lakoff and Mark Johnson (1980) described how metaphors are tools to help us communicate about intangible concepts in terms of things more familiar and concrete. For example, a metaphor ubiquitous in our culture is "time is money". We use money-related words to help us talk about time. We say we are "spending" or "wasting" time. Time isn't literally money, but so much of our experience with time is in the context of time-metered, monetary compensation that we use this metaphor without a second thought. The use of metaphors has an important consequence. Our feelings and actions with respect to the intangible concept become tied to our feelings and actions related to the thing upon which our metaphor is based. So, our behaviors and emotions with respect to time become influenced by our behaviors and emotions related to money. Lakoff and Johnson referred to these consequences as entailments. People get angry about time that is "poorly spent," are happy to "invest" time wisely, and are reluctant to consider some activities because of their opportunity "costs." Their feelings are shaped by the metaphorical equivalence of time and money.

When a person claims that old age is a disease (defined chronologically), is this meant literally, or do they mean that old age can be understood using disease as a metaphor? It is usually the latter. The high prevalences of disability and morbidity and the elevated mortality risk associated with old age set the stage for the disease metaphor, in the same way that the time-clock sets the stage for the "time is money" metaphor. Table 1 elucidates the extent to which old age might be considered as a disease, and lists 14 attributes associated with entities considered to be diseases. The list is meant to be illustrative rather than exhaustive, and not every disease entity has all 14 attributes. Some of these attributes relate to biology and pathophysiology, and some relate to societal responses to persons having a disease, which may differ by geography and time. The pathophysiologic attributes of a disease are often considered to be defining; that is, many diseases are defined by the specific underlying abnormal pathophysiologies that give rise to their signs and symptoms. The first column shows an unambiguous example of a disease: acute childhood leukemia, which is ultimately fatal in the absence of treatment. Every attribute applies to childhood leukemia. The second column displays how old age relates to these attributes. In the author's opinion, only three attributes (Attributes 2, 4, and 5) are literally true for old age: there are specific signs (graying hair and wrinkling skin), it can be associated with distressing symptoms or functional limitations, and it does increase the risk of worse distress, more limitations, or death.

Being old shares some attributes of a disease, but is this enough for old age to be considered a disease? The same subset of attributes apply to sex or being a neonate, neither of which would be considered a disease state, and none of the conditions denote a specific, abnormal pathophysiology, which is central to many disease definitions. If we reject that old age is literally a disease, what are the consequences of adopting a disease metaphor to understand and discuss advanced age? If we adopt an "old age is a disease"

Table 1. Disease Attributes and Entailments of Using Disease as a Metaphor

If X is a disease, then …	Childhood Leukemia	Old Age (>65 Years)	The Aging Process	Hypercholesterolemia
1. It has specific symptoms	Yes	No	Rarely	Rarely
2. It has specific signs	Yes	Yes	Rarely	Yes
3. It is to be feared	Yes	No	No	No
4. It is associated with distress or functional limitations	Yes	Yes	Sometimes	No
5. It increases the risk of worse distress, more limitations, or death	Yes	Yes	Yes	Yes
6. It has a pathophysiology distinct from normal physiology	Yes	No	Unclear	Sometimes
7. Its pathophysiology, if unchecked, leads to worse outcomes	Yes	No	Unclear	Sometimes
8. It's diagnosed/identified by health professionals	Yes	No	Yes	Yes
9. Responses to it are in the domain of medicine	Yes	Not exclusively	Yes	Yes
10. It can be cured	Yes	No	No	No
11. Its treatment/prevention may be coerced	Yes	No	No	No
12. We should change behaviors to avoid it, if possible	Yes	No	Potentially	Yes
13. The FDA is willing to approve drugs to treat/prevent	Yes	No	Not presently	Yes
14. Insurers cover its diagnosis or treatment	Yes	No	Not presently	Yes

Note. FDA = Food and Drug Administration.

metaphor, then the listed attributes of diseases in Table 1 become entailments suggested by adopting the metaphor. The "old age is a disease" metaphor would lead us to act and feel about advanced age the way do about disease. Old age would be something to be feared and avoided. There would be a tendency to expect to identify abnormal pathologies driving aging, which hucksters could exploit to offer "aging cures." There would be a tendency to expect persons of advanced age to cede autonomy to medical authorities. But the metaphor would also pressure regulators to approve treatments and insurers to pay for them.

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In considering some of the attributes, one needs to specify whether the presumed disease is old age or aging as a biological process. Different disease attributes may apply to the biological aging process (Table 1, Column 3). The aging process operates across the lifespan and, for most people, it is indistinguishable from normal biology; thus, the biological aging process is not typically associated with specific signs or symptoms *per se*. (Attributes 1, 2, 4, 6, and 7) There are genetic syndromes that greatly accelerate the biological aging process, where the accelerated aging process is associated with specific signs and symptoms (Ahmed, Ikram, Bibi, & Mir, 2018). Likewise, the process can be accentuated or accelerated in response to environmental stressors, such as diet, disease, or disease treatments. In people in whom there is evidence that the biological aging process has unfolded faster than expected based on chronological age, the risk of adverse outcomes is higher (Attribute 5; Levine et al., 2018).

A major motivation to consider old age as a disease is driven by the attitude of regulators and insurers towards potential treatments targeting aging biology. Over the past 2 decades, a growing body of biological research has shown that there are underlying biologic processes that drive physiologic aging and the emergence of age-related health conditions (Kennedy et al., 2014). Moreover, mounting evidence from model organisms indicates that the biological aging process can be influenced by genetic manipulation, caloric restriction, and pharmacologic agents to extend the lifespan and reduce the risk of disease and functional declines. The core premise of the emerging field of geroscience is that these same processes can be targeted in humans to slow the emergence of disease, and both proposed and ongoing human clinical trials are seeking to test whether targeting aging biology can benefit human health (Kritchevsky, 2019). The FDA does not recognize age as a drug indication, because age is not recognized to be a disease or a health condition. This stance makes private-sector investments for work

targeting aging financially risky. Without a clear indication, the path to drug approval is murky, lowering the prospects of returns on investments made in the area. The aging process might be somewhat more promising from a regulatory standpoint. The FDA does approve drugs for treating disease risk factors (e.g., hypercholesterolemia and hypertension). Hypercholesterolemia shares several disease attributes with the aging process (Table 1, Column 4). The approval of lipid-lowering drugs is based on the fact that lowering cholesterol prevents atherosclerotic disease and is supported by a tremendous body of research showing that serum cholesterol is a causal factor for the disease. A similar research foundation does not yet exist for the biologic aging process.

The targeting of biological aging processes challenges the paradigm exemplified by hypercholesterolemia, lipid-lowering drugs, and atherosclerosis. If successful, targeting the aging process will affect many age-related diseases, rather than a single, specific disease. This could have a larger impact on societal health than targeting specific age-related diseases, because preventing one age-related disease leaves a person exposed to exponentially increasing risks of many others. Is this promise worth redefining old age as a disease, whether literally or metaphorically? It would be preferable to address the heart of the problem and work to change the regulatory framework to be permissive of indications for treatments targeting aging biology, rather than to classify aging as a disease, which would stigmatize and medicalize the more than 1 in 7 Americans who are over the age of 65. FDA rules should allow for the use of age-related syndromes (e.g., frailty or dysmobility) in the drug qualification process, and allow for drugs with mechanisms of action based on targeting common age-related pathways in addition to mechanisms specific to individual disease targets.

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