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From Phylogeny to Ontogeny of Longevity: Contributions of the Evolutionary Approach to Gerontology

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Abstract

This qualitative study aimed at performing a theoretical review and understanding the phylogenic aspects and the story of the ontogenic development of human longevity, in addition to proposing a brief reflection about the role of old age in an evolutionary perspective based on the theoretical references of Ethology, Evolutionary Developmental Psychology, and Gerontology. This is a narrative review based on national and international publications selected from journals and books indexed online which were accessed by the following database: Lilacs, Google Scholar, and Scielo, with a 55-year period range for the search (1957 to 2012) through the combined descriptors: longevity, aging, evolutionary psychology, phylogeny, and ontogeny. According to the inclusion criteria, 43 publications were analyzed through the Content Analysis and discusses in three categories: distal causal mechanism of human longevity, approaching the enlargement of the stages of life, and theories that discuss the reproductive role of the species; proximal causal mechanisms, built along life and the evolutionary role of aging with its importance for the species in the attempt to amplify the meanings of this stage of life in the Gerontology field. Faced with the discussion, we perceived that the study of the determinants of human longevity (in their phylogenetic and ontogenetic dimensions) is consistent and represents an important model for a broader and deeper understanding.

Keywords

Longevity, Aging, Evolutionary Psychology, Phylogeny, Ontogeny

1. Introduction

The extension of life expectancy on the 21st century is considered one of the greatest triumphs of humanity and

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it has been an area of several concerns and discussions in Gerontology. However, several scientific efforts have directed the researches towards finding out mechanisms that increase human longevity instead of trying to understanding it (Turner, 2004).

Patrício, Ribeiro, Hoshino and Bocchi (2008) highlight that in a scenario where the population is aging and life expectancy is increasing, aligned to human instinctive motivation to preserve life to the maximum when it is possible to enjoy it with quality, generated the need to study the determining factors that increase longevity.

In this context, it is highlighted the importance to differentiate the determinants of longevity from those responsible for human aging, even though the themes partially override each other (Hayflick, 2000). Freitas, Py, Neri, Cançado, Doll and Gorzoni (2006) define longevity as "a dynamic and progressive process in which there are morphofunctional, biochemical, and psychological modifications, from conception to death". Yet on the need to differentiate the field studies, Hayflick (2000) affirms that longevity is a process capable of extending the reproductive capacity through natural selection ensuring the achievement of better and longer survival. In this sense, the author still asks two fundamental questions: Why do we grow old? Why do we live as long as we do?

Many scientific studies have been performed in the attempt to answer such questions, especially because of the noticeable growing population of elderly people followed by the extension of life expectancy in the world. These efforts come from several areas as biology, medicine, psychology, sociology, and anthropology, let alone the emergence of one more study field that aims at integrating the specialized perspectives: Gerontology (Brasil, 2006; Neri, 2001; Silva, 2008).

Resende (2011) emphasizes that historically the proximal causes of these process have been approached by several theories, each with a different perspective. However, its distant causes, in other words, the phylogenetic history and function of aging, have been receiving less attention. The ethological perspective and the Evolutionary Development Psychology (EDP) fill this gap, as they may bring a better capacity to predict behavior or a better understanding of certain behavioral patterns.

The need to understand better this scenario motivates us to ponder about the evolutionary motivation that makes human longevity possible and on the possibility of old age (evolutionary stage of life) to have had any role for the survival of the species from the ethological point of view. On that account, the evolutionary theory contributes largely for this understanding through a methodological approach that proposes the distal (phylogenesis) and proximal (ontogenesis) causal mechanisms (Fonseca, 1998).

Considering the importance of this topic and the need to exploit it widely this review focuses on the objective of presenting a theoretical review about the integration of phylogenetic aspects and the history of ontogenetic development, in addition to proposing a reflection about the role of aging in an evolutionary approach.

2. Methodology

For the conduction of this investigation it was adopted the qualitative methodology through a narrative review which consists of a critical research summary about a topic of interest, prepared to set a research problem in a context to justify a new investigation. The source of research was the analysis of national and international publications in journals and books indexed online and accessed through the following database: Lilacs, Google Scholar, and Scielo. For the search in the database the following descriptors were used combined, both in Portuguese and English: *longevidade*/longevity, *envelhecimento*/aging, *psicologia evolucionista*/evolutionary psychology, *filogenia*/phylogeny, and *ontogenia*/ontogeny. Through these keywords the systematic searches were the basis for the elaboration and exploration of the scientific information.

The inclusion criteria for the publications in the current study were: to be published either in English or Portuguese; to approach distal and proximal causal mechanisms of longevity in an evolutionary perspective, and that it discussed the evolutionary role of aging and its importance for the human species, at first 996 publications were found. The criteria for exclusion were: publication doubled, publications of dissertations and editorials, and references that didn't have the full text online, totaling 181 publications.

Once the bibliographic material was compiled the exploratory reading was initiated, recognizing the materials that fit the previously established criteria. In order to recognize the distal and proximal mechanisms of longevity and its evolutionary role, they were selected within a 55-year range (from 1957 to 2012) as the period for the analysis of the publications.

For the analyses of the publications in this study it was used Bardin's (2011) Content Analysis. After reading the studies it was performed the categorization and discussion of the data based on the objectives proposed here.

3. Longevity and Distal Causal Mechanisms

For the Evolutionary Developmental Psychology (EDP), in conceptual terms, the phylogenesis (phylogenetic) consists in the study of the evolutionary history of the species, possibly defining limits and possibilities of development, in other words, the phylogenetic sense is present when the word evolution leads us to the progress of the human species that have been happening since the origins of life up to the current forms adopted by mankind (Moura, 2004; Fonseca, 1998).

In this context, the EDP takes the knowledge from Comparative Psychology and Ethology, considering that there is a phylogenetic continuum between human beings and other animals, searching for a broader view of our species and a better understanding of what it is to be a human being (Moura, 2004). It is noteworthy mentioning that phylogenetic studies are trying to recreate the natural history of behavior, as it was modified along many ancestor generations up to how they are presented nowadays.

By tracing a more distal perspective we may go deeper in the comprehension of the aging process and its relation to the increase in longevity from an evolutionary point of view. Even today many questions are asked on this matter, as it was already by indicated important scientific findings that deserve to be highlighted in this discussion (Poli, Schwanke, & Cruz, 2010).

From the evolutionist standpoint the understanding of aging and consequently of human longevity at first go through the approach of the cycle of life. About that, several comparative scientific studies propose a specific pattern in the course of life for each species, in other words, by comparing the human phases of life with the ones of other species it is possible to notice that there is a considerable augmentation of some periods, including the adult phase that is extended to the old age (Keller, 1998; Geary & Bjorklund, 2000).

Historically much has been asked about what in fact triggered this augmentation and which are the real causal mechanisms that motivated them. In consequence to the evolution along with the increase in the life time of hominidae there were greater possibilities to achieve long stages, thus modifying the populational scenery, which is still a currently panorama (Hawkes, O'Connell, Jones, Alvarez, & Charnov, 1998).

By speculating evolutionarily about the more distal causal mechanisms that possibly contribute for an increase in the longevity of the hominidae species it is possible to highlight two hypotheses greatly broadcasted in the scientific fields that state about the theme (Peccei, 1995; Williams, 1957).

The first hypothesis for the increase in the lifetime of the human species is based on the extreme altriciality of human babies. According to Hawkes (2003) two of the main biological characteristics of the human species are: bipedalism, and a large brain, in comparison to other primates. The evolution of these psychical characteristics determined some important biological problems that needed to be solved in order to guarantee our survival. The change from a quadruped position to a biped one determined, at first, a decrease in the width of the hips, thus affecting the ideal conditions of pregnancy and labor for females.

On the other hand, the increase in the human neonatal brain determines, initially, babies with bigger cranial bone capacity, which would increase the risk for mortality of mothers due to labor complications. Because of that, the bioevolutionary solution found to this problem was the birth of neurologically immature children. In that sense, it is noted that the brain from newly born children require great development, making them highly dependent of adult care (usually the mother's) to acquire their survival (Hawkes, O'Connell, & Blurton Jones, 1997; Hawkes, O'Connell, Jones, Alvarez, & Charnov, 1998).

In addition, considering that maternal mortality increases with age and that it will largely compromise the survival of extremely dependable offspring, not having more children seems to make sense when risks surpass the benefits. Facing this phylogenetic hypothesis it is possible to observe that the early end of reproductive life (menopause) in hominidae contributed somehow for the longevity of the species, therefore being considered one of the main evolutionary mechanisms for the survival and extension of life (Hawkes, O'Connell, & Blurton Jones, 1997; Hawkes, O'Connell, Jones, Alvarez, & Charnov, 1998).

Another hypothesis also deserves to be emphasized and it is considered a key-reference on the subject yet in discussions is The Grandmother Hypothesis, which approaches the wide possibilities for cooperation among generations in the kinship (Hawkes, 2003).

Hawkes, O'Connell and Blurton Jones (1997) and Hawkes, O'Connell, Jones, Alvarez and Charnov (1998) point out that *Homo sapiens* is the only primate that helps with the care of the kin and provides for the young and orphans. Therefore, they commonly survive even in adverse environments.

Therefore, this hypothesis predicts that the reproductive burst in middle-aged woman seem to have evolved with the social perspectives that woman could help significantly their daughters in the care and protection of

their offspring, in other words, woman would be biologically programmed to stop their fertility to invest in raising their grandchildren (Hawkes, 2003; Costa, 2010).

In this sense, the post-reproductive period allows them to focus on these children, avoiding costs with additional pregnancy at a moment their health and probability of survival are decreasing (Alexander, 1974; Williams, 1957).

A parallel is found in current pre-industrial societies, where parents usually commit infanticide to reduce the risks for their older children (Daly & Wilson, 1988; Hill & Hurtado, 1996). When this pattern is combined with an increase in the development period, menopause comes as a logic evolutionary adaptation with the same function—reducing the number of dependable children so the parental resources may be applied to a smaller number of children (Geary & Flinn, 2001).

Charnov (1993) considers to be likely that during the hominidae evolution the clear increase in lifetime is partially related to this increase in parental investment (all the efforts and expenses associated to the production, gestation, post natal care, food, and protection of the young ones), which, on its turn, becomes reproductive benefits and more favorable life conditions in this stage. Therefore, the resulting reduction in the infant mortality rate favors a longer infancy with greater opportunities of perfecting socio-cognitive competences, making them more competitive and competent from the reproductive standpoint (Geary & Bjorklund, 2000).

Arking (1998) contributed for this understanding affirming that the analysis of the evolution and persistence of the species, through genetic transmission of each individual to the next generation, reveals the existence of different biological strategies. To that extent**,** there are groups of species that adopt strategies that favor larger offspring with lower parental care resulting in high mortality rate. When analyzed, it was noticed that high fertility is necessary, while longevity, on the other side, it is not only unnecessary but impairing.

Other groups adopt strategies that favor small offspring (low reproductive potential), attached to low mortality (high probability of individual survival), for such species develop some type of prolonged parental care towards the infants to keep the population in the limits of the environment. In these groups the adults tend to have greater longevity and reproduction is only one of their adult functions, as human beings (Arking, 1998).

Some studies performed have suggested the connection between longevity in the post-menopause period to the well being of a woman's descendent, however, most studies have focused on the menopause moment (Hawkes, 2004).

A multigenerational and multicentric study focused on the issue of longevity published in 2004 by Lahdenperä, Lummaa, Helle, Tremblay and Russell, became famous in the scientific scenery. It analyzed complex demographic data from two populations: one from Finland, with a slow growth, and the other from Canada, with a fast growth. The data show that in both population the useful post-reproductive life of a woman have influence on their children's reproductive success, enabling them to reproduce earlier and with a higher frequency, as for the survival of their grandchildren (Lahdenperä, Lummaa, Helle, Tremblay, & Russell, 2004).

More refined data from the Finland population were analyzed in this same research and they enabled a deeper analysis. Sons and daughters of a mother who had their own mother alive after their menopause had children at younger ages and in shorter intervals with a higher possibility of reaching adult life. Those differences were verified regardless of the socioeconomic disparities and were related to the lifetime of the mothers. Besides, it was observed that less grandchildren were born if the grandmother would leave in the same region. The authors of this study affirmed that "family assistance provided by grandmother is the central determinant of longevity" (Lahdenperä, Lummaa, Helle, Tremblay, & Russell, 2004).

It is worth mentioning that other studies have associated longevity in the post-reproductive period with the number of children, however, the results are questionable and diverting (Doblhammer & Oeppen, 2003). While some reinforce the negative connection showing that reproductive costs reduce women longevity, others didn't find a connection or reached an opposite conclusion (Müller, Chiou, Carey, & Wang, 2002; Westendorp & Kirkwood, 1998; Smith, Mineau, & Bean, 2003; Korpelainen, 2000; Lycett; Dunbar, & Voland, 2000; Jasienska, Nenko, & Jasienski, 2006).

4. Proximal Causal Mechanism Connected to Human Longevity

Ontogenesis (ontogeny) is understood as a formation process of a human being from its conception to death. It is characterized by a sequence of events that take place in a precise manner and similarly to all living beings of a species. It is determined by our genes and molded by the environment. In this case, the focus is on the process of

differentiation/change and integration of behavioral patterns in the course of human development (Moura, 2004).

At light of the ontogenesis, human longevity may be understood as a process determined by important technological changes that enable a demographic and epidemiologic transition very singular and never seen before (Mendes, Gusmão, Faro, & Leite, 2005).

The increase in the life span is attributed to several factors, one of the main ones are those related to health, as for example, sanitary measures, immunization, use of antibiotics, chemotherapeutic that enable prevention or cure of several diseases, among other medical advances (Olshansky, Carnes, & Desesquelles, 2001; Mendes, Gusmão, Faro, & Leite, 2005).

Several studies have demonstrated some relevant mechanisms that influence the increase of the lifespan such as feeding factors, physical and intellectual activities, besides not being exposed to unhealthy habits, as making use of alcohol, unbalanced diet, smoking, and sedentary life style (Receputo, Rapisarda & Motta, 1995; Roth, Ingram, & Lane, 1999; Perls, Kunkel, & Puca, 2002).

Patrício, Ribeiro, Hoshino and Bocchi (2008) state that the feeding issues have been largely emphasized when related to longevity. It is known that excessive ingestion of food may be linked to obesity and other diseases that shorten the lifespan. According to Genaro, Sarkis and Martini (2009) calorie restriction (CR) is one of the nutritional interventions widely discussed in order to extend the lifespan of a variety of species, including human beings. Such intervention seems to reduce the risk for developing non transmissible chronic diseases and the incidence of diseases related to age.

Several lab experiments have clearly demonstrated the effects of CR in the longevity of mice. By reducing the food disposal (30% to 50%) it was observed an increase in the life expectancy of these animals up to 40% (Patrício, Ribeiro, Hoshino, & Bocchi, 2008). Nonetheless, such data are not established for human beings, more studies are necessary to elucidate the cellular mechanisms responsibles for the therapeutic effects of calorie restriction (Genaro, Sarkis, & Martini, 2009).

Matsudo, Matsudo and Barros Neto (2001) affirm that one of the most fascinating aspects that have motivated several researches is the connection between physical activities and longevity. Several epidemiologic evidences have already been published and strongly suggest a direct link for man and woman. In this sense, several researches support the idea that physical activity is a major ally of longevity, in addition to reducing the risk of some diseases.

It is important to mention that this association is stronger with the present level of physical activities. Thus, the data support the need for motivating regular physical activity for people older than 50 years, even if the person is sedentary, for the maintenance of regular physical activities or the change to a more active life style has a real impact on longevity. However, some researches that associate longevity with vigorous and light physical activities show that only vigorous physical activities (>6 MET: resting metabolic rate) would have the properties to directly increase longevity (Lee, Hsieh, & Paffenbarger, 1995; Jones & Eaton, 1995).

Besides practicing regular physical activities some previous studies performed with centenary elderly show that a good level of mental activities also have direct influence on the life expectancy of the individuals (Marigliano, Bauco, Campana, Cacciafesta, Bagaglini, Fritz, & Ettorre, 1992; Receputo, Rapisarda, & Motta, 1995).

It is worth mentioning that environmental factors, such as socioeconomic conditions, deleterious habits (smoking and elitism) in addition to the exposure to contemporary stress are strong indicators that contribute for the early aging and development of chronic diseases in humans, reducing thus their lifespan (Perls, Kunkel, & Puca, 2002; Cavalcanti, 1996).

The psychological factor is also mentioned in researches that aim at understanding the reason for the broadening of human longevity. Oliveira (2001), based on studies from the positive psychology, affirms that all the factors that have influence on a healthy life, as for example, genetics and eating healthy, don't have their value increased if they are not followed by a happy life, with purposes and objectives. Friedman and Martin (2012), on the other hand, state that being happy is not the same as living a long life, for many extremely optimistic people get involved in risky behaviors. These author then emphasize that consciousness is the key for a long life, for conscious people are more likely to adopt healthy habits, get involved in healthier relationships, and have less tendency to several diseases, not only the ones caused by harmful habits. To Friedman and Martin (2012), awareness, persistence, caution, and responsibilities are very important characteristics for human longevity.

Other important researches that investigated longevity from the genetic and hereditary standpoint also deserve to be mentioned.

The geneticists Schächter, Cohen, & Kirkwood (1993) raised a curious hypothesis that the chance to live past 100 years is due to three factors: only to the environment; only to genetics; and the connection between both.

About the influence of the genetic compound in human longevity Patrício, Ribeiro, Hoshino and Bocchi (2008) highlight that most studies have demonstrated that about 25% of the lifetime are determined by genes, also that the greater methodological difficulty in studying these factors is that longevity involves a complex phenomenon.

Regarding the contribution of heredity to longevity, some studies that analyzed families of centenary people demonstrated that their descendents showed a slower aging process, in addition, have less risks for the development of diseases associated to age, and when manifested they are in older ages (Perls, Kunkel, & Puca, 2002).

Facing this diversity of researches and factors presented, it was noticed that longevity is a very complex theme and with many questions that still need to be answered (Patrício, Ribeiro, Hoshino, & Bocchi, 2008). As seen, there are several factors that may have influenced human longevity.

In this context, Baulieau (2001) clarifies that the survival of the human species is due to work and development. These factors contribute in the sense of modifying "housing, food, social practices, through changes, thus through the environment". These modifications lead to favorable adaptations for the functioning of some body systems (nervous, immunologic, hormonal, among others) so they could bring benefits and prolong human life.

Generally, it can be noticed that the longevity process is the product of interactions of biological, psychological, social, and environmental factors that act throughout human life, possibly influencing longevity positively or negatively. Several possible environmental factors have influenced human longevity: pre-natal environment, pollution, radiation, carcinogens, nutrition, medical products, stress, life style, isolation, number of children, sexual activities, sports, and physical activities, among many others (Patrício, 2006).

Facing the diversity of researches and factors presented in this review, it was verified that human longevity is a very complex theme and many questions still need to be answered. Little is known about all the mechanisms that control human longevity, as it is a complex phenomenon. The main obstacle is the difficulty in studying it directly in human beings, besides the time demanded by the research, resulting in very little epidemiologic methods to investigate the phenomenon (De Benedictis et al., 2001).

5. The Role of Aging in the Evolutionary Perspective

From what was discussed, it can be noticed that the issue of human longevity has a major evolutionary importance. In addition to the distal and proximal causal mechanisms of longevity it is yet to be analyzed the importance of old age as a resource for the extension of life of our species.

On the gerontological scientific approach**,** it is noted a broad and spread use of biophysiological perspectives that treat old age solely as a decay, deterioration and/or irreversible loses of the person's capacity of adapting to the environment, becoming more vulnerable to pathological processes that lead to death (Freitas, Py, Neri, Cançado, Doll, & Gorzoni, 2006; Kirkwood, 1999; Carvalho Filho & Papaleo-Netto, 2005).

Hence the necessity to trace a discussion about the concept of development. Inasmuch, it is possible to demystify restrictive perspectives that deal with aging as a stage with strongly negative effects instead of one more path of development.

Historically, according to Fonseca (2007), during the first half of the 20th century the prevailing concepts restricted development either to the sequence growth-stability-decay or to infancy and adolescence. On the other hand, along the second half of the century some conceptions of multidisciplinary nature emerged which considered distinct concepts of development.

Silva and Gunther (2000) state that most part of the studies about adult development has been based on the Life Span theoretical perspective proposed by Baltes, Reese and Lipsitt (1980). This approach is distinct from the one of the classical developmental psychology that supposes the termination of development with the end of adolescence. To Baltes (1987) human development is considered a process that lasts the entire life, through developmental changes and the expressions of ontogenic and evolutionary principles.

In this approach, development is considered a multidirectional and multifunctional process, characterized by a constant balance between winnings and losses that result in an intra-individual variability and in an individual plasticity. In this context, this perspective contributes enormously for demystifying the elder as a sick and passive being, breaking with the antagonistic view between development and aging, which was in effect approximately until last century (Scoralick-Lempke & Barbosa, 2012).

From the historical standpoint, it is worth mentioning that the last decades from the 20th century, specifically,

were marked by a progressive production on the theme, and this fact when linked to the political, social, and cultural changes contribute to modify the conception that aging is associated only to decay, diseases, and inabilities (Scoralick-Lempke & Barbosa, 2012).

In this sense, Beauvoir (1990) and Freitas, Py, Neri, Cançado, Doll and Gorzoni (2006) affirm that aging must be understood in its totality and in its multiple dimensions, as it is constituted in a period during the biological process, however, it is still a social and cultural fact. Aging, yet, must be understood as a phase of the life span in which biopsychosocial and cultural changes take place due to the advanced chronologic age.

The evolutionary approach of longevity discussed here clearly reinforces the importance of old age for human longevity, considering that grandparents are very important sources of knowledge (Hawkes, 2003).

On this subject Lewis (1999) suggests the "educator's hypothesis". The author suggests that grandparents and grandchildren have evolved some complementary adaptative behaviors that are adjusted to the roles of educator/student and affirms that the transmission of knowledge summed along generations from grandparents to the progeny worked as an impeller to extent human longevity. The author argues that the human species attribute its success to knowledge, therefore knowledge may facilitate an increase in longevity, through its transmission from grandparents. They have larger life experience than the parents and can reach a higher number of children, for instance, when they gather the grandchildren to tell stories or demonstrate actions, hence transmitting knowledge. Parents, on their turn, end up providing food for their children, while grandparents facilitate acquiring food from their teachings.

Lewis (1999) adds that human beings are extremely competitive and dispute many resources to the point of fatality. One group that already received the knowledge of older people that reached longevity has more chance to be longevous and transmit that to the generations, transmitting also the genes of longevity. The theory of the "educator" reaches both genders, nonetheless women usually have a more extensive role in educating, which may contribute for their life expectancy to be about 8% higher than man. Mothers and grandmothers are always busier teaching, speaking what is more correct, even in the adult life of their children and grandchildren, in an attempt to transmit that for all possible generations.

It is important to mention that human beings are the only ones in the animal kingdom that have a considerably long life after the reproductive period. When pondering about it comparatively, it is noticed that to the other animal species it is not an advantage to maintain an "old and unproductive" individual in the community. That reinforces even more the notion that this transmission of knowledge from grandparents to the progeny worked as a strength to extend human longevity (Lewis, 1999).

Penninx, Van Tilburg, Kriegsman, Deeg, Boeke and Van Eijk (1997) report a possible programmed suicide, in other words, the older people that feel useless end up being influenced by psychological factors that may increase mortality: lack of emotional support and low domain, consequently, they lose control over their lives. The capacity to manage their lives seems to represent a form of control of their own lives.

In this context, it may be affirmed that old people historically constitute important resources for the structure of our society. Spirduso, Francis, and MacRae (2005) remember that, even though there are some tendency to put stereotypes in old age, the elderly show greater individual variability than younger people. Each year lived enables more unique experiences, more opportunities for the manifestation of genes, more opportunities to have environmental influence and more exposure to casual accidents. Generally, it might be said that the elderly become more unique as time passes by.

The authors report that the sources of variability of the elderly are based on genetic issues, variations in the life style, diseases, gender, different aging rate of the several systems, intra-individual biological variability, compensatory behaviors, on the designs used by gerontology researches, and finally, on cultural issues, society and education (Spirduso, Francis, & Macrae, 2005).

Therefore, the final objective of studies that approach longevity is healthy longevity and well being, for old age is understood as a stage in the evolutionary cycle that can be surrounded by adversities as the other ones. The elderly as any other human being is constantly challenged to maintain and renovate its life significantly and productively. The passage of time implies, however, successive and cumulative deficits to which there is the constant challenge of learning new concepts and compensating possible losses, valuing and reinforcing what is kept or developed (Knopoff, Antagostino, & Zarebski, 2004).

6. Conclusion

This theoretical study aimed at presenting the integration between phylogenetic and ontogenetic aspects of hu-

man longevity, in addition to discuss the role of aging as an important potential to extend human longevity through the transmission of knowledge for the progeny.

Facing the approached theme, it can be stated that human longevity is a very complex theme. In summary, the main hypotheses and factors presented under the evolutionary view suggest that the history of life of the modern man is a reflex of the co-evolution of longevity and extensive parental investment as part of the biocultural evolution of our species.

Finally, through this analysis, it is concluded that the study of the determinants of human longevity (in this phylogenetic and ontogenetic dimension) is consistent and represents an important model for a larger and deeper comprehension on the Gerontology field.

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