BEYOND THE WEAK AND STRONG LIFE EXTENSION DIVISION: «DON'T ADD YEARS TO LIFE IF YOU CANNOT ADD LIFE TO THOSE YEARS»

MÁS ALLÁ DE LA DISTINCIÓN ENTRE EXTENSIÓN DE LA VIDA DÉBIL Y FUERTE: «NO AÑADIR AÑOS DE VIDA SI NO SE PUEDE AÑADIR VIDA A ESOS AÑOS»

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ABSTRACT: The philosophical and scientific debate about life extension is polarized between two views: a weak and a strong stances. They are divided over their approach to the age of Jeanne Calment, or what is the same, the maximum life span of the human species. In this article, I will evaluate this division and I will propose other alternative for thinking about the life extension possibilities. In order to do so, I will first review five key concepts in the literature, since some of them are misunderstood by the authors who defend this division. Furthermore, this division suffers from a major flaw: the failure to acknowledge that maximum life span is not a fixed number, and that there are no strong arguments to ensure that this is the limit to human longevity. Moreover, I will argue that these authors do not adequately capture the main aspect that we care about when we address the issue of improving the quality of life throughout our existence.

KEYWORDS: Aging; longevity; strong life extension; weak life extension.

RESUMEN: El debate filosófico y científico sobre la extensión de la vida está polarizado entre dos visiones: una forma de prolongación débil y otra fuerte. Ambas se distinguen en función de la proximidad a la edad de Jeanne Calment o, lo que es lo mismo, a la máxima duración de la vida en la especie humana. En este artículo, evaluaré esta distinción y propondré otra alternativa para pensar en las posibilidades de prolongación de la vida. Para ello, primero revisaré cinco conceptos clave en la literatura científica, ya que algunos de ellos son interpretados erróneamente por los autores que defienden esta distinción. Una distinción que adolece además de una falla importante: la incapacidad de reconocer que la duración máxima de la vida no es un número fijo de años y que no existen argumentos sólidos para garantizar que ese sea el límite de la longevidad humana. También indicaré que estos autores no captan adecuadamente el aspecto principal que nos interesa cuando tratamos de mejorar la calidad de vida a lo largo de nuestra existencia.

PALABRAS CLAVE: Envejecimiento; longevidad; extensión de la vida fuerte; extensión de la vida débil.

1. INTRODUCTION

In the last two decades, the possibility of extending life expectancy and maximum life span has been a highly debated topic by both biomedical scientists (Blasco and Salomone, 2016; de Grey and Rae, 2007; Sinclair and LaPlante, 2019) and philosophers (Agar, 2010; Davis, 2018; Overall, 2003). Our knowledge of aging is expanding, our technological possibilities are better, and many conceptual and practical questions are being opened. Against this backdrop, there are two well-known opposing groups related to a possible increase in human life: bioconservatives and transhumanists.

The former (bioconservatives) tend to interpret aging as a natural, normal, and universal process. They equate maximum life span with the human life-cycle and argue that efforts to push past it indefinitely are ultimately dehumanizing. For them, mortality is essential to the meaning of life—our goals and values depend on our finitude. What is more, if a human body could be sustained indefinitely, our personal identity would not depend on the temporal limits that necessarily define any particular person's lifetime (Kass, 2003; notably Fukuyama, 2002; Sandel, 2007).

The opposing view, the one held by transhumanists, tends to interpret aging as a disease, a pathological process that is potentially curable. They argue that efforts to arrest aging are not only morally permissible, but that they should be given high priority within biomedical research. Accordingly, we should always keep striving to overcome the limits of our maximum life span just as we accept no limits on our health, no matter how old we may grow up to be. For these authors, living longer or even living forever would be the best possible scenario, as they believe that there should be no limits to our enhancement. In saying so, transhumanists defend the most extreme position on life extension (Kurzweil, 2005; notably Harris, 2007; Wood, 2016).

Conceptually and practically, bioconservatives and transhumanists are clearly incompatible. If these were the only possible positions, the debate would be stalled. The division between both sides is excessively wide. For that matter, it is virtually impossible to obtain a productive dialogue between them. They do not consider the arguments of the opposing side and, occasionally, they commit straw man fallacies to each other decreasing their academic rigor. These approaches might provide a simplified image of all the existing aspects of the life extension possibilities. Nonetheless, they are the main representatives of the philosophical-scientific debate. For this reason, some authors have tried to frame this debate in a way that can facilitate progress in biogerontology and the philosophy of aging beyond these two opposing views. These authors generally do so by distinguishing two forms of life extension: (1) weak (moderate) efforts of current biomedicine to sustain a good quality of life in old age; and (2) strong (radical) efforts of some future biomedicine that will allow people to live healthy lives well beyond the current maximum life span (Lucke and Hall, 2006; Moody, 2001; complementarily Glannon, 2002a; Rantanen, 2014). In the light of this division, these authors describe each of the possible scenarios to assess whether they are desirable for humans.

This article is about the weak and strong life extension division. First of all, I will take the approaches of Harry Moody (2001) and Jayne Lucke and Wayne Hall (2006) as significant examples (section 2). Later, in sections 3-4, I will review several key concepts that are used by authors that are proponents of this division. I will propose dividing these key concepts into two different categories: concepts that revolve around individual properties and concepts that revolve around population properties. Then, in section 5, I will expose a serious flaw of this division. This flaw is related to how maximum life span should be quantified. According to the above, I will argue that human life is more worth living when we have better health prospects for longer life, regardless of whether we can extend it. In this regard, in section 6, I will introduce a thought experiment to show that we should only add years of life if we can add life to those years. Living a healthier life throughout our existence should be prioritized over any attempt to live longer than we live now.

2. MEDIATING MODELS TO GOVERN THE PRACTICE AND THEORY ABOUT LIFE EXTENSION

The mediating models that appear in conceptual and practical discussions over life extension can be classified into a weak and a strong stance. These authors aim to be clear about what is at stake in this dialogue between both extremes: bioconservatives and transhumanists. By means of these mediating models, they respond to different concerns, dilemmas, and problems about life extension. For instance, some of the classical questions go as follows:

(1) is it desirable to live longer than today's average? (Temkin, 2008); (2) should we cure aging? (de Winter, 2015); or (3) what kind of philosophical consequences and implications could be derived from life extension? (Glannon, 2002b). This division leads them to respond to each of the challenges from their particularities rather than from a common theoretical framework that applies to all problems, as bioconservatives and transhumanists usually do. They argue that this is the only possible way to prevent the debate from getting stalled.

I will firstly present the division by Moody (2001) and by Lucke and Hall (2006), as mediating models to govern the practice and theory about life extension. Secondly, I will summarize the main ideas shared by different authors who defend this division[1]. Despite having significantly different starting points, they all pursue the same objective: evaluating what a post-aging world could look like.

Moody feels a strong tension between the idea of looking young in first person and the anthropological, philosophical, and social consequences of living longer than we live now. Taking his own ambivalence as a point of departure, this tension between a personal yearning and the normative restraint, an inner dialogue emerged. In order to position himself in this debate, Moody divides it into two camps. Briefly:

«1. "Weak" life extension means increased average life expectancy —say, from 76 to 100, combined with compressed morbidity, with maximum lifespan remaining unchanged (at around 120 years). 2. "Strong" life extension means dramatically increased life expectancy— say, from 76 to 200 years, with continued compression of morbidity, and maximum lifespan rising to something like 240 years» (Moody, 2001: 33-34).

Moody thinks that weak life extension is an extrapolation of the world as we know it —with substantial changes but recognizable from our history. This scenario will be available in the near future. Furthermore, biomedical interventions are already present. Life expectancy will increase by about 25 years, but the maximum life span will be around 120 years, which is the current record. For him, weak life extension would not involve as many terrible consequences as strong life extension. He implicitly justifies it on the basis of two features of his view: (1) an increase in life expectancy and not so much in maximum life span (from 122 to 128); and (2) no deep modifications in the human life-cycle. By contrast, Moody thinks that strong life extension requires that we imagine a world that has changed so dramatically that we can hardly recognize ourselves. This scenario will be available in the distant future. Its success will double life expectancy. In other words, maximum life span will exceed 200 years, which would be a new record. Finally, Moody ponders about whether anyone could fear life extension. In the radical scenario, he considers that the meaning of human life would not be very familiar to us. He argues this by rejecting possible scenarios which in many points substantially resemble what transhumanists promise.

Lucke and Hall point out that their distinction is influenced by Moody's position, which I have summarized above. In their words:

«'[S]trong lifespan extension' in which scientific advances increase both average and maximum lifespan, for example, enabling most people to live to be 112 years and some to 140 years; and 'weak lifespan extension', which is the incremental increase in average life expectancy resulting from continued improvement in the prevention and treatment of disease» (Lucke and Hall, 2006: 58).

Lucke and Hall argue that weak life extension is the real scenario for biomedicine in the near future. Life expectancy will increase to 100 years, but maximum life span will not overcome 130 years. Thus, there will be more healthy individuals as a result of medical prevention of cognitive and physical aging. They enumerate different therapies and treatments in this form, including gene influencing and regenerative medicine. Lucke and Hall argue that strong life extension will be based on diverse model organisms that have led to success in extending life. According to many authors, the advancements of science and technology will allow for these results to be extrapolated to humans. Lucke and Hall enumerate different therapies and treatments in this form: substances that mimic the effects of caloric restriction or telomere reactivation, among others.

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1   Broadly speaking, these authors do not tend to explicitly argue about what is aging before presenting the division between the weak and the strong stance. However, they implicitly defend that aging is not a disease and that it can hardly be cured. In this line, Walter Glannon affirms that «aging is the bane of our human existence. It is responsible for degenerative disease of the body and mind and is the cause of much pain, suffering, and diminished quality of life. It is a constant reminder of our mortality: Assuming that mortality is not a disease, and that aging is an intrinsic property of mortality, aging itself is not a disease» (Glannon, 2008: 175).

Now, I summarize each of the two forms under three premises which are shared by all these authors. Beyond Moody's and Lucke and Hall's position, there is a long list of philosophers who have sustained this division (Glannon, 2002a; Rantanen, 2014). In addition, they take one step further in that they ensure that the weak and the strong camp are divided by the fixed value of maximum life span. Without any doubt, this is the best-known feature of mediating models[2].

They all suggest that, for conceptual and practical discussions, there is a weak scenario characterized by trying to extend life expectancy until Jeanne Calment's record at most. She is considered as the person with the longest life span to this day. This supercentenarian woman reached the age of 122 years and 164 days old. She had the opportunity to meet Vincent van Gogh and witnessed the digital age. In order to do so, they advocate maintaining biological adulthood for as long as possible, and eliminating the disability and weakness of old age as quickly as possible. Thus, they predict success in achieving this goal by 2050, using concrete treatments drawn from current biomedicine. They believe that it is a feasible scenario and quite desirable for many of us.

They contrast this view with a radical scenario characterized by trying to extend life expectancy beyond Calment's record, including doubling our maximum life span. They usually quantify it at 200-250 years and argue in favor of maintaining biological adulthood indefinitely, or what it is the same, the elimination of the aging process itself. Thus, they predict success in achieving this goal by 2070-2080, using future biomedicine. They believe that it is a utopian scenario and that it would not even be very desirable for many of us.

Before discussing a serious flaw underlying the weak and strong life extension division, I will criticize how it does not adequately define the key biogerontological concepts.

3. REVIEWING THE KEY CONCEPTS: DEFINITIONS

I have presented the weak and strong life extension division established by several authors. Now, I will evaluate the key concepts that appear in the scientific field that studies the biology of aging, and in the philosophical approaches that reflect on that science. In particular, there are some concepts which are often confused or misinterpreted by some authors in the debates over life expectancy, life span, and the possibility of life extension. Due to this confusion, there are a number of inconsistencies in this division. The problem is twofold: to begin with, it is not well theoretically defined, and also, practical concerns (implications) cannot be inferred with certain guarantees.

Thus, I will now introduce a distinction between the concepts that revolve around individual properties and the ones that revolve around population properties (Table 1). I argue that this distinction is a good strategy to start the criticism of the weak and strong life extension division. In addition, in section 6, this distinction will help me provide an alternative to think about life extension.

Individual concept	Population concept
Lifetime (age at death)	Maximum life span (oldest life time recorded for pop.)
	Life expectancy (average life time in pop.)
Health time (duration of individual functionality)	Health span expectancy (average vitality in pop.)
Frail time (duration of individual non-functionality)	Frail span expectancy (average disability in pop.)

Table. 1. Table presenting my own division related to the key biogerontological concepts. The right column represents those individual concepts and the left column represents those population concepts. Source: Author's own elaboration

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2   I will take this measure since this really is implicit in each of the proposals. Specifically, Rosa Rantanen argues that «[c]onsiderable life extension involves manipulating aging in the later stages of human life. Extending the average length of human life beyond the current maximum of c. 120–125 years requires technologies that enable manipulation of the biological process of aging (senescence), which currently takes place in the later stages of every human being's life». By contrast, she barely mentions what the radical form would be, but her idea may be implicit in the following words: «It does not mean helping people to lead a healthy life until the age of 120 but rather helping people to live tens or, perhaps, eventually hundreds of years more than the current maximum age» (Rantanen, 2014: 104).

Maximum life span is a theoretical concept from biology which refers to the maximum length of time that a member of a given species can live. It is usually defined empirically as the age at death of the oldest documented member of the species. Taking humans as an example, Jeanne Calment's record is 122 years and 164 days at a given environment and space-time, among other factors. Her life went beyond all other records of longevity, so when she died, she defined a new maximum life span for humans.

Lifetime is the time length beginning when a person is born and ending when this person dies. However, the theoretical concept of a species' life span is sometimes confused with a colloquial use of life span to refer to the duration of a particular individual's life, for example, as when one says: «I know that my life expectancy is around 79 years, but I would like to see if I can extend my lifespan beyond that population average, so that I die after I turn 90». There are many factors which determine our own lifetime, such as alcohol consumption, diet, educational status, exercise, or smoking habits. Some factors are difficult to measure; for instance, the chance of catching a cold that might be fatal for the elderly.

Life expectancy[3] is a statistical concept based on demographic studies of aging. It refers to the average number of years that members of a particular population are expected to live. There are many factors that influence life expectancy within any particular population, such as access to food and water, disease prevalence, environmental and social conditions, and levels of infant mortality. Life expectancy has two subsets: health span and frail span.

On the one hand, health span is a biogerontological concept which refers to the portion of a population's time that is spent in good health, free from diseases, and weakness of aging[4]. This process is portrayed as a heuristic and simplified picture of a specific population. On the other hand, the opposite biogerontological concept is frail span which refers to the portion of a population's time that is spent in age-related dependence and disability, especially in old age. Note that while both of these terms are sometimes contrasted with the individual sense of lifetime, these are both unrelated to the biological concept of life span: there is no species-wide measure of health span or frail span.

4. REVIEWING THE KEY CONCEPTS: MISTAKES

I have presented five key biogerontological concepts. Seeing that these are very commonly used in the debate over life extension, I have considered it pertinent to define them in order to avoid certain mistakes. These mistakes do not only occur in Moody's and Lucke and Hall's position, but they are common among defenders of this division. I classify them as follows: (1) problems related to the concept of maximum life span; (2) problems related to the concept of universal life expectancy; and (3) asymmetry problems in this division.

It makes no sense to say that the maximum life span in humans is around 120 years as a matter of insuperable human biology. At best, one might say that Jeanne Calment's age marks the record. This could be corrected as follows: they would suggest that there is a plateau at around 120 years since only one individual has exceeded this age, Jeanne Calment.

Similarly, it makes no sense to say that life expectancy is around 76 years as a universal measure. Life expectancy is a population concept; therefore, we should specify the country, culture, or social class to which we are referring. There are some substantial differences between populations. In Japan, the country with the highest number of centenarians per inhabitant and the highest average life expectancy, this is at around 85 years. By contrast, Eswatini barely exceeds 30 years[5].

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3   Moreover, one cannot separate the individual from the population. If every individual life is longer, then life expectancy in the population increases. If life expectancy in the population increases, the average individual does live longer. The two key concepts are interdependent. However, if the life of very few individuals, or rather, only of an economic elite increases, life expectancy will hardly change. For reasons of time and space, I do not discuss this point.

4   This concept is interchangeable with that of quality of life which will appear in the following sections only referring to the maintenance of cognitive and physical capacities.

5   Moreover, it is not the same to refer to the life expectancy of a person at birth than to discuss what the life expectancy of that person X could be at a time Y in which the circumstances and technological resources have changed dramatically.

There is an asymmetry between the weak and strong life extension related to its own proposal (notably Lucke and Hall, 2006). In the first scenario, life expectancy increases for the whole species, while in the second one, the life expectancy of many people increases to 112 years. They use two different meanings of life expectancy: for human beings in a broad sense and for a concrete population in a narrow sense. This asymmetry is based on a lack of clarification of the goals of biogerontology: whether it is for everyone or for an economic elite in developed countries. Weak life extension requires a prevention and treatment policy quite close to the healthcare system in such countries. This seems to indicate that it is for everyone who has the possibility to pay for this type of life insurance. Strong life extension requires therapies that are likely to be limited to those provided by private biomedicine companies in the most developed countries. This seems to indicate that such a life extension is only for some people. Therefore, these authors defend different goals in the same division.

In short, these authors do not clearly express whether they believe that this extension will be of life expectancy or maximum life span, among other problems. While it is true that there are many other contingencies to take into account in this debate, we have to clarify the key biogerontological concepts. Now, I will show a flaw against the weak and strong life extension based on the fixed value of Jeanne Calment's age. After that, I will show my alternative to think about life extension possibilities, using the key biogerontological concepts defined in the previous section.

5. PROBLEMS IN QUANTIFYING THE MAXIMUM LIFE SPAN

The most important problem with the division approach to classifying proposals in this debate is that the difference between the weak and strong forms of life extension cannot be explained in quantitative terms, as all these authors try to do. As I have noted previously, biogerontologists define maximum life span as a fixed value, based on the longest human life that we have documented to date. In fact, the existence of a limit on human longevity remains a puzzle in the biology of aging. From a theoretical perspective, we still do not actually know how long humans can live, or why we age as we do (Kirkwood and Austad, 2000; Oeppen and Vaupel, 2002; Vaupel and Kistowski, 2005). Jeanne Calment's record is not the longevity limit for any scientific reasons, and I propose the idea of Potential Additional Life (PAL) to shed some light on this problem. PAL covers the period between the Maximum Documented Life Span (MDLS) and the Maximum Theoretical Life Span (MTLS). These can be defined as follows:

1. The MDLS is the unique performance of an individual of a certain species in terms of how long this individual lives with regard to the highest observed quota.

2. The MTLS refers to how long an individual of a certain species could theoretically live in ideal circumstances, given what we know about biology (Weon and Je, 2009: 70)[6].

The MDLS is 122 years and 164 days, although it can be readjusted if a person lives at least one day longer than Jeanne Calment[7]. The MDLS can only increase or stay the same, while the MTLS is always equal to or greater than the MDLS. I would even say that the MTLS is always larger than the MDLS, because there is no obvious reason to think that something (i.e. an intrinsic biological limit) triggered the death of Jeanne Calment. She could have lived longer —perhaps not much longer— yet her death was still the product of some chance factor. At that age, it is quite likely that an infection was a sufficient cause for her death. This factor could have been crucial for other supercentenarians that could not reach the barrier of 120 years. So, the MTLS can fluctuate but only above the

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6 They say: «Our estimate is in an agreement with the hypothesis of the maximum human lifespan to be around 125 years. This result suggests that the '125 years' may be a 'magic number' in human aging dynamics» (Weon and Je, 2009: 70). Contrarily to these authors, Aubrey de Grey defends that «quantitatively, what this means is that if a 10% per year decline of mortality rates at all ages is achieved and sustained indefinitely, then the first 1000-year-old is probably only 5-10 years younger than the first 150-year-old» (de Grey, 2004: 725). Note that a transhumanist could affirm that we can free ourselves from our biological chains and live forever. In this sense, the concept of MLTS would be infinite, that is, as much as we want. By contrast a bioconservative would not be interested in the value of the MTLS or the MDLS. We shall not overcome what we have experienced and we shall not cease to be immortal.

7 We could debate whether we have all the evidences to ensure that no one, not even somebody in the middle of a rainforest, has overcome Jeanne Calment´s record. This possibility would be remote, but it is undeniable that there might be a small margin of doubt in regard to this matter.

MDLS: as a totally hypothetical example, we might now optimistically say that the MTLS is 1000 years, but in a decade, we may come to the conclusion that it is 200 years, or, perhaps, that we were too pessimistic ten years ago and it is actually 1500 years.

Thus, the MDLS is a non-fixed value and it only makes sense in a specific space-time (with respect to a particular person's life). In addition, I defend that the MTLS is X years because this concept depends intrinsically on the prevailing states of demographic data and biogerontological research. The MTLS is a hypothetical value. In order to avoid Moody's (2001) and Lucke and Hall's position (2006), thinking about the weak and strong life extension division cannot be measured in quantitative terms. If effective life-extending technologies continue to be developed over time, both life expectancy and maximum life span calculations will change as well (life expectancy in Ancient Greece was around 28 years old, but Aristotle, according to different manuscripts, lived 66 years —almost certainly maximum life span at this time had already exceeded 70 years). Therefore, the gap between the MDLS and the MTLS is what really matters. I illustrate this with a sketch representing what I call the current longevity line (**Figure 1**).
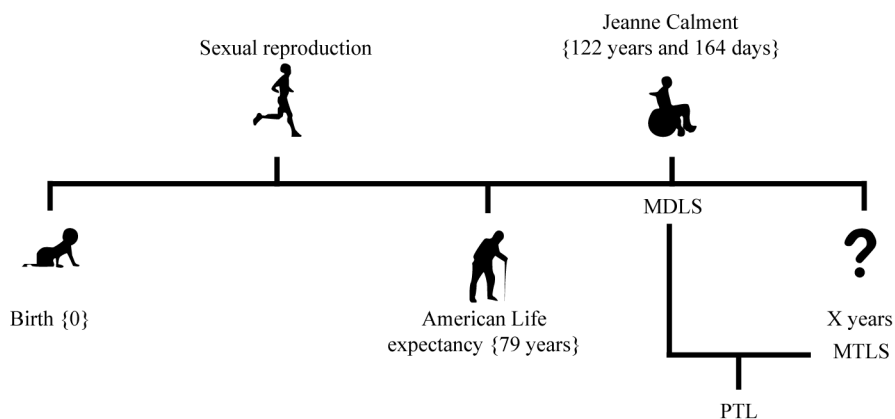
Figure 1. The current longevity line. These concepts are from 2020. Source: Author's own elaboration

In order to understand the significance of PAL, consider the current study by Xiao Dong, Brandon Milholland, and Jan Vijg (2016). They report that, firstly, the number of supercentenarians has not increased for more than 50 years; secondly, death has settled on a plateau of 115 years (see Gavrilov, Krut'ko and Gavrilova, 2017; Vijg and Le Borg, 2017). Eighteen people have lived at least 116 years and 45 days, and no one has exceeded 120 years except Jeanne Calment. I justify the MTLS and PAL through some of the criticisms received in this study. Bryan Hughes and Siegfried Hekimi (2017), and Maarten Rozing *et al*. (2017), analyzing trends in the lifetimes of the longest-living individuals from France, Japan, and the United States from each year since 1968, found that both life expectancy and life span may continue to increase far into the foreseeable future (see also Oeppen and Vaupel, 2002; Vaupel and Kistowski, 2005; Wilmoth, 1998). Many of the longest-lived people were born before World War II. Current health conditions differ significantly from those at the time of their births, thus making the MTLS difficult to predict based on past data.

But even if maximum life span is not biologically fixed, it is conceivable that there is a biological limit on longevity that we do not yet know. In order to understand why this is so, consider the parallels between human longevity and the limits on how fast a human can run 100 meters. Jamaican sprinter Usain Bolt's record-setting performances have unleashed a wave of interest in the ultimate limits to human running speed. An eight-time Olympic gold medalist, he has won the 100-m, 200-m and 4×100-m relay at three consecutive Olympic Games. Bolt improved upon his second 100-m world record of 9.69 with 9.58 seconds in 2009. The first documented record (1912) was set in 10.4 seconds in Stockholm, Sweden, by Don Lippincott and Jackson Scholz. The records have progressed in the last century, decreasing by more than 1 second. It is possible to think that there might be

a sprinter who could bring down the 100-m record to 9.5 seconds. No one can say that Usain Bolt's record will never be exceeded, but that is entirely different from suggesting that we will go from having sprinters to having speedsters like *The Flash* (superhero in the DC Universe). In the comics, Professor Allain begins his analysis by studying the speed when he captures an arrow thrown by Oliver Queen (Green Arrow). He observed that *The Flash*'s speed reaches 37 m per second. It seems irrational to think that a person can run at the speed of *The Flash*, simply because of what we know about the structure of the human body and the physics of motion and speed—which could be equated to thinking of new Methuselahs (Gems, 2003)[8].

By the same token, just as the human skeleton and musculature are structurally composed in ways that allow us to reach a given maximum in sports (Marck *et al.,* 2017), there are hallmarks of aging (López-Otín *et al.,* 2013). We can see how the cases of Jeanne Calment and Usain Bolt, despite being valuable examples, are extraordinary. Just as there have been advancements in racing and trainings and methods are increasingly better, we have extended life expectancy through different milestones such as better hygiene or vaccines. In light of such an incremental progress, we can only expect that the MDLS might come closer to the MTLS over time, always showing that the MDLS and the MTLS depend on demographic data and the state of science. At present, the MDLS is Jeanne Calment's record and the MTLS is X. In the future, it could be balanced or even change its values for others that are still unknown.

According to the above, PAL helps to clarify why the weak and strong life extension division cannot focus on the limit on human longevity—let alone a fixed number of "X" years. Incremental progress seems the most plausible position.

6. THE PETER PAN DRUG: A WAY TO LIVE HEALTHIER LIVES

I have shown the mistakes in regard to the key biogerontological concepts in the weak and strong life extension division. Moreover, I have pointed out that the MDLS is a quantitative measure that does not adequately capture the main aspect of aging research. In my view, what really matters is to achieve a longer period of health span and a shorter frail span at population level, or, what is the same, to focus on the quality of life during our entire existence and not simply in the last years[9]. My proposal can be illustrated through a thought experiment about a hypothetical pill that I will call the Peter Pan Drug (PPD) (Figure 2). The PPD shows what a desirable goal of biogerontology would be in the future[10].

Imagine that we could take a pill that would decelerate aging in the same way that Peter Pan's growth was stalled in childhood. Unlike Jeanne Calment, we would retain all the vigor of young adulthood until we stopped taking the pill, at which point normal aging would resume. The PPD does not only control aging, but it is vital to its users' ongoing survival once they start taking it. If we decided to stop taking the pill at the age of 80, and then we still lived for 40 additional years of normal aging to the age of 120, would that not be a scientific revolution?[11]

This thought experiment shows the turn that biogerontology has to take to emphasize controlling and slowing down aging rather than focusing on life extension as it is now, that is, a prolonged period in which our cognitive and physical capacities are at a level near zero.

In order to do so, I propose a simple comparison between the weak and strong life extension division and my own proposal in this debate, having the PPD as an example to illustrate my thought. This comparison is also influenced by the previous flaw according to which the debate can hardly be quantified in terms of

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8   Another problem to be considered regarding the question of a limit to the human body's ability to run at an increasingly higher speed is whether it would result in injury beyond a certain point. There may be only so much that the human skeleton and musculature can do. This was discussed following Bob Beamon's record-setting long jump in the 1968 Summer Olympics in Mexico City.

9   Many authors affirm that weak life extension has to focus on improving the quality of life in old age. By contrast, I will defend that we should be healthy for as long as possible, beyond any improvement in our last years. We must maintain a high level of functioning in our cognitive and physical capacities—longer than we do today.

10   The opposite case of the PPD is the famous Greek myth of Tithonus, who was granted immortality without eternal youth, so he declined more and more with the passage of time until he became a cricket (de Grey, 2008; Williams, 1999).

11   I always imagine this hypothetical scenario from a population perspective: the PPD would be available to anyone who wanted it. In this way, the inclusion of health span as a priority in the medical agenda seems more evident.
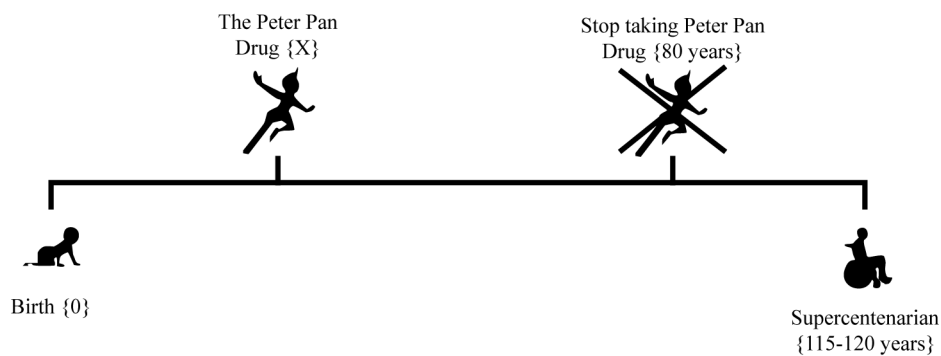
Figure 2. The PPD. Sketch representing a hypothetical timeline of human life with the pill. Source: Author's own elaboration

a definitive measure. While I have criticized this division during the previous sections, I have argued that mediating models are valid in order to continue developing the debate, as opposed to the more extreme positions. However, my alternative position goes beyond trying to overcome the MDLS and focuses on increasing our health span.

For some, a person who lives 123 years, but without any special improvement in their quality of life, will be in a strong scenario[12]. While the case of Jeanne Calment was an exceptional record, she suffered from a normal cognitive and physical decline at the end of her life. In other words, even though her record-setting lifetime defined the maximum life span: her health span was as typical as others of her time. Although her long life was a major milestone, she did not enjoy a vigorous health in her last years. Therefore, we cannot uphold that the quality of her life was as remarkable as her record. Many would have preferred to have a shorter and full life, since they fear aging and not being able to fulfill their life projects with dignity. My case with the PPD is quite different: a population who lives around 120 years (that is, less than Jeanne Calment's record), but whose health has been maximized. Their last years are full of activity; for example, diving in the Great Barrier Reef. In my view, it would be much stronger if their health span were longer. For them, if a person exceeds Jeanne Calment's record by a couple of years, it would be the beginning of a post-aging world. However, I argue that this would be strong for just the opposite reason: for an elderly population to sustain their cognitive and physical capacities for as long as possible.

Moreover, if old age were simply a stage, it would be overcome by biogerontology in the future. Using other words, de Grey defends the same idea: «a typical expression of this is that biogerontology is focused on 'adding life to years, not just years to life'» (de Grey, 2005: 659). Today's 80s are not the biological 60s yet, but we should be optimistic about this goal. Admittedly, today's 60s are not the same as a 100 years old. The challenge, biologically speaking, is to transform our 80s into our 40s, i.e. maintaining our health standards while we maximize our personal experiences. Our old age will be substantially different from today.

Of course, if a person lived longer than Jeanne Calment in the future, it will be socially relevant news. This person could live a day longer than the MLSD without implying that treatments against aging are any better. In the best-case scenario, one person could have more robust genetics or a bit more luck than Jeanne Calment. Over the past 100 years, there has been a substantial improvement in health and social conditions almost everywhere in the world, albeit at different levels (Oeppen and Vaupel, 2002; Vijg and de Grey, 2014). In most cases, these conditions were measured in terms of populations. However, there surely has been a readjustment of the MDLS. It is true that the data is not reliable, but someone would have reviewed the established record and the next person would do the same with their predecessor.

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12   My goal would be that everyone in the world can access these improvements, having a healthier life. I am aware that life expectancy varies substantially from one place to another. Therefore, the increase must be significant for the population that we are referring to. One of the biggest challenges will be to reach less developed countries.

Taking this debate one step further, I defend that we should not add years to life if we cannot add life to those years[13]. The end of our lives is characterized by a prolonged period of disability and weakness, and it is not very desirable that this be extended if our cognitive and physical capacities decrease to a level near zero. Is a longer life worth living if it is not healthy? Really, it is not. Life expectancy must continue to increase if and only if our health span is much more extended than our frail span, regardless of whether the MDLS continues to be 122 years and 164 days. Life expectancy increases by five years every two decades, while the heath span does so by just over four years. If this continues, by 2050 we will live an additional 7.5 years of life of which more than one and a half will be of extreme decrepitude (Christensen *et al*., 2009). Life expectancy is increasing at a fast pace compared to our healthy life and it seems that this tendency will continue raising decade after decade and it could bring us an undesired scenario. I refuse to live the end of our lives in the current conditions, since this prevents us from developing the kind of life that we want, whatever that type of life is. Not surprisingly, many people spend their last years in nursing homes simply waiting for death to come. We could all meet somebody who has escaped the ravages of aging for a very long period. However, at a population level, there are many people losing their physical and mental capacities. In my view, frail span has to diminish even if this entails some stagnation in the expectations of extending life[14]. In this vein, I agree with Christine Overall when she writes that:

«If the available medical, social, and material resources are so limited that one's extra stretch of time is lived in misery, then that is a problem, and no prolongevist advocates the extension of human life if it can be lived only in poverty, pain, and ill health» (Overall, 2003: 41).

Thus, in short, the goal of biogerontology should be to increase our quality of life without this implying that we live substantially more than now[15].

7. CONCLUDING REMARKS

My aim in this article was to clarify the conceptual confusions related to the possibility of extending life expectancy and life span. I have argued against the weak and strong life extension division for one major reason. The concepts of the MDLS, MTLS, and PAL have been employed to show that Jeanne Calment's for all times, just for now, and it was different before her, and so on. The weak and strong life extension division fails because it rests on the now demonstrably false premise that the MDLS is a fixed value. I have also argued that the attempt to classify life extension possibilities quantitatively makes no sense. Furthermore, a "strong life extension" based on health span is something completely different from what some authors have proposed (that is, living 130 years, since this is more than what Jeanne Calment lived). The goal of biogerontology should be to treat aging at a population level to ensure maximum quality of life in terms of health. Maintaining our cognitive and physical capacities for as long as possible and reducing the period of dependence, disability, and weakness must be prioritized over any attempt to increase life.

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13 This statement is inspired by the well-known slogan «Don't simply add years to life but add life to years». However, my point is to argue how life extension is increasing the period of frail span to make it even longer than in the past. While much of our life is healthier, our last moments are very complicated.

14 Of course, we could not expect that in the whole world it is possible to decelerate aging to the same level. The inequalities between countries are notable. In addition, it is not only an improvement in old age but throughout the entire existence of the person.

15 There is no consensus in biogerontology as to whether being healthier will lead to living longer. Broadly speaking, anyone could argue that if our cognitive and physical capacities are optimal, our life would increase by some years, however few they were. By contrast, very few could say just the opposite. However, one further possibility is that there is a tradeoff between the number of years and the life in them.

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