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Portuguese Successful Centenarians

Tese de Candidatura ao grau de Doutor em
Ciências Biomédicas submetida ao Instituto de Ciências
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Finantial support from the Polytechnic Institute of Viseu within the PROFAD program

*There is nothing which for my part I like better (Cephalus) than conversing with aged men;
for I regard them as travellers who have gone a journey which I too may have to go, and
of whom I ought to enquire, whether the way is smooth and easy, or rugged and difficult.*

— Socrates, in Plato's Republic

ACKNOWLEDGMENTS

Depois desta pequena jornada de investigação, este documento só poderia estar completo com uma palavra sentida de reconhecimento para com todas as pessoas que, mais direta ou indiretamente, contribuíram para o desenvolvimento deste trabalho (e para a minha realização pessoal).

Em primeiro lugar, a quem orientou este trabalho. Ao Professor Oscar Ribeiro, para quem qualquer palavra de agradecimento será certamente de muito pouco significado em relação ao contributo, apoio e ensino, que estão espelhados neste trabalho e naquilo que sou. Sem a sua iniciativa (e coragem) para iniciar e coordenar o *PT100 Estudo de Centenários do Porto*, o presente trabalho não teria sido possível. À Professora Constança Paúl, que de uma forma tão simples (e tão complicada) me fez pensar no envelheSER.

À Professora Rosa Marina Afonso, do *PT100 Estudo de Centenários da Beira Interior*, e aos Professores Daniela Jopp e Christoph Rott do *Estudo de Centenários de Heidelberg*, cuja colaboração enriqueceu este trabalho.

Às colegas e amigas da UNIFAI, Laetitia, Natália, Daniela, Sara, Maria João, Mafalda, Susana, Cátia, Joana e Cristina, com um agradecimento particular às que colaboraram no PT100. É uma honra fazer parte deste grupo, onde encontro amizade, suporte e direção, e assistir ao seu crescimento.

Ao Instituto Politécnico de Viseu, que financiou o doutoramento. A todas as colegas da ESEV, Professora Maria João e Professora Emília, Paula, Susana, Rosina, Cátia, Leandra e Ana Berta, que me acompanharam durante este processo. Agradeço toda a compreensão, interesse, e os momentos de prazer que partilhamos.

Aos centenários, familiares e profissionais que participaram no PT100, disponibilizando tempo (que aos 100 anos tem valor acrescido), energia e intimidade. Levo comigo todas as experiências, memórias e opiniões partilhadas, que tanto contribuíram para o meu crescimento pessoal e profissional. Espero que este trabalho faça honrar todos os que participaram.

Aos meus amigos e família, que foram o meu pilar, lugar seguro. À Carina, Ana Carolina, Raquel e Fernandinha, que nunca me cobraram as ausências. Aos pais, Carolina e João, ao Eduardo e ao Camané que dão sentido ao que faço.

ABBREVIATIONS

ADL - Activities of Daily Living

Cf. - Confer

CFA - Confirmatory Factor Analysis

CRUP - Conselho de Reitores das Universidades Portuguesas [Rectors' Council of Portuguese Universities]

EFA - Exploratory Factor Analysis

Et al. - *Et alii*, and others

IADL - Instrumental Activities of Daily Living

i.e. - *Id est*, that is

MMSE - Mini-Mental State Examination

CNPD – Comissão Nacional de Proteção de Dados [National Commission of Data Protection]

OARS - Older Americans Resources and Services

QoL - Quality of Life

SD - Standard Deviation

SEM - Structured Equation Model

SOC - Selection, Optimization and Compensation

VOL - Valuation of Life

SST - Socioemotional Selectivity Theory

SWL - Subjective Well-Being

UNIFAI - Unidade de Investigação e Formação sobre Adultos e Idosos [Unit for Research and Education on Aging]

RESUMO

A publicação de um artigo em 1987 veio transformar a área da gerontologia. Ao distinguir “envelhecimento bem-sucedido” de “envelhecimento normal”, o modelo de Rowe e Kahn alertou a comunidade científica para a heterogeneidade e o potencial de crescimento na idade avançada. Após três décadas, investigadores continuam a debater assuntos relacionados com a definição, avaliação e aplicações práticas do envelhecimento bem-sucedido, provando persistência em não abandonar este conceito e confiança do seu valor acrescido. Mais recentemente, equipas internacionais que estudam especificamente as pessoas centenárias têm vindo a explorar o conceito de envelhecimento bem-sucedido naquela população, revelando importantes contributos acerca da sua capacidade excecional para lidar com os principais desafios inerentes à longevidade avançada. Esta tese apresenta uma série de estudos que visam dois objetivos principais: explorar o conceito de envelhecimento bem-sucedido em centenários e identificar os fatores subjacentes à adaptação bem-sucedida dos centenários aos constrangimentos da fase avançada de vida. Ao considerar estes objetivos procura, na sua parte teórica, expor uma reflexão acerca das várias questões relacionadas com o estudo do envelhecimento bem-sucedido e das dimensões que configuram a vida aos 100 anos de idade. Os primeiros três estudos constituem revisões teóricas em torno do investimento da psicologia positiva no estudo do envelhecimento (estudo 1), das relações sociais dos centenários (estudo 2), e da qualidade de vida aos 100 anos de idade (estudo 3). A primeira abordagem empírica (estudo 4) apresenta as propriedades psicométricas da versão portuguesa da Escala de Valoração de Vida Positiva, a qual demonstrou ser um instrumento apropriado para avaliar o envolvimento com a vida na idade avançada. Os quatro estudos seguintes basearam-se em duas amostras de centenários que fazem parte de num projeto de maior dimensão – o Estudo de Centenários do Porto (PT100) e o seu projeto satélite, o Estudo de Centenários da Beira Interior (PT100 BI). Começa-se (estudo 5) por identificar os centenários que cumprem os requisitos do modelo de envelhecimento bem-sucedido de Rowe e Kahn (1997), considerando-se para o efeito critérios objetivos e subjetivos. Os resultados indicam que apesar das perceções individuais dos participantes serem mais positivas que a sua real condição, apenas um número muito reduzido de centenários cumprem os requisitos definidos por Rowe e Kahn (1997), o que sugere a necessidade de considerar modelos de envelhecimento bem-sucedido alternativos. No estudo 6 surge a exploração do modelo multidimensional de envelhecimento bem-sucedido proposto por Young, Frick, and Phelan (2009). Através da análise de equações estruturais, um modelo final constituído por quatro domínios (biológico, social, função cognitiva e bem-estar) demonstrou bons índices de adequação. Na abordagem empírica seguinte (estudo 7), foram explorados diferentes níveis de envelhecimento bem-sucedido e respetivos preditores. Os resultados indicaram dois grupos distintos, um dos quais com melhores resultados em todos os domínios (i.e., melhor saúde, funcionamento cognitivo e emocional, e maior envolvimento social), e que o género (masculino), elevados recursos económicos e alguns recursos psicológicos (e.g. propósito de vida e autoeficácia), estavam associados a níveis mais elevados de envelhecimento bem-sucedido. No último estudo (estudo 8) foi explorado o papel das crenças existenciais na mediação da influência do estado de saúde no bem-estar. Os resultados sugerem que os centenários são capazes de manter um nível aceitável de bem-estar subjetivo apesar dos constrangimentos de saúde pronunciados; adicionalmente, verificou-se que os recursos

existenciais (incluindo aspetos relacionados com significado, propósito de vida e espiritualidade) medeiam a associação entre a capacidade funcional e a satisfação de vida. No seu conjunto, os oito estudos aqui apresentados contribuem para enriquecer a compreensão sobre o envelhecimento bem-sucedido na idade muito avançada, providenciando pistas importantes para o desenvolvimento de intervenções dirigidas especificamente a esta população e, de uma forma mais geral, ao grupo das pessoas muito idosas também.

ABSTRACT

A publication of an article in 1987 has transformed the field of gerontology. By distinguishing “successful aging” from “usual aging”, Rowe and Kahn’s model warned the scientific community to the heterogeneity and the potential for growth in old age. Nearly three decades after, scholars are still debating what successful aging is, how to measure it, and how to develop interventions to promote it, proving persistence to not abandon this concept and confidence on its compelling value. In last years, a number of research teams have focused on centenarian research to define successful aging, and several studies have been documenting centenarians’ exceptional capacity to face major aging challenges. In this thesis we pursue two main goals in a series of studies: to explore the concept of “successful aging” in centenarians and to capture the underlying factors allowing centenarians to adapt successfully to very old age. Considering these main goals, several concepts and issues related with successful aging and with the dimensions that configure centenarians’ life are subject to a theoretical revision. The empirical part describes the eight studies developed. The first three studies are theoretical reviews on the focus of Positive Psychology on older age (study 1), the centenarians’ social relationships (study 2), and the quality of life at one hundred years old (study 3). The first empirical output (study 4) presents the psychometric properties of the Portuguese version of the Positive Valuation of Life Scale, which has shown to be an appropriate instrument to measure attachment to life in old age. The following four studies were based on a broader research project with two centenarians’ samples – the Oporto Centenarian Study (PT100) and one of its satellite projects, the Beira Interior Centenarian Study (PT100 BI). We started (study 5) by analyzing the proportion of centenarians fulfilling Rowe and Kahn’s successful aging model using both objective and subjective criteria. Although centenarians’ self-evaluations were better than their objective condition, the results exhibit a very low percentage of participants fulfilling Rowe and Kahn’s (1997) successful aging criteria, suggesting that alternative models should be considered. Subsequently (study 6), the application of a multidimensional model of successful aging (Young, Frick, & Phelan, 2009) in centenarians was explored. Through structural equation modeling analysis, a final model with biological, cognitive function, well-being and sociological domains demonstrated good fit indices. The next empirical approach (study 7) explored different levels of “success” in centenarians and the associated predictors. Main results indicated two distinct clusters, one of them with better outcomes in all domains, i.e., better health and cognitive status, emotional functioning, and social engagement. Gender (male), no income difficulties and psychological resources, such as purpose or self-efficacy were found to predict the odds of successful aging. Finally, the last study (study 8) explored the role of existential beliefs in mediating the influence of health on centenarians’ well-being. Results suggested that centenarians were able to maintain an acceptable level of subjective well-being despite the pronounced health constraints; in addition, existential resources (including aspects related with personal meaning, purpose in life and spirituality) were found to mediate the association between functional capacity and satisfaction with life. Altogether, these studies advance new knowledge on successful aging in very advanced life, providing important clues to develop interventions that specifically target this population and, more broadly, that may apply to other older adults as well.

LIST OF PAPERS

The work presented in this thesis is an expanded and updated version of eight scientific articles that included nacional or international publications and papers submitted for publication in international peer-reviewed journals (same order as in the thesis):

Study 1 [Chapter IV]

Araújo, L., Ribeiro, O., & Paúl, C. (submitted). Hedonic and Eudaimonic weel-being in old age through Positive Psychology studies: a scoping review. *Review of General Psychology*.

Study 2 [Chapter V]

Araújo, L., & Ribeiro, O. (2012). Centenários: que redes sociais? [Centenarians: what about their social relationships?]. *Revista Kairós*, 15, 57-74.

Study 3 [Chapter VI]

Araújo, L., Ribeiro, O., & Paul, C. (2011). Dinâmicas psicossociais e a sua contribuição na qualidade de vida dos centenários [Psychosocial dynamics and their contribution to centenarians' quality of life]. In: M.E. Chaleta, N. Santos & M. Grácio (Coords.), *Livro de Atas do II Congresso Internacional Interfaces da Psicologia – Qualidade de vida... Vidas de qualidade* (pp. 195-214). Évora: Centro de Investigação em Educação e Psicologia. ISBN: 978-989-8339-12-6.

Study 4 [Chapter VII]

Araújo, L., Ribeiro, O., Teixeira, L., Azevedo, M.J., Jopp, D., & Paul, C. (2015). Measuring well-being in old age: Positive Valuation of Life Scale for Portuguese older adults. *Quality of Life Research*. doi 10.1007/s11136-015-0981-z

Study 5 [Chapter VIII]

Araújo, L., Ribeiro, O., Teixeira, L., & Paul, C. (accepted). Successful Aging at 100 years: The Relevance of Subjectivity. *International Psychogeriatrics*.

Study 6 [Chapter IX]

Araújo, L., Ribeiro, O., Teixeira, L., Afonso, R.M., & Paúl, C. (submitted). A Multidimensional Concept of Successful Aging in Centenarians. *Clinical Gerontologist*.

Study 7 [Chapter X]

Araújo, L., Ribeiro, O., Teixeira, L., & Paúl, C. (submitted). Predictors of Successful Aging. *Research on Aging*.

Study 8 [Chapter XI]

Araújo, L., Ribeiro, O., & Paúl, C. (submitted). The role of existential beliefs within the relation of centenarians' health and well-being. *Journal of Religion and Health*.

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GENERAL INTRODUCTION

Successful aging is possibly the most important research outcome related to aging and the aging population. Back in the 80's, Rowe and Kahn (1987) revitalized research and discussion on the gerontological field, bringing a new and positive outlook of advanced age. Their model stimulated research on physical and psychosocial aging over the past 25 years and as a consequence several advances were made in the definitions of successful aging, particularly in the last decade, with a number of researchers reviewing, comparing, and evaluating successful aging as a core concept. In particular, the notion that the definition should consist of a subjective dimension emerged as a significant theme (e.g., Pruchno, Wilson-Genderson, & Cartwright, 2010a), as well as the value of individuals' personal views of success (e.g., Phelan, Larson, Anderson, & Lacroix, 2004), and the integration of biomedical and psychosocial definitions into a biopsychosocial approach (e.g., Bowling & Iliffe, 2006). Alternative theories based on individual adaptive capacity also contributed to understanding successful aging, namely the Selection, Optimization and Compensation (SOC) model (Baltes & Baltes, 1990), the Socioemotional Selectivity Theory (Carstensen, Isaacowitz, & Charles, 1999), and the Gerotranscendence Theory (Tornstam, 2005).

In the last decade, a number of research teams have focused on centenarians to define successful aging, and several studies have been documenting their exceptional capacity to overcome several major social and historical events (e.g., economic depression, World War; Martin, MacDonald, Margrett, & Poon, 2010) and personal experiences (e.g., loss of their spouses, children and most of their contemporaries; Martin, da Rosa, & Poon, 2011), as well as to thrive in face of aging challenges (e.g., diminishing physical capacity; Jopp & Rott, 2006). Celebrating one hundred years has become an increasingly common event to many elders, particularly in developed countries. The great expansion in life expectancy and human longevity was the result of the advances in medical, social, political, economic and cultural domains, with better conditions of health, nutrition, and sanitation. However, this delay on mortality, that for some individuals meant to live beyond 110 years old (*supercentenarians*), rises important questions about the quality of additional years of life lived by those achieving exceptional longevity, and even promoted a contemporary debate on life extension possibilities within clinical, bioethical and social discourses (e.g. Serra, Watson, Sinclair, & Kneale, 2011).

Prior research on long-lived individuals confirms that despite a huge variability among those who survive to exceptional old age, there is a high prevalence of disease and disability as well as impaired cognitive performance (Poon et al., 2010). Although much of the research thus far on successful aging has emphasized health and functioning, we argue that a more comprehensive understanding of very old age could be achieved by additionally considering psychosocial well-being. It is possible, for instance, that those experiencing health and functioning declines that accompany very advanced age are still able to maintain a high quality of life with respect to social and psychological well-being. Successful aging at one hundred years may not mean to stay healthy longer and longer but, rather, to adapt. This work assumes that decline is to be expected at advanced ages, and that a successful centenarian is someone who still searches for a positive trajectory, be it through social and support systems, by specific coping mechanisms, personality characteristics, lifestyle, personal beliefs and attitudes, or through a developmental move towards transcendence. Unveiling the aspects of internal and external sources of life-strengths and the related psychosocial resources as well as more existential issues is what motivated us.

We pursue two main goals. The first one is to explore the concept of “successful aging” in centenarians. In last years there has been an ongoing debate about successful aging definition, measurement and implications. The term “successful aging” has been an important reference in the gerontological research since it considers the possibility of a positive aging process for some (Rowe & Kahn, 1998) but has been provoking criticisms for failing to be comprehensive enough or too over-arching (Holstein & Minkler, 2003). The applicability of this concept under more adverse health and autonomy conditions seems to be even more important for centenarians, since their general health status has been reported as bad (Andersen-Ranberg, Schroll, & Jeune, 2001). We investigate this issue in two ways. The first approach consists in examining Rowe and Kahn’s domains of successful aging, confronting objective and subjective criteria; the second consists of exploring and validating a multidimensional model of successful aging in centenarians, comprising not only physical domains but also psychosocial ones (Young, Frick, & Phelan, 2009).

The second goal of this work attempted to capture the underlying factors allowing centenarians to adapt successfully to very old age. The identification of successful agers’ characteristics has been a concern of different researchers as expressed in extensive reviews of this body of literature (e.g., Depp & Jeste, 2006). However, there is still scarce information about risk and protective factors for successful aging in centenarians. Thus, we’ve explored the influence and prediction of different sociodemographic characteristics,

internal and external resources in relation to the domains of successful aging previously referred.

The thesis is divided in two parts. Part 1 comprises the conceptual framework, covering successful aging theories (Chapter I. *Successful aging*) and with a focus on very advanced age and centenarian's capacity of adaptation (Chapter II. *Centenarians*). In the end of this part, the goals and context of the studies are described (Chapter III. *Goal and context of this thesis*). Part 2 comprises the review and empirical studies. The three studies presented on chapters IV (*Hedonic and Eudaimonic well-being in old age through Positive Psychology studies: a scoping review*), V (*Centenarians: what about their social relationships?*) and VI (*Psychosocial dynamics and their contribution to centenarians' quality of life*) are theoretical reviews on specific subjects-matter for this thesis. The five empirical studies (Chapters VII. *Measuring well-being in old age: Positive Valuation of Life Scale for Portuguese older adults*; Chapter VIII. *Successful aging at 100 hundred years old: The Relevance of Subjectivity*; Chapter IX. *A multidimensional concept of successful aging in centenarians*; Chapter X. *Predictors of successful aging*; Chapter XI. *The role of existential beliefs within the relation of centenarians' health and well-being*) address different aspects related with successful aging and well-being in advanced age. A brief conclusion is also provided, in which we summarize main findings and conclusions of the studies and highlight some intervention issues. Avenues for future research are also discussed. Abstracts of several papers and presentations that complement the studies presented in this thesis are gathered in Appendix A.

The review studies include a scope review on the focus of Positive Psychology toward older age (Chapter IV. *Hedonic and Eudaimonic weel-being in old age through Positive Psychology studies: a scoping review*), followed by two reviews on International Centenarians Studies and their contributes concerning social relationships (Chapter V. *Centenarians: what about their social relationships?*) and quality of life (Chapter VI. *Psychosocial dynamics and their contribution to centenarians' quality of life*) at one hundred years old. Altogether, these review studies seek to gather a deeply understand on several issues related with well-being and centenarian's research.

The first empirical study (Chapter VII. *Measuring well-being in old age: Positive Valuation of Life Scale for Portuguese older adults*) presents the psychometric properties of the Portuguese version of the Positive Valuation of Life Scale (Lawton et al., 2001). This instrument was presented by Lawton and colleagues (2001) in an attempt to evaluate the individual's valuation of life (VOL), defined as the subjectively experienced worth of a person's life. In Portugal the interest for well-being research is booming, however, there is

no validated instrument to assess the VOL construct, and further research about VOL in very old age and potential changes at end of the life span is needed. Additionally, this instrument seems to be suitable to capture important aspects related with centenarians' capacity to adapt successfully to very old age.

The following studies are empirical outputs that specifically analyze the criteria, domains, predictors and mediators of successful aging and well-being in centenarians. More specifically, the study presented on chapter VIII (*Successful Aging at 100 years: The Relevance of Subjectivity*) follows the discussion promoted by Pruchno and her colleagues' (2010a) work on a two factor model with objective and subjective information. It includes the examination of centenarians fulfilling Rowe and Kahn's (1997) criteria within the successful aging model (i.e., objective and subjective criteria of no major disease and disability, high cognitive and physical functioning and engagement with life) and then presents whether sociodemographic factors, psychological, social and economic resources are related to objective and subjective successful aging profiles.

In the study contained on chapter IX (*A Multidimensional Concept of Successful Aging in Centenarians*), the intention was to further explore the domains used to assess successful aging. In recent years, psychosocial approaches, based on internal and/or social phenomena, have been focus of increased interest in the gerontological field (Cosco, Prina, Perales, Stephan, & Brayne, 2013a), providing a discussion of great relevance when particularly considering successful aging in very old individuals (cf. Chapter II). Thus, a multidimensional model of successful aging (Young et al., 2009) was explored and the results from structural equation modeling analysis performed in a sample of Portuguese centenarians are presented.

When considering multi dimensions of successful aging, the tight connections among physical, psychological and social functioning in late life may result in distinct clusters of (un)successful aging. Chapter X (*Predictors of Successful Aging*) reports the results from a cluster analysis indicating different levels of successful aging and the associated predictors. Accordingly, the factors that may influence the odds to be more or less successful, including social resources, or personal characteristics, such as positive outlook and self-worth, self-efficacy or sense of control over life (Bowling & Illiffe, 2006), are explored.

From the literature review as well as from the results of this thesis, one striking finding in very old individuals, it's their capacity to maintain a fair to good level of well-being despite deficits in more objective measures (Martin, Deshpande-Kamat, Poon, & Johnson, 2011b; Gondo, 2012). Within the factors that may promote the adaptation at very advanced age,

existential resources have been overlooked. The last empirical study (Chapter XI. *The role of existential beliefs within the relation of centenarians' health and well-being*) explores the relationship of centenarians' health and well-being and the role of existential beliefs in mediating this association. Along with external resources and psychological strengths, key existential resources may enhance centenarians' capacity to protect themselves against several threats of a longer life, and therefore must be included into intervention programs to foster a successfully aging.

PART 1 – CONCEPTUAL FRAMEWORK

Chapter I

Successful aging

1. New Gerontology: aging as a success

Aging research and intervention has been marked by a tremendous investment and evolution since the recognition of gerontology as the study of aging and longevity in 1903 by Elie Metchnikoff (Martin & Gillen, 2013). Although only 110 years have passed, at least four conceptual phases characterizing the different approaches of Gerontology study can be identified (Blazer, 2006). According to Blazer's review, the first phase focused the inevitable and natural decline of the aging process; the second was marked by the emergence of "geriatrics" and the research of main age-related diseases; and in the third phase researchers assumed that the observed decline in function did not occur at nearly the rate that clinicians and the general public assumed, and a representation of "normal" aging was established (Blazer, 2006). The fourth stage was defined by Holstein and Minkler (2003) as the "new gerontology" and corresponds to a vigorous emphasis on the potential for a healthy and engaged old age. Since then several efforts have contributed to the development of a conceptual basis of the positive aspects of aging, aiming to clarify the genetic, biomedical, behavioral, and social factors contributing to the maintenance and promotion of function in later life (Blazer, 2006; Paúl, 2012).

Regardless of the increasing body of scientific literature on successful aging that has emerged over the last twenty years, the first references to an optimistic view of aging can be found in ancient writing, particularly in Cicero's model of aging (106 a.C) (Jarcho, 1971). Within the scientific literature it was the remarkable first issue of "The Gerontologist" journal that reported for the first time the term "successful aging" which was defined by Havighurst (1961) as getting a maximum of satisfaction out of life though no operational definition was presented. Only 26 years later, within the MacArthur study led by the researchers Rowe and Kahn, successful aging was assumed as a new paradigm still largely valued and studied nowadays (Martin & Gillen, 2013).

2. What means to be "successful" at old age

Originally developed in 1987 within a biomedical model focused on outcomes, Rowe and Kahn's paradigm on successful aging suggested that "success" could only be achieved if

good health and function were maintained or regained at old age. With this approach the authors attempted to overcome the simplistic classification of aging as “pathologic” or “not pathologic” by differentiating the non-pathologic groups in usual aging (absence of pathology but high risk) and successful aging (low risk of disease and high function) (Rowe & Kahn, 1997). In the decade following the introduction of Rowe and Kahn’s (1987) model, the MacArthur Foundation supported a Research Network on Successful Aging and a broader definition of success was investigated. Successful aging emerged then as a multidimensional new concept trying to overcome healthy aging. Three major domains were defined: (i) Low probability of suffering from disease or disease-related disabilities; (ii) High cognitive and physical functioning, and (iii) Active engagement with life (Rowe & Kahn, 1998). In the following years, new approaches have been presented and multi components, based on biological, psychological and social aspects became widely generalized (Figure 1).

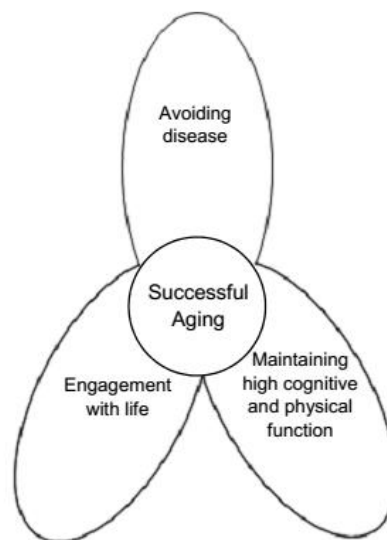


Figure 1. Rowe and Kahn’s Successful Aging Model (Rowe & Kahn, 1997)

Summarizing the available scientific literature, Bowling and Dieppe (2005) have identified the three most examined factors that researchers use to define successful aging: physical health, psychological well-being, and plenty of social activity. In a comprehensive review of larger quantitative studies Depp and Jeste (2006) came up with at least 10 different domains in English-language articles published between 1978 and 2005 and available in PubMed. The most frequently appearing component were disability and/or physical functioning (26 of 29 studies), followed by cognitive function (13), life satisfaction/well-

being (9) and social and productive functioning (8). In a more recent publication, Theodore Cosco and colleagues (2013a) presented a review of successful aging studies, published before March 2013, including non-English articles and searching in databases as PsycInfo, ISI Web of Knowledge, EmBase, and CINAHL. Of the 105 operational definitions that were identified, the majority included physiological constructs (n = 97), followed by engagement constructs (n = 52), well-being constructs (n = 51), personal resources (n = 27), and extrinsic factors (n = 6).

Although different investigators agree that successful aging is a multidimensional construct, some studies still present single constructs (34 according with Cosco's review); furthermore, physical health variables have been studied more often than psychological variables, such as cognition and emotion (Jeste, Depp, & Vahia, 2010). The most common successful aging operational definitions relied in a single construct – physiological (n = 30), two constructs - physiological, engagement (n = 12), or physiological, well-being (n = 9), and three constructs – physiological, well-being, engagement (n = 19) (Cosco, Prina, Perales, Stephan, & Brayne, 2013a; Figure 2).

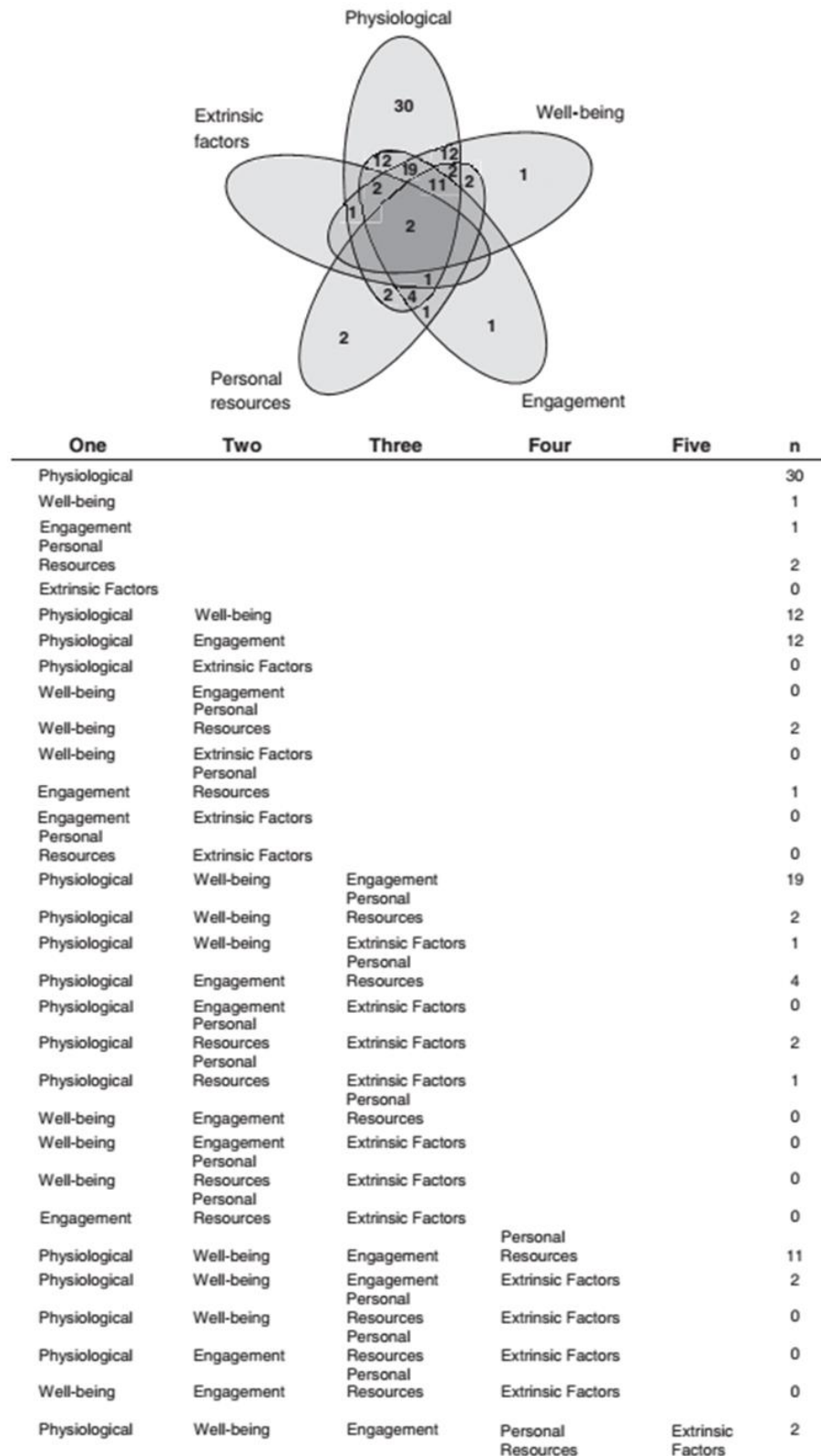


Figure 2. Frequency of studies identifying successful aging constructs: a venn diagram and a table of the number of studies containing each of the combination of the five successful aging constructs (Cosco et al., 2013a).

2.1. The movement towards psychosocial domains

Within the physiological domains, studies have been focusing on the requisites for a healthy aging, which were operationalized according different forms. The more frequent include physical functioning/disability (often measured by means of self-reported activities of daily living – ADLs, instrumental activities of daily living - IADLs) as well as objective performance like the ability to walk a quarter mile or grip strength); and the presence of illness/disease (i.e. being free of major chronic conditions or the absence of diseases); cognitive function, generally measured through the Mini-Mental Status Examination (MMSE; (Depp & Jeste, 2006; Cosco et al., 2013a).

Whereas the biomedical model emphasizes the absence of disease and the maintenance of physical and mental functioning as key elements for aging successfully, socio-psychological models emphasize life satisfaction, social participation and functioning, and psychological resources, including personal growth (Bowling & Dieppe, 2005; Depp & Jeste, 2006; Cosco et al., 2013a). Psychosocial approaches based on internal and/or social phenomena have been the focus of increased interest in last years (Cosco et al., 2013a) and have as proponents' notorious theories from the gerontological field.

Perhaps the best adaptive explanation of extreme old age is encapsulated in the selection, optimization and compensation (SOC) model postulated by Baltes and Baltes (1990). According to these authors, the three-fold process of selecting areas of functioning, optimizing the use of available resources, and compensating for lost or weakened functions is an effective life management particularly critical to the the aging process (e.g., Baltes & Baltes 1990; Freund & Baltes 1998). These three strategies of SOC promote an adaptive response to everyday demands and functional decline in later life, and are associated with optimal functioning, thus with successful aging (Baltes, Freund, & Li, 2005). Selection in everyday life is defined as actively or passively focusing in the activities, goals or domains that are most important in one's life, which in the context of loss may require the reduction of activities and goals. Optimization is defined as enhancing the means to refine one's resources in a selected domain; it includes investing more time and effort in specific tasks or activities that provide meaning and less in others that are not as important. Compensation is the use of new and alternative means to reach a goal or to maintain a desired state once a loss has occurred; it includes the use of alternative strategies and routines once a functional loss has occurred (Baltes & Baltes, 1990). This approach defines those who are successful aging as individuals who choose to make the best use of the capacities and resources they still have, despite illness and

functional problems, while also finding ways to compensate the observed limitations (Baltes et al., 2005), i.e., doing the best one can with what one has (Kahn, 2009).

Based on the assumptions of SOC theory, particularly on selection strategies, Carstensen (1992) suggests that older adults prioritize emotional goals and adjust emotional regulation and social interactions to maximize positive experiences. The Socioemotional Selectivity Theory posits that with advancing age and the perception of a limited future, individuals are able to regulate their affect so that they increase their experiences of positive emotions and decrease their experiences of negative emotions (Carstensen, Isaacowitz, & Charles, 1999). Consequently, older adults tend to select more satisfying emotional contacts, eliminating unsatisfying relationships and retaining satisfying ones (Carstensen, 1992; Carstensen, Fung, & Charles, 2003).

Regardless of these recent theoretical advances, important contributions for the psychological domains of successful aging emerged early, with Havighurst (1961) and Ryff (1989) who have focused on adaptation as the result of maintaining a sense of life satisfaction. Satisfaction with one's past and present life was presented as a condition for successful aging (Havighurst, 1961), and deeply investigated in the following studies (Bowling & Depp, 2005). Ryff (1989) presented the construct of psychological well-being which includes enjoying life and having a sense of humor, positive relations with friends and family, and accepting changes related to aging (both social roles and physical constraints), as well as accepting changes in the world around. Considered as a positive and adaptation outcome in later life, psychological well-being has been examined as an indicator of successful adaptation during old and very old age (Smith, Fleeson, Geiselman, Settersten, & Kunzmann, 1999).

Kahana and Kahana (2003) highlight the importance of proactive coping in old age with the Preventive-Corrective-Proactivity Model. This model emphasizes continuous adjustment to change, and highlights the moderating effects of proactive behaviors on health outcomes and successful aging. Also Ouwehand, Ridder, and Bensing (2007) have emphasized the importance of proactive coping to successful aging. They posit that attempting to prevent potential stressors that are the cause of the decrease in resources, may be a valuable strategy to successful aging, i.e., proactive coping may sustain important resources for optimization and compensation and therefore postpone disengagement from valuable personal goals, which contribute to well-being.

Within psychological approaches of successful aging, the construct of emotional successful aging (Depp & Jeste, 2009) is one of the best known. Attempting to investigate positive states of mental health (Jeste et al., 2010) and to overcome the focus of previous

models on physical attributes (Depp & Jeste, 2006), the authors included optimism, personal mastery and other cognitive-emotional constructs (e.g., wisdom) in their definition of success (Depp & Jeste, 2009). As for the social domains within a successful ageing approach, contemporary operationalizations have been including active and social engagement and support system, namely participating in outside activities, occupational status, and contact with friends/relatives (Depp & Jeste, 2006; Cosco et al., 2013a). The importance of activity is one of the assumptions of a leading theory in gerontology and successful ageing (Havighurst, 1961), as has been emphasized by many authors who underline the importance of social commitment with life (Baltes & Baltes, 1990; Rowe & Kahn, 1989; Cosco et al., 2013a). Other investigators have emphasized psychosocial aspects such as independence, mastery/growth, engagement with life, interpersonal relationships, social activities, as well as positive adaptation, perceived control and acceptance of change (Depp, Palinkas, Folsom, & Jeste, 2007; Menec, 2003; Montross et al., 2006; Reichstadt, von Faber et al., 2001; Vaillant, 2002), arguing that successful aging may enrich our understanding of the strengths and competencies that people bring with them or bring to bear in later life.

Unidimensional biomedical and psychosocial perspectives are argued to be incomplete conceptualizations of successful aging (Baltes & Baltes, 1990; Bowling & Dieppe, 2005). Biomedical theorists suggest that psychosocial measures may be misleading indicators whereas psychosocial theorists suggest that avoiding disease and maintaining physical functioning is an unrealistic perspective (Bowling & Dieppe, 2005). Multidimensional models on successful aging, on the other hand, bring together perspectives from different disciplines and afford a greater opportunity to identify areas of deficiency for research and intervention purposes (Cosco et al., 2013a). Nevertheless, despite the larger representation of multidimensional models, often reaching one toward the other, each assumes to have its own emphasis (Kahn, 2009) that tends to echo the theoretical background and orientation of the researchers.

2.2. Lay perceptions of successful aging

In an attempt to overcome the major factors missing in all the previously exposed views of successful aging, a new trend of studies attempted to reach what older persons themselves have to say on the concept (lay perceptions). Diverse qualitative studies tried to reach a more genuine indication of older individuals' perceptions of what successful aging means and how it should be measured by simply asking them. This was the case of the studies developed by von Faber and colleagues (2001), Phelan and Larson (2002),

Knight and Ricciardelli (2003), Bowling (2007), Montross and colleagues (2006), Ferri, James, and Pruchno (2009), Laditka and colleagues (2009), Reichstadt, Sengupta, Depp, Palinkas, and Jeste (2010), Cherry, Marks, Benedetto, Sullivan, and Barker (2012) and Jopp and her team (2014). This emergent body of literature, with a large multicultural scope, relies in qualitative methods, including personal interviews, surveys and focus groups, and their results converge in one similar conclusion: older adults' views of successful aging appear to be multidimensional and more complex than the apparent viewpoint of many of the early published studies.

Findings from a recent review of qualitative studies conducted by Cosco, Prina, Perales, Stephan, and Brayne (2013b) add that lay perceptions tend to diverge from traditional biomedical conceptualizations, highlighting the multidimensionality and psychosocial emphasis of successful aging. According to this review, biomedical aspects were referred by older people themselves in the majority of the studies about lay perceptions (Cosco et al., 2013b), more concretely having good health and functioning (Bowling & Dieppe, 2005), activity/exercise (Ferri et al., 2009), being physically active (Ladkita et al., 2009), being free of chronic disabilities and diseases (Reichstadt et al., 2007), and "health" (Knight & Ricciardelli, 2003; Jopp et al., 2014). But psychosocial factors were the most frequently mentioned components of successful aging, since they appear in all the 26 studies considered. Well-being (Jopp et al., 2014), living a faithful life (Cherry et al., 2013), being mentally agile (Ladkita et al., 2009), having psychological / cognitive health (Ferri et al., 2009), self-acceptance/self-contentment (Reichstad et al., 2010), personal growth, happiness, and an overall positive appreciation of life (Knight & Ricciardelli, 2003) were referred as important psychological factors for successful aging. Also aspects related with psychological resources, as strategies, attitudes/beliefs, and meaning (Jopp et al., 2014), coping and adaptation, and spirituality (Laditka et al., 2009) emerged as important dimensions of "success". As for the social domain, older individuals referred the importance of being socially engaged (Ladkita et al., 2009) and having social interactions (Reichstad et al., 2010; Ferri et al., 2009). Longevity (Knight & Ricciardelli, 2003), financial security and the availability of community facilities (Bowling & Dieppe, 2005) only appeared in a few studies.

In sum, when asked about what constitutes "successful aging", older adults appear to emphasize psychological factors, such as having a positive outlook, being adapted, and being happy (Cosco et al., 2013b) and are not so restrictively focused on physical health as the researchers definitions often do (Montross et al., 2006; von Faber et al., 2001). This finding suggests that older individuals reaffirm that the biomedical perspective of successful aging needs balancing with a psychosocial one.

2.3. Emergent trends in successful aging research

Several empirical studies and reviews of gerontological literature from the last years, confronting different perspectives of successful aging, have definitely contributed to the emergence of comprehensive and multicomponent models of successful aging. Most inputs came from cross-sectional designs, with criteria defined by researchers and/or lay perceptions, but also from longitudinal studies (e.g., Hodge, English, Gilesa, & Flicker, 2013; Hsu & Jones, 2012) and systematic reviews (e.g., Depp & Jeste, 2006; Cosco et al., 2013a; Cosco et al., 2013b).

One of the issues scholars have debated is what dimensions should be included in successful aging conceptualization and therefore operationalization. Several inputs have been proposed. Ferri and colleagues (2009) provided data confirming that successful aging is a multidimensional concept, such that participants endorsed physical health, social support, psychological well-being, functional ability/activity as important to the definition of successful aging. Also in 2009, Young and coworkers proposed a model of multiple pathways to successful aging through three components: physiological, psychological and sociological. Lee, Lan, and Yen (2011) added leisure activity to physical, psychological, social support domains and tested a model with four factors. Their findings confirmed that the proposed model is well supported by the data and fits well for both female and male populations. In turn, Hsu & Jones (2012) expanded the domains, including in their model chronic diseases, physical function difficulties, depressive symptoms, emotional social support, social participation, as well as economic satisfaction.

In a similar attempt, other authors have been proposing multidimensional models of “positive aging”. That was the case of Fernández-Ballesteros (2011), who proposed a structure with five independent factors: health, cognition, activity, affect, and physical fitness. Health was the most important factor accounting 21% of the variance, followed by cognition (account variance 10.98%), and activity (account variance 7.59%). An important addition to previous models is the emotional and evaluative component of successful aging (account variance 9.2%), which was integrated by positive mood, life satisfaction, and perceived self-efficacy for aging. The fifth factor, physical fitness (account variance 6.7%) included physical activity and nutrition as indicators of healthy aging (Fernández-Ballesteros, 2011). Also Woods and his team (2012) identified a multidimensional phenotype of positive aging that included physical–social functioning and emotional functioning. Multidimensional models including physical, social, and psychological components were also tested in samples of very old individuals (people aged 90+), by

Nosraty, Sarkeala, Hervonen, and Jylha (2012). The authors found that models which emphasize the absence of disease and activity as criteria for successful aging may not be the most relevant and applicable in oldest old (Nosraty et al., 2012). Accordingly, age-sensitive approaches would help us better understand the potential of successful aging among individuals who already have success in longevity.

Taken together these studies point to a general structure of three different domains: physiological, psychological, and social. This type of structure was presented by Young, Frick and Phelan (2009) in the paper *Can Successful Aging and Chronic Illness Coexist in the Same Individual? A Multidimensional Concept of Successful Aging*. The authors postulated that successful aging occurs when an individual uses adaptive mechanisms and spiritual resources to compensate for physical limitations and environmental challenges, and in doing so, achieves a strong sense of well-being, quality of life, and personal fulfillment (Young et al., 2009). This theoretical proposal appeals to two big issues in successful aging research: the possibility of being successful despite illness and the importance of spirituality for adaptation.

2.3.1. Successful aging despite illness

Notwithstanding the relevant contribution of Rowe and Kahn's model of successful aging within gerontological research, the model has been subject of long-lasting controversy (Martin, Kelly, Kahana, Kahana, & Poon, 2012). Major critics argue that Rowe and Kahn's criteria automatically exclude a significant number of people that can not reach advanced age free of age associated diseases and without appreciable functional deterioration (Cho, Martin, & Poon, 2012; Jeste & Depp, 2006; Ferri et al., 2009; Phelan & Larsen, 2002; Strawbridge & Wallhagen, 2009; Strawbridge, Wallhagen, & Cohen, 2002; Tan, Ward, & Tahereh, 2010; Young et al., 2009). In fact, although Rowe and Kahn's model expanded definition does include a nonphysiologic component (engagement with life), it emphasizes the physiological domains of health (Young et al., 2009).

Kahn (2009) in the book "Successful Aging and Adaptation with Chronic Diseases" draws attention to Strawbridge and Wallhagen's (2009) presentation of a definition of successful aging that mixes both positive and negative factors. As Kahn refers "they appreciate to shift in focus toward those persons who are doing well as opposed to the usual focus on the four Ds (disease, disability, dementia, and death) (p. 64). This way of thinking and approaching successful aging has been increasingly recognized in the Gerontological Society Meetings (e.g., New Orleans, 2013; Washington, 2014), namely in Campbell's presentation who stated that older people may be frail but have no failure and that

disability has to be addressed in successful aging studies (Campbell, 2013); also Ryff (2013) in her presentation about health, resilience and well-being in the same meeting, referred that we may investigate the negative (i.e., the individuals who are experiencing difficulties) to reach the positive (i.e., the capacity of adaptation). Already in the beginning of this century, in the book "Aging Well: Surprising Guideposts to a Happier Life" George Vaillant (2002) had summarized such an idea in a very interesting way by stating that "it is all right to be ill as long as you do not feel sick".

Strawbridge and Wallhagen (2009) agree that Rowe and Kahn's concept of successful aging is attractive and directly challenges the view that aging inevitably involves unrelenting declines, but it has proven difficult to operationalize. The criterion of little or no age-related decrements in physiologic function for those aging successfully can lead to focusing on a small, elite segment of the population and thus reduce interest in secondary and tertiary prevention for the majority of older persons already experiencing chronic conditions and symptoms (Strawbridge & Wallhagen 2009). Also Bowling and Dieppe (2005) claim that it is not possible for a large proportion of the population to age without disease, therefore, individuals dubbed "usual" agers are excluded from further analysis into the characteristics of a successful aging phenotype.

Evidence from cross-sectional studies has demonstrated that although the absence of chronic conditions and maintenance of functioning were positively associated with successful aging, many study participants with chronic conditions and with functional difficulties still rate themselves as aging successfully (Cosco et al., 2013b; Pruchno, Wilson-Genderson, & Cartwright, 2010a; Strawbridge, Wallhagen, & Cohen, 2002). Ferri and colleagues (2009), for instance, found no significant correlation between the number of illnesses and subjective successful aging, suggesting that the participants' perception of their health status was more related to successful aging than their objective physical health status.

When studying Anglo and Chinese-Australians, Tan, Ward, and Tahereh (2010) revealed that the way in which a person copes with the physical and mental challenges of old age is an important facet of successful aging. Also for African American, White, Chinese and Latino disabled elders, physical function did not define successful aging, since the majority reframed their personal situation and felt they aged in a successful manner (Romo et al., 2013). In this sense, successful aging seems to require an adaptive facet to multilayered challenges that maximize an individuals' capacity to reach personal goals (Ferri et al., 2009; Jopp & Smith, 2006; Reichdstad et al., 2010; Wahl et al., 2013).

The importance of psychological and behavioral adaptations to life changes and disabilities, rather than the freedom from/avoidance of physical disability, is reflected in the well-being paradox. This is a striking gerontological finding often investigated related with the consistence and stability of well-being measures in later life (Mroczek & Spiro, 2005; Spini & Jopp, 2014). It indicates that despite the presence of various losses in central domains of functioning, including loss of loved ones and social roles, mental capacity and health, certain individuals can maintain positive appraisals of their health and overall life (Araújo & Ribeiro, 2011).

In order to encompass and understand these paradoxical results, Young et al. (2009) proposed a successful aging model in which it is possible to have chronic illnesses and functional incapacity, and still be regarded as “successfully aged”. Along with the traditional physiological domain (e.g., disease and functional impairment), the authors suggest the consideration for psychological (e.g., emotional vitality, coping and resilience) and social domains (spirituality and adaptation through social support mechanisms) (Figure 3). Their model seems to be more appropriated since it considers three important principles: the heterogeneity of the aging process, the existence of multiple pathways to successful aging, and the presence of individual compensation mechanisms to adjust forage-related changes (Nosraty et al., 2012; Young et al., 2009). Although the model’s structure has not been validated and confirmed to date, several studies based on its structure have been developed and found to be suitable (Pruchno et al., 2010a; Nosraty et al., 2012).

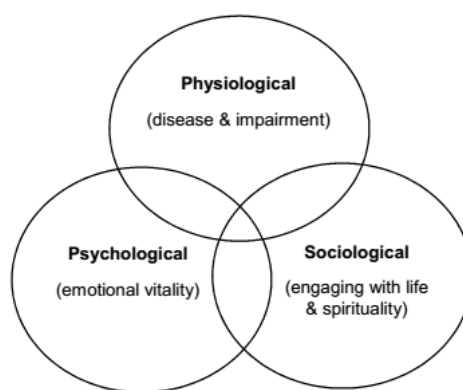


Figure 3. Multidimensional model of successful aging (Young et al., 2009)

2.3.2. Positive spirituality and successful aging

The inclusion of spirituality as a successful aging domain was suggested in 2002 by Crowther and her coworkers in the paper entitled Rowe and Kahn's Model of Successful Aging Revisited: Positive Spirituality - The Forgotten Factor (Figure 4). Positive spirituality was defined as "...developing an internalized personal relation with the sacred or transcendent that is not bound by race, ethnicity, economics, or class and promotes the wellness and welfare of self and others" (Crowther, Parker, Achenbaum, Larimore, & Koenig, 2002, p. 614). They argued that successful aging extends beyond social connectedness with others to include nontangible means of support such as giving and receiving prayers (Crowther et al., 2002).



Figure 4. Revised Rowe and Kahn's model of successful aging (Crowther et al., 2002)

Other authors had made the point that spirituality has been a forgotten factor in previous conceptualizations of successful aging, namely Sadler and Biggs, (2006), Iwamasa, and Iwasaki (2011), and Cherry et al. (2013). These last ones, for instance, found that living a faithful life was referred by older individuals as a component of successful aging (Cherry et al., 2013). Other authors recognized the importance of spirituality for successful aging and suggested that it surely deserves more scientific attention (McCarthy & Bockweg, 2013; Knight & Ricciardelli, 2003).

In overall, there has been an abundance of discourses and philosophical treatises on religion, spirituality and existential beliefs as important contributors to human adaptation for many centuries, but only in the last years these themes had emerged as contenders for serious scientific consideration (Bishop, 2011). The majority of studies came from psychology of aging that during many years have been emphasizing the individuals' socio-cognitive capacities and resources (e.g., internal control, mastery) and that now

recognizes the importance of individuals as existential beings (Krause, 2005; Pargament, 1997; Tornstam, 2005).

As a matter of fact, today it is well established that religious belonging and meaning have benefits for resilience, and mental and physical health (e.g., Ai, Peterson, Bolling, & Koenig, 2002), and that they are closely related to positive and successful aging outcomes, particularly life satisfaction, and coping with stress and life-threatening illnesses (Pargament, 1997). For this recognition the emergence of the gerotranscendence concept was crucial. Joan Erikson (Erikson & Erikson, 1998) equated gerotranscendence as the ninth stage of psychosocial development. During this developmental period, exceptionally old persons may experience significant physical and mental decline followed by a significant loss in autonomy, increased dependence and increased feelings of despair (Erikson & Erikson, 1998). Thus, when very old adults fail to derive basic, conditional or personal resources to respond to adversity, they tend to shift their priorities to energies, or spiritually meaningful resources and activities (Krause, 2008; Tornstam, 2005). That was one of the assumptions of the Gerotranscendence Theory, developed by Tornstam (2005). This theory set the importance of religion and spirituality, which tend to be complex and overlapping constructs (Moberg, 2008). Religion has been defined as a system of ideas or ideological beliefs and commitments, whereas spirituality has been commonly used in reference to the experiential and subjective identification of religious experience (Hill & Pargament, 2008). In effect, religion and spirituality are related rather than independent constructs (Bishop, 2011). Thus, it may be difficult for ordinary individuals (and even researchers) to distinguish between the two phenomena in the event of coping with physical and mental health problems.

Existential issues appear to gain increasing importance with advancing age, as in later life persons demonstrate a greater preference for deriving meaning from the complexities and problems of everyday life (Krause, 2005). Some authors argue that the search for new and emerging sources of life-strengths is continual throughout life, but greatly accelerated in late life; as individuals move further, seeking and redefining their meaning for life and achieving some measure of self-transcendence is an important strategy to overcome the stress and pain of physical and emotional losses (Tornstam, 1997; Wong & Fry, 1998). In a cross-sectional study of late-life spiritual development, Tornstam (2005) found that a majority of his representative sample of 912 Danes over the age of 75 perceived an increase in spirituality. Compared to when they were 50, they responded with statements such as "I have more delight in my inner world"; "The border between life and death is less striking" (Tornstam, 2005). As stated by Vaillant (2002, p. 278) "... growing older does alter the conditions of life in ways that are conducive to spirituality".

3. Evaluation, prevalence and predictors of successful aging

Evaluations of successful aging are diverse, including some that are single item and others that are multi-item as previously explained, but none of the models have been subject to rigorous measurement analysis (Pruchno et al., 2010a). Beyond differences within the construct and its operationalization, successful aging studies have been using different types of assessments and, as a result, no universally accepted standards for measuring successful aging are available (Depp & Jeste, 2006; Strawbridge, Cohen, Shema, & Kaplan, 1996).

Objective or the so-called “researcher-defined” measures of successful aging have traditionally received more attention in the literature when compared with subjective ones (Pruchno et al., 2010a). One reason for this has been the widespread application of Rowe and Kahn’s successful aging model (1998) that have influenced subsequent important studies as that conducted by Hank (2010) with a sample from the Survey of Health, Ageing, and Retirement in Europe ($n = 21,493$) and McLaughlin, Connell, Heeringa, Li, & Roberts (2010) with data from the USA Health and Retirement Study ($n = 37,106$).

Studies based on subjective criteria began to widely emerge afterwards and, not surprisingly, when comparing subjective and objective definitions of successful aging, the results tend to demonstrate that more people categorize themselves as successful according to their subjective perceptions (Montross et al., 2006; Pruchno et al., 2010a; Strawbridge et al., 2002; von Faber et al., 2001) suggesting the need for less constrained measures of successful aging. In a direct investigation on this particular issue, Montross and colleagues (2006) found that the majority of their study sample (92%) viewed themselves as “successful agers,” whereas only 5% met the three objectively defined Rowe and Kahn’s (1997) criteria. Strawbridge and collaborators (2002) presented similar results in their study with 867 older individuals: most of the participants (50.3%) strongly agreed with the statement “I am aging successfully (or aging well)”, whereas less than 1/5 (18.8%) met objective criteria (Rowe and Kahn’s objective measurements).

This is a relevant issue since the prevalence of successful aging depends on its measurement. The above mentioned study of Hank (2010) in Europe revealed substantial cross-country variation around a mean value of 8.5%, with the highest proportion for the Danes (21.1%) and the lowest for the Polish (1.6%). In a similar study with a national sample from the USA, McLaughlin et al. (2010) found that no greater than 11.9% of older adults were aging “successfully”. However, when compared the prevalence of successful aging between researcher-defined with self-rated scores, the percentage increases exponentially. For example, in the six studies reviewed by Cosco and colleagues (2013a)

in average 71.3% (SD 18.6%; 95% CI 56.4–86.2%) of the participants were identified as successful agers through self-rating (Cosco et al., 2013a).

The prevalence of successful aging also varies according with the criteria required in the physiological component, i.e., those definitions that permitted individuals with a chronic disease and/or physical disabilities to be classified as successfully aged were more comprehensive and less discriminatory (Jeste & Depp, 2006). Physical functioning and disability appeared as the principal domain measured in defining success and the primary limiting factor in excluding people from meeting criteria for successful aging (Cosco et al., 2013a). It is important to address that the discrepancy between objective and subjective criteria might be related with the influence of psychological resources and processes (i.e., adaptation, resilience), as it was suggested in many of the psychological approaches to successful aging. For example, Baltes and Baltes' (1990) when describing the Selection, Optimization with Compensation processes (SOC theory) posit that older adults have the ability to compensate for manifested losses through substitutive manners (i.e. external aids and/or help of others) that allow a positive appraisal of their functioning despite their objective condition.

The identification of successful agers' characteristics has been also a concern of different researchers as expressed in extensive reviews of this body of literature (Depp & Jeste, 2006; Depp & Jeste, 2009; Phelan & Larson, 2002). As support for their theory, Rowe and Kahn (1997) within the MacArthur Studies of Successful Aging, firstly developed empirical studies in which they demonstrated that genetic risk factors for disease diminished with age, whereas extrinsic factors (e.g., education, behaviors, and environment) and psychological variables (e.g., self-efficacy, mastery, and control) become more influential with age and may decrease the likelihood of developing disease, disability, and decline in later life, or at least moderate ill-effects so that the individual can continue to find meaning and purpose in life and thereby age successfully (e.g., Berkman, et al., 1993; Seeman et al., 1994). The importance of these factors was later confirmed and today it is well established the relationship between health behaviors and successful aging, namely that physical activity influences each component of successful aging, with a stronger effect on functional decline than either chronic disease and disablement (Meisner, Dogra, Logan, Baker, & Weir, 2010), as well as not being a current smoker (Depp & Jeste, 2006). Also important were the benefits of better social support (Montross et al., 2006; Seeman et al., 1995), volunteering (Borgonovi, 2008) and stronger religious convictions (Crowther et al., 2002) for physical and mental health.

Although The MacArthur Studies of Successful Aging didn't emphasize any concrete psychological significant predictor (Seeman et al., 1995), years later Fernández-Ballesteros and her team (2010) found that affective functioning and personality were predictors of successful aging. More specifically, a positive emotional balance, extraversion, neuroticism (with negative weight) and self-efficacy were associated with higher probability of being successful (Fernández-Ballesteros et al., 2010).

The association between sociodemographic factors and the odds to be successfully aged has shown the effects of gender, race, marital status, education and living arrangements. Depp and Jeste (2006) revealed that in 50% of the longitudinal studies they reviewed, women were more likely to experience successful aging than men. In terms of race, the same authors found that Whites presented higher levels of successful aging than ethnic minorities (in 28.6% of the studies), but some authors considered the effects of gender and race on successful aging as inconsistent (Pruchno, Wilson-Genderson, Rose, & Cartwright, 2010b).

As for the relevance of marital status, and the educational level, Bowling and Iliffe (2006) reported that respondents who were currently married had higher successful aging scores than those who were not married, which was also verified in other studies (Depp & Jeste, 2006). Education is known to have an impact on health and life style, as it tends to reflect socioeconomic status; therefore, it can also be considered a potential predictor of successful aging (Nosraty et al., 2012). Most of the studies reviewed by Depp and Jeste (2006) found no differences according to educational level, but McLaughlin et al. (2010) as well as Pruchno et al. (2010b) revealed that a higher level of formal education is associated with successful aging.

In relation to living arrangements, although few studies have analyzed this specific factor, the study of Nosraty et al. (2012), conducted with a nonagenarian sample revealed that the prevalence of successful aging was clearly lower for those living in institutions. Their analyses indicated that disease, disability, and problems with hearing and seeing were particularly prevalent in institutions, as it is self-rated health, which partly explains the lower prevalence of successful aging in institutionalized elders.

In sum, these results reflect the importance of contextual variables in the odds for successful aging. Thus, if the educational levels, living arrangements and other sociodemographic aspects, vary between countries and cultures, it is expected that also the means and outcomes for successful aging do.

4. Successful aging across cultures

As it has been discussed so far, successful aging is a complex construct that ideally must include multiple domains and subjective ratings from older individuals. Complementally, it must include an environment and ecological perspective, encompassing the individual and/in his sociocultural context (Fonseca, 2005; Paúl, 1991). In fact, several publications about successful aging suggest that older people may value specific domains of the concept differently across cultures (e.g., Fernández-Ballesteros et al., 2008; Hung, Kempen, & de Vries, 2010). The assumption that Rowe and Kahn's concept measures successful aging can be comparable way across a variety of social and cultural contexts was one of the limitations assumed by Hank (2010) in his study with data from SHARE. Profound differences were found within European countries (Hank, 2010) and also between Europe and America (McLaughlin et al., 2010), demonstrating that what constitute an individual's classification as being "successful" might be contextually bound. Indeed, ethnic, religious, economic and political traditions are important forms that may differentiate the ways in which successful aging is defined, thus different cultures may not value the components of successful aging equally and/or have different idealizations (Cosco et al., 2013b).

This is a second limitation of the present study because we assume that Rowe and Kahn's concept measures successful aging in a comparable way across a variety of social and cultural contexts—which might not always be fully accomplished

Studies with different cultures have demonstrated that what it means to age successfully is both culturally and historically contingent (Gergen & Gergen, 2010). Asians, for instance, were found to be more likely to emphasize the relationships between outlook and health, family and having few health problems (Ladkita et al., 2009) as well as the importance of financial stability (Hsu & Jones, 2012; Li et al., 2006). On the other hand, prominent among the Latinos is the idea that education and walking were important for successful aging, as well as having faith in God (Romo et al., 2013). The importance of faith is also a recurrent theme among African Americans, who tend to associate the positive aspects of their lives with God – an entity that blessed them with old age (Parker et al., 2002; Romo et al. 2013). Anglo-Australians regarded growing old gracefully and acceptance as important aspects of successful aging, whereas Chinese-Australians valued financial security and an active lifestyle (Tan et al., 2010).

Also in Portugal, the last years have been marked by an increased interest around successful aging, which is notorious through the number of academic studies analysing this issue. A clear trend within these studies is fact that the majority had approached only

one dimension for representing successful aging, such as integrity (Guimarães, 2013), optimism (Melo, 2008) or physical activity (Abreu, 2010). Following the European focus on active aging (Foster & Walker, 2015), several Portuguese publications had explored this concept, as we can see in a special issue on active aging from the journal “Fórum Sociológico” (Alves, Bäckström, & Nunes, 2007) or in the “Active Aging Handbook”, a publication with practical guidelines for active aging promotion (Paúl & Ribeiro, 2011). Within academic works, a Portuguese doctoral thesis on success in aging and life stories in socio-culturally differentiated elderly, showed the enormous influence of social relations and cultural context on personal development (Amado, 2008). The results demonstrated the importance of social position, gender, third and fourth-age, strength of faith and, specially, of SOC behaviors for the understanding of a successful aging. Also resignation with life and fate were identified by other authors as common feelings among the elderly, and that such sentiment together with a deep religious attitude seems to define the image of the elderly who age successfully (Paúl, Fonseca, Martin, & Amado, 2005).

5. Contributes of positive psychology to successful aging research and the centrality of the well-being construct

Successful aging studies, particularly those focusing on psychosocial models, have also culminated in the positive psychology movement (Bowling & Dieppe, 2005). The focus of positive psychology on successful aging issues came mostly from Martin Seligman’s work entitled “Authentic Happiness: Using The New Positive Psychology To Realize Your Potential For Lasting Fulfillment” (2004) through which he directs the reader to a study that followed nuns throughout their lives and examined factors such as longevity and health, in which optimism emerged as a predictive factor of successful aging and life satisfaction. This search for positive trajectories and sources of internal strengths is what best defines this new and emerging approach of psychology (Seligman & Csikszentmihalyi, 2000). According to current theorizing, thriving health implies not merely the absence of disease. The Salutogenic Theory (Antonovsky, 1987) highlights that the focus must be on positive predictors for health and well-being rather than risk factors for disease. Antonovsky’s (1987) particular research focus was on the search for factors that keep people healthy, especially those in difficult circumstances, as opposed to investigating the reasons for ill health.

In overall, the positive psychology movement has contributed for replacing the typical pessimistic view of aging as decline into physical and mental abilities. Researches are now exploring the immense potential of older adults to overcome the challenges of old

age and pursue active lives with renewed vitality (Fry & Keyes, 2010; Schmitt, Oswald, Jopp, Wahl, & Brenner, 2006). This attempt to boost strengths and competencies that people bring with them over the years (or bring to bear in later life) may enrich our understanding of successful aging into a construct more appropriated and plausible. Several authors suggest that it is particularly important to acknowledge how people learn to cope and adapt in the face of changing circumstances (Fry & Keys, 2010; Wong, 2000), and currently the increased life-expectancy has highlighted the need for greater attention to health promotion and disease prevention (Strawbridge & Wallhagen, 2009), as well as to older persons' capacity for resilience throughout later life (Clark, Burbank, Greene, Owens, & Riebe, 2011). Older adults have to face several constrains normally demanded by advancing age, becoming therefore examples of intensive search for positive trajectories in order to attain improved levels of emotional, social and cognitive functioning (Shmotkin, 2011). The links between successful aging, salutogenesis and positive psychology are evident and very promising. Citing Wong's own words retrieved from his work on meaning of life and meaning of death in successful aging "...Successful aging is 80% attitude and 20% something else" (2000, p.26). A further challenge ever since has been to clarify what do such "attitude" may include.

Despite the recent efforts to focus on the positive side of human functioning with advancing age, the current available knowledge about well-being in old age is very little when compared with what is known about human illness, dysfunction and disorder (Fry & Ikels, 2011; Ong & Bergman, 2010). Within well-being research, one of the most controversial issues is the disagreement between hedonic and eudaimonic perspectives (Keyes, Shmotkin, & Ryff, 2002; Novo, 2003). While the first approach refers to the conventional subjective well-being dimensions of satisfaction and affective tone (Diener, Suh, Lucas, & Smith, 1999), the eudaimonic perspective mainly involves meaningful pursuits that promote purpose and growth in life (Ryff & Keyes, 1995). The complexity of the well-being construct, which presents several uncertainties in its definition, measurement and associated constructs (cf. George, 2010), constitutes a challenging issue for the study of adaptation in advancing age (Hagberg & Nordbeck, 2000).

Recent studies have been showing that well-being does not necessarily decrease with advancing age. Pinquart and Sorenson (2000), for instance, found no age-related decline in subjective well-being and concluded that social networks were one of the most important positive influences. When analyzing the effect of age on subjective well-being, Shmotkin (2011) verified that negative affect remained stable or decreased with age, whereas positive affect remained stable or increased with age. But the most interesting finding on this matter was that age per se does not lower subjective well-being if

adjustments are made to age-related adverse conditions, such as poor health and widowhood. The justification for these trends about subjective well-being (hedonic) may be reached though the focus on psychological well-being (eudaimonic), reinforcing an issue that has been recently questioned: is eudaimonia a goal to be achieved or is it a means of reaching well-being (Cohen-Mansfield & Poon, 2011)? According to Cohen-Mansfield and Poon's (2011), for many older adults eudaimonia is a necessary condition for reaching subjective well-being, i.e., the stability in subjective well-being that has been reported in gerontological evidence, may be related with adaptation (Shmotkin, 2011), self-regulation mechanisms (Spini & Jopp, 2014), and psychological traits (Martin, Deshpande-Kamat, Poon, & Johnson, 2011).

There is a growing body of evidence that support the individuals' capacity to maintain or regain relatively high levels of mental health and emotional well-being in the face of multiple losses (Gergen & Gergen, 2010; Rott, Jopp, D'Heureuse, & Becker, 2006). Most scholars argue that self-regulation mechanisms are responsible for the stabilization of self-esteem or well-being in the face of adverse conditions and age-related declines (Baltes & Baltes, 1999) and that they are available and well-functioning until very old age (Jopp & Rott, 2006). This approach is particularly relevant for the position previously recognized that successful aging does not mean remaining healthy as long as possible, but rather adapting to losses when they occur. Psychological strengths and related strategies (e.g. coping, life management) as well as attitudes and beliefs (e.g., self-efficacy, optimism, meaning in life, spirituality) have been some of the best interpretative clues.

5.1. Psychological and existential strengths

Positive psychological traits have remarkable effects on mortality, with a number of longitudinal studies indicating that, even after controlling for other relevant variables as higher sense of purpose in life, optimism, and more positive attitude towards aging, they are associated with longer lifespans (e.g., Fernández-Ballesteros, 2013; Giltay, Geleijnse, Zitman, Hoekstra, & Schouten, 2004; Krause, 2009;). A number of individual characteristics have been proposed to contribute to the success with which one adapts to challenges (Hochhalter, Smith, & Ory, 2011). Different studies have been emphasizing the value of personality traits, which might have a greater effect on the sense of well-being than on objective circumstances (Martin, 2007; Vaillant, 2002). A robust personality can overshadow developmental decline and contributes to a continued sense of self that may

be preserved until the very end of life (Hagberg & Nordbeck, 2000; Poon, Martin, & Margrett, 2009).

Beliefs and attitudes about oneself, life, and aging, like self-esteem, optimism, self-efficacy, and control beliefs, as well as existential constructs such as personal meaning, purpose in life and spirituality (Jopp & Rott, 2006; Jopp & Smith, 2006; Wong, 2000) seem to be critical to the positive development in old and very old age (Wozniak & Jopp, 2012). According to Shmotkin (2011), meaning in life refers to a combination of cognitive schemas (e.g., concepts and beliefs) that provide an explanation for essential aspects of one's life (e.g., its worthiness, guiding values, course, and purpose). Moddy (2009) highlights the importance of having meaning to deal with life adversity, arguing that personal meaning is sustained through inner resources which promote a continued growth even in the face of loss, pain and physical decline. "...Without a clear sense of meaning and purpose in the face of physical decline, longevity may prove to be an unbearable burden. People need to develop a positive attitude towards life in order to maintain life satisfaction in the midst of losses and illness" (Wong, 2000, p.24). Reker and Wong (1988) complement this line of reasoning by arguing that the meaning system allows discovering purpose and goals for live. These goals are described in terms of meeting basic needs, leisure activities, personal relationships, personal achievements, personal growth, social and political activism, altruism, religion or legacy (Reker & Wong, 1988). Wong even assumes that "...personal meaning is the hidden dimension of successful aging" (2000, p.24).

Many of the researches who have focused on the meaning in life construct consider that purpose and meaning in life need to be complemented with a more universal source of life-strengths emanating from a higher power outside the individual (Fry & Debats, 2010). Wong reinforces the association between existential meaning and successful aging by stating that "...from [an] spiritual, existential perspective, successful aging is attainable for everyone with positive meanings, regardless of his or her physical condition" (2000, p.28).

Spirituality often provides a sense of meaning and an alternative (and positive) perspective on difficult economic and health problems, contributing to deal with the emotional and physical distress that often accompanies the aging process (Ardelt, Landes, Gerlach, & Fox, 2013). Data from a cross-sectional study with 144 respondents, including 18 hospice patients, 23 nursing home residents, and 103 community residents, demonstrated that the effects of older adults' internal strengths on indicators of aging well appear to be stronger than effects of objective life conditions, illustrating that successful aging is possible even when external circumstances are difficult (Ardelt et al., 2013). In

short, what these findings highlight, in line with what has been previously exposed, is that individuals may be turning to religion and spirituality in the quest for the ultimate meaning of human existence and for sustenance, comfort and emotional resilience (Mlinac, Sheeran, Blissmer, Lees, & Martins, 2011).

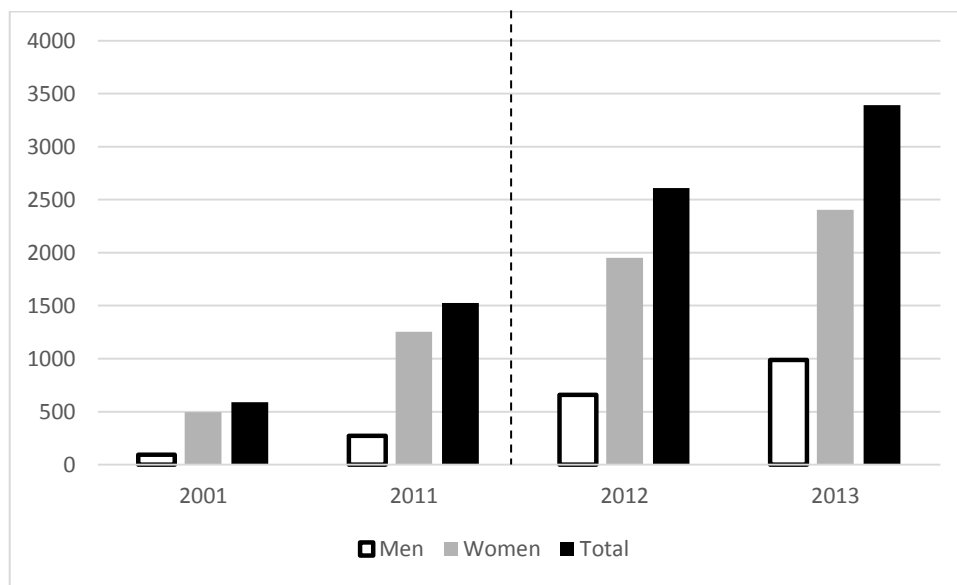
Chapter II

Centenarians

1. Aging and longevity

Thanks to advances of social-environmental conditions, medical care, and general quality of life standards, the world's current population is about 7 billion people and will grow by more than a third and reach 10 billion in 2050 (EC, 2014). To this increase, the reduction of the overall morbidity and mortality, resulting in an overall increase of life expectancy were important achievements (Vacante et al., 2012). The oldest generations are being more representative and centenarians are likely to become more common (EC, 2014).

In the United States there were 37 306 centenarians in 1990, 72 000 in 2000, 131 000 in 2010, and it is projected that there will be 834 000 in 2050 (Poon & Cheung, 2012). Also in Europe this number has been increasing in all countries. From 1976 to 2006 the number of centenarians almost doubled every decade (EU-27; Robine & Saito, 2009). In 2006, population estimates for centenarians reached 57 306, with 8 228 males and 49 078 females, corresponding to a mean sex ratio of 6 females to 1 male (Robine & Saito, 2009). Specifically in Portugal, data from the Census and the Human Mortality Database showed that there were 589 centenarians in 2001 (INE, 2001), 870 in 2006 (Robine & Saito, 2009) and 1526 in 2011 (INE, 2011). Since 1980, our country has been revealing a significant increase in the number of centenarians, having a higher growth rate than other European countries like England, Sweden and Belgium (Robine & Saito, 2009). As presented in Graph 1, the gender differences are also verified in our country: in 2001 there were 95 men to 494 women and in 2011, 273 men to 1253 women (INE, 2001, 2011). National Statistical Institute projects a number of 3393 centenarians in 2013, 2440 women and 989 men, reflecting an exponential grow of this population (Bastos, 2013). According to the United Nations (2009), by 2050 the proportion of centenarians around the world is projected to increase to 4.1 million, particularly in more developed countries, where the majority (69%) of centenarians currently live.



Graph 1. Evolution of Centenarians in Portugal (official data from 2001 and 2011; projections for 2012 and 2013)

The exponential increase in centenarian numbers noted in many countries combined with the fall in mortality over and above 100 years of age (Robine, Saito, & Jagger, 2003) has speeded up the increase in maximum age reported at death that has been observed over the last two or three decades. The oldest-ever person in the world has been Jeanne Louise Calment. In 1997 she passed away at the age of 122 years and 164 days (Jeune & Andersen-Ranberg, 2000). This French woman, described as someone who was immune to stress and who had a realistic sense of coping (Martin, 2007) was an important case study for today's knowledge about longevity.

Regardless of the crucial importance of Jeanne Calment, more and more individuals are currently reaching the age of 100 and many questions remain unanswered: How do they live? How is their health and how do they function? Are they capable of caring for themselves? If no, who does it? With whom do they live? How do family and communities view these centenarians? Given the dimension of the longevity phenomenon, Vacante and colleagues (2012) even compare the growing number of centenarian to a "black swan event", i.e., as a high-impact, hard-to-predict, and rare event beyond the realm of normal expectations. The existence of centenarians has been a rare and unpredictable phenomenon but the recent trends about the growth of this population requires considering the health, welfare, social and economic consequences of this phenomenon

(Serra, Watson, Sinclair, & Kneale, 2011). Future resources and infrastructures to care for the oldest old have to be planned, and wide economic and social adjustments are necessary (Herm, Cheung, & Poulain, 2012). Beyond the need of sustainable healthcare systems, the European Commission (2014) has even drawn attention to the importance of creating opportunities for the aged, allowing all society to benefit from the wisdom and expertise of these very old individuals, and several researchers from around the world subscribed a letter to the United Nations Secretariat supporting the protection of the rights and dignity of very old individuals and centenarians (Jopp et al., 2013)

1.1. The interest for long-lived individuals

Attaining 100 years of age has historically been viewed as accomplishment, as something special. In England, it merited a telegram from the Queen and in the United States a prospect of national television recognition (Rowles, 1997). In Eastern cultures, centenarians have been considered a symbol of honor and, in some cases, even as legends. In Taiwan, for instance, centenarians are great symbols of good luck and people who provide social support for centenarians often feel quite blessed in return (Yang, 2012). All over the world, the interest in long-lived individuals is evident in contemporary media press, including journal press, books and websites that have been covering centenarians' cases very frequently. Particularly in Portugal, a recent study on the social representations about individuals aged 100 years and over demonstrated the increased interest in reporting the anniversary of these long-lived individuals (Lameiro, 2014). Longevity is viewed as a miracle, and 100 is the magic number. Ninety years is old, and 100 is news (Beard, 1991).

This public interest in older people, and particularly in centenarians, may be contributing to reduce ageism and negative stereotyping of older people, since centenarian are presented as examples of worth living (Koch, Turner, Smith, & Hutnik, 2010). But despite this greater interest, little is known about these older citizens and whether and how adults can live longer and fulfilling lives beyond the current average life expectancies. Thus, the complex and diverse reality of living well into advanced age necessitate careful exploration by gerontologists and other scientists.

What is different about the relatively few humans who become very old? This question has motivated researchers from different parts of the world, who consider centenarians as the best model to study human longevity. Those current aged 100 years or more were not affected by the infectious diseases of childhood, the accidental deaths of adolescent and young adult life (e.g., influenza pandemic, tuberculosis); and more recently they have

avoided or survived the most important pathologies that usually affect old people and are responsible for elderly morbidity and mortality, such as heart disease, cancer, strokes, and pneumonia (Smith, 1997). For males it also included surviving two world wars, and for females it included surviving child bearing at a time when the maternal mortality was high (Smith, 1997).

Moreover, centenarians are by definition extremely old people, and show all the signs and the characteristics of a prolonged aging process. They had lived at least 36 500 days, and are considered older persons (65 plus) from a period of at least 35 years. With such an increased life extension, this population challenges researchers and professionals to understand new life stages that are unique to late life. In order to uncover the biological, psychosocial, demographic, genetic, or clinical characteristics of these long-lived individuals, specific centenarian studies began to emerge all over the world (Table 1).

Belgium Center on Demographic Studies for Public Administration, Université Catholique de Louvain, Belgium	Using the Belgian Centenarian data
Denmark University of Southern Denmark and Epidemiology, Institute of Public Health, University of Southern Denmark, Odense	Participants accessed through the Danish Civil Registration System
Finland Centenarian Study in Finland by the Second Department of Medicine, University of Helsinki	Visited 185 centenarians based on the Finnish National Population Registry
France ‘In search of the secret of centenarians’ by the IPSEN Foundation, INSERM	During 1990-1991, 29 669 medical and geriatric doctors were visited to estimate the number of centenarians in France
Georgia Georgian Longevity Study: National Centre of Therapy, Research Institute of Experimental and Clinical Therapy, Tbilisi	136 long-lived persons aged ≥ 90 years were interviewed since 2004

<p>Germany</p> <p>Heidelberg Centenarian Study by the University of Heidelberg</p>	<p>Based on the city registries in Germany, 91 centenarians and near-centenarians were accessed in face-to-face interviews during 2000-2001; The study was reconducted in 2011</p>
<p>Greece</p> <p>Ikaria, Greece Study on oldest old (>80 years) by the First Cardiology Clinic, School of Medicine, University of Athens</p> <p>Greek centenarians by the Laboratory of Cell Proliferation and Ageing, Institute of Biology, Athens</p>	<p>89 men and 98 women aged ≥ 80 years were interviewed</p> <p>All 489 centenarians and their proxies/caregivers were interviewed by health professionals at their domicile</p>
<p>The Netherlands</p> <p>Leiden 85+ Study by the Section of Gerontology and Geriatrics, Department of General Internal Medicine, Leiden University Medical Center</p>	<p>Data were obtained from 599 participants aged ≥ 85 years (response rate, 87%) in Leiden with 27 qualitative in-depth interviews</p>
<p>Poland</p> <p>Polish centenarians programme by the International Institute of Molecular and Cell Biology, Warsaw</p> <p>Department of Neurosurgery, Medical Research Center, Polish Academy of Sciences, Warsaw</p>	<p>364 subjects aged ≥ 100 years were visited, biological material was collected from 285 subjects, and 153 lymphocyte cell lines were immortalized</p> <p>The selected centenarian group (n=10) and a reference group (n=20)</p>
<p>Portugal</p> <p>Oporto Centenarians Study, by the Institute of Biomedical Science Abel Salzar, University of Porto</p>	<p>140 subjects aged ≥ 100 years and their proxies were accessed in face-to-face interviews</p>

<p>Italy</p> <p>Sardinian Centenarian Study (AKEA study) by the Department of Biomedical Sciences, University of Sassari</p> <p>Italian Multicenter Study on Centenarians (IMUSCE) by the Psychogeriatric Service, University of Padua</p> <p>Calabria oldest old descriptive study by the University of Calabria</p> <p>MALVA Study in Mantova, North Italy by the University of Bologna</p>	<p>233 potentially eligible centenarians were traced from the entire territory</p> <p>Personal records of 38 people aged ≥ 100 years residing in Padua and Pordenone were supplied by the data processing centre of their municipalities under local health unit ULSS</p> <p>Two specific questionnaires were used, one for subjects aged ≥ 90 years ($n=400$) and another for subjects aged 65 to 85 years ($n=453$)</p> <p>117 subjects aged ≥ 98 years (39 were centenarians) were traced in 1998</p>
<p>Russia</p> <p>Centenarian Studies in Russia by the Russian Institute of Public Health, Moscow</p>	<p>Genealogical data on longevity in European royal and noble families. 8409 records for men and 3741 records for women</p>
<p>Spain</p> <p>Spanish centenarians (100-108 years) by the Universidad Europea de Madrid, Madrid</p>	<p>Centenarians aged 100 to 108 years ($n=64$, 57 women) versus young healthy controls aged 21 ± 2 years ($n=283$, 67 women)</p>
<p>Sweden</p> <p>Stockholm University Swedish Centenarian Study by Lund University</p>	<p>164 centenarians born in 1887-91 who lived in southern Sweden were asked to participate. Of the 143 survivors, 100 agreed</p>

5-Country Oldest Old Project (5-COOP) Funded by the CERA Foundation (Lyon) and the AXA Research Fund, Paris	This project focus on data from low mortality countries (Denmark, France, Japan, Switzerland, and Sweden) and analyzed cohorts of people born in 1911 (and later) who reach their 100th birthday from 2011 onwards with data from the Human Mortality Database
Europe Genetics of Healthy Aging in Europe (GEHA) (2003-2008) coordinated by Claudio Franceschi from the University of Bologna, Italy	25 partners (24 from Europe and 1 from China) involving 11 European countries. Long-lived 90+ sibpairs (n=2650) versus younger ethnically matched controls (n=2650)

Table 1. Summary of centenarian studies in Europe (adapted and updated from Poon & Cheung, 2012)

Centenarians' studies, like most centenarians themselves, have been a phenomenon of recent decades. The first study dates back in 1975 and is still nowadays running - the Okinawa Centenarian Study (Willcox, Willcox, & Poon, 2010). This study has focused mainly on health, medicine and the contribution of genes and lifestyle in determining longevity (Willcox, Willcox, & Ferruci, 2008). Another Japanese example is the Tokyo Centenarian Study (Gondo et al., 2006) that sought to define models for centenarians' quality of life. In Asia, other studies have been reported from Mainland China, Hong Kong, India, South Korea, and Taiwan (Poon & Cheung, 2012).

In the USA, the longest running research is the Georgia Centenarian Study (Poon et al., 1992). This study, that recently celebrated its 20th anniversary, has been dedicated to capture the underlying factors allowing centenarians to adapt successfully to very old age (Poon et al., 1992). Also in the United States, the New England Study is one of the largest and longest studies (since 1994, Perls, Levenson, Regan, & Puca, 2002). It has been focusing the genetic influence upon longevity through the study of centenarians' siblings and long-lived families (Perls et al., 2002). Other studies have been reported in the states of California, Florida, Georgia, Iowa, Idaho, Louisiana, New England, New York, and Utah (Poon & Cheung, 2012).

In Europe, at least 17 countries have conducted oldest-old or centenarian research. These are Azerbaijan, Belgium, Denmark, Finland, France, Georgia, Germany, Greece, Hungary, the Netherlands, Poland, Italy, Russia, Spain, Sweden, Switzerland, and the United Kingdom (Poon & Cheung, 2012). The Swedish Centenarian Study (Samuelsson et al., 1997) and the Danish Longitudinal Study (Andersen-Ranberg, & Jeune, 2006) are two of the most well known. The last one is very focused in defining profiles of functional capacity. In turn, the search for social and psychological resources associated with advanced longevity and centenarians' adaptation has been the main interest of the Heidelberg Centenarian Study (Jopp & Rott, 2006).

In Australia, three centenarian studies have been reported (e.g., Richmond, Law, & Kay-Lambkin, 2011). In South America, such studies have been very recently initiated, namely the Cuba Centenarian Study (Giraldo, 2009).

In 1989, at the XV International Congress of Gerontology (Mexico), researchers from Sweden (Hagberg and Samuelsson) and Georgia (Poon and Martin) have initiated a discussion toward the possibility of create a group of investigators from countries around the world with interest in centenarians (Poon, Hagberg, & Martin, 2004). Thus, it was constituted the International Centenarian Consortium, aiming to conduct studies together and share/compare findings about the secrets of longevity.

1.2. Considerations from centenarians' research

Examining factors, especially genetic and biomedical ones, that contribute to reach the age of 100 years or more has been a central topic in centenarian research (Jeune, 2002). Only more recently, researchers have addressed the equally important question of how well these very long lived individuals are able to adapt to the enormous physical, cognitive, social and economic strains that they are facing (Martin, Rosa, Siegler, Davey, MacDonald, & Poon, 2006). This tendency on biomedical approaches was clear in a search presented by Poon and colleagues (2010) on the publications about centenarians available in PUBMED. Between the periods of 2004-2009 the ratio of biomedical to psychosocial studies of longevity ranged from a low of about 3:1 to a high of 7:1 (Poon et al., 2010).

In relation to the type of studies, in the first years most were descriptive and focused in the study of unique cases (e.g., Wilmoth, Skytthe, Friou, & Jeune, 1996) or with very small sample sizes (e.g., 28 centenarians, Receptuto et al., 1996). Also, only a few isolated domains such as health habits and the presence of specific diseases were investigated

(Poon & Cheung, 2012). More recently, systematic studies with sufficient sampling power and representative samples began to emerge (Poon & Cheung, 2012). Population-based studies, the majority of them cross-sectional but also longitudinal studies, were developed (e.g., Danish Centenarian Study; Engberg, Oksuzyan, Jeune, Vaupel, & Christensen, 2009), making it possible to test different hypotheses and make generalizations of possible mechanisms and principles of longevity.

In order to achieved and explore centenarians' experiences, personal views on life, and life strategies, qualitative studies were also developed. Pascucci and Loving (1997) asked centenarians themselves to communicate their experiences of healthy aging and analyzed 12 interviews within a phenomenological framework. Elsner and his team (1999) have used case histories to examine the provision of care to the oldest old, and more recent studies have explored the life experiences of centenarians and factors related to their well-being and exceptional longevity through in-depth interviews about what means living to one hundred years old (Archer, Brathwaite, & Fraser, 2005; Darviri et al., 2009; Freeman, Garcia, & Marston, 2013; Hutnik, Smith, & Koch, 2012).

Along with the methodological challenges common to aging studies, centenarians' research poses some challenges that are unique to this population: one of the basic requirements of a study with long-lived individuals is the procedure of age validation (Poon et al., 2007; Sachdev, Levitan, & Crawford, 2012). Main well-established guidelines suggest that researchers shouldn't rely in only one type of information, but to consider multiple, convergent and validated sources, such as birth certificates, early school records, marriage certificates, children's birth certificates, passports or others (Poon & Perls, 2007). A second major challenge is to obtain an optimal sample. Since in convenience sampling subjects are selected because of their accessibility and proximity to the researcher, individuals proud of their longevity and with high functioning are more likely to participate (Sachdev et al., 2012). In the study of centenarians, which are described as the most heterogonous group ever (Poon et al., 2007), this type of sampling can induce to a larger error. Thus, various methods to achieve comprehensive sampling are recommended (Poon et al., 2007). For instance, the Heidelberg Centenarian Study defined a geographical area of about 60 km² around the city and sampled 172 communities with 2.6 million inhabitants (Jopp & Rott, 2006). Within this type of process, further challenges may arise - the identification of potential participants. In Heidelberg study, records from the resident registration offices on inhabitants born in 1901 or earlier were obtained and all potential participants were invited to participate in the study (Jopp & Rott, 2006). In turn, the Georgia Centenarian Study relied on the list of registered voters and also contacted all nursing facilities and personal care homes in order to identify

potential participants (Poon et al., 1992). Another strategy was used in the Sydney Centenarian Study, that in addition to electoral roll and residential aged care facilities in the area of interest, used the Medicare data together with recruitment through word-of-mouth, newspaper articles and community forums, hospital admissions, and referrals by geriatricians and psychogeriatricians (Sachdev et al., 2012). Nonetheless, due to the existence of cases that choose not to participate or are too impaired to give informed consent and their families are unwilling or unable to provide proxy consent, some authors consider that even population-based studies may not yield findings that are readily applicable to other populations (Poon et al., 2007; Sachdev et al., 2012).

After highlighting the sample procedures and its cautionary steps, there are also the specificities of measurement. Different studies have reported that the presence of hearing and visual deficits, mobility restrictions, cognitive deficits, and complains of pain and fatigue are frequent in very old individuals (e.g., Cimarolli & Jopp, 2014; Jopp & Rott, 2006; Poon et al., 2010). Consequently, the interviews are ought to be carried out in the centenarian's home and the scheduling must be flexible and adapted to the centenarian's daily routine. Assessments are often carried out over many visits to avoid tiring the participant, and materials may have to be presented slowly, as well as adapted to overcome hearing and visual impairments (Sachdev et al., 2012). Also associated with the centenarian condition is the existence of a very close and dependent relationship with family, so the involvement of a family member is mandatory, even when the centenarian is autonomous and fully competent to participate independently (Sachdev et al., 2012). All of these particularities are important for the success of research but may involve additional expenses and are very demanding for the interviewers. Furthermore, in what regards to the use of psychometric tests, despite their innumerable benefits, some adjustments may be required as the use of some techniques to facilitate the centenarian's understanding (e.g., shorter questionnaires, assistance), and also during the scoring and interpretation of results in which age must be taken into consideration (Sachdev et al., 2012). Reliance on significant others (proxies) for objective information about the centenarian, especially for those that have cognitive impairment and dementia, can contribute to a more comprehensive data collection. This seems to be a reliable method since different studies have demonstrated high levels of agreement between centenarians and proxies' answers (e.g., Cho, 2014; MacDonald, Martin, Margrett, & Poon, 2009; Rodgers & Herzog, 1992).

2. Living at one hundred years old

A long life is desirable for most individuals, but extending life without quality may not be equally desirable. Are longer lives accompanied by worse health and functional limitation at very old age? Is it worth living until one hundred years old? Interestingly, few researchers (and quite recently) have addressed questions regarding how well very long-lived individuals are at physical, cognitive, emotional, social and economic levels (Martin et al., 2006). The answer to these questions probably starts with “it depends”, since not all centenarians are in equally good or poor condition (Martin, Rott, Hagberg, & Morgan, 2001). Heterogeneity and diversity are to be expected when investigating the worlds of people who have lived to become the oldest old (Fry & Ikels, 2011). As summarized by Hagberg (2007), at 100 years, the only trait the centenarians seem to have in common is advanced age.

2.1. Physical health

A substantial amount of literature has been focused on health outcomes at the limit of longevity (Poon et al., 2010). The evidence is contradictory with some studies reporting centenarians as being in relatively good health conditions (e.g., New England Centenarian Study; Hitt, Young-Xu, Silver, & Perls, 1999) whereas others presenting high levels of frailty and morbidity among this age group (e.g., Danish Centenarian Study; Andersen-Ranberg, Schroll, & Jeune, 2001).

The fact that centenarians are survivors does not mean that they are still healthy (Jeune & Andersen-Ranberg, 2000). Three profiles of morbidity have been identified and currently accepted within centenarian research: survivors, delayers and escapers. The escaper is the individual who reach the age of 100 by escaping the main fatal diseases associated with aging; delayer is a centenarian who have pushed back the age when these diseases appear to at least 80 years of age; and survivor is the one who have reached 100 by surviving these diseases diagnosed before the age of 80 (Evert, Lawler, Bogan, & Perls, 2003). In the New England Study, 24% of men and 43% of women were survivors, 44% of men and 42% of women were delayers, and 32% of men and 15% of women were escapers (Evert et al., 2003). Preliminary data from the Porto Centenarian Study proved to be 17% of men and 21% of women centenarians survivors, 8% of men and 26% of women as delayers, and 42% of men and 20% of women as escapers (Ribeiro et al., 2013). The Portuguese team also analyzed the frailty phenotype criteria in centenarians, finding that most of them were frail and pre-frailty, and that the frailty criteria most

common was low physical activity, followed by slowness and weakness (Duarte, Teixeira, Ribeiro, & Paul, 2014).

The study of Danish centenarians (Andersen-Ranberg et al., 2001) found that there were few healthy centenarians. Most of the sample had several common diseases and the prevalence of chronic conditions was 72% for cardiovascular disease, 54% for osteoarthritis, 52% for hypertension, 51% for dementia, and 28% for ischemic heart disease. Also in the Porto Centenarian Study health problems were found. With a mean number of 4.7 (SD 2.0) diseases, 35.7% of the sample had three or four diseases and 37.1% had five or six (Ribeiro et al., in press). Even so, Jeune and Andersen-Ranberg (2000) consider that it is possible that the comorbidity of centenarians is less serious and that a few specific diseases are less frequent than in younger elderly.

In order to compare the effect of age, the Georgia team developed a longitudinal analysis of sexagenarians, octogenarians, and centenarians' resources within a period of 20 months (Randall, Martin, Bishop, Poon, & Johnson, 2011). The centenarians reported the lowest levels of physical health and functional capacity in instrumental activities (IADLS) during the first assessment and such resources significantly declined over time (Randall et al., 2011). This data is consistent with the "compression of morbidity hypothesis", i.e., rather than experience gradual declinations in overall health and gradual increases in disease-related mortality, individuals appear to experience a longer lifespan of good health truncating in a short period of poor health prior to death (Fries, 1980; Paul, 2011).

Within the health profile of centenarians, sensory deficits tend to be emphasized since the prevalence of sensory impairment in oldest old is substantially higher than in younger age groups. Cimarolli and Jopp (2014) found that 17.1% of their sample had vision impairment, 17.9% hearing impairment and 37.6% dual sensory impairment. Tafaro and colleagues (2009) presented that 54.1% of the cases have hearing impairment and 41.3% visual impairment. Preliminary data from the Porto Centenarian Study showed that 72.6% of the sample was visual impaired and 70.1% hearing impaired (Ribeiro et al., 2013).

Also in relation to functional capacity, the results vary between studies. For instance, in the Australian Centenarian Study 30% of the sample reported severe functional impairment on the objective Katz Activities of Daily Living (ADL) scale, indicating a poor independence in the overall sample (Richmond et al., 2011). In Italy, 26.6% of the subjects were found to be dependent in all six activities considered and the average score of IADL (measured with Lawton and Brody Index) was very low (1.4/8) with 40% of dependent subjects in all IADL (Tafaro et al., 2009).

In a broader analysis, within the Tokyo Centenarian Study, Gondo and colleagues (2006) classified the 304 centenarians interviewed into four phenotypes based on three functional dimensions: sensory loss, physical function, and cognitive function. Only 5 (2%) of the centenarians were classified as exceptional with all of their functions graded as excellent, whereas 56 (18%) were classified as normal, exhibiting retention of fine cognitive and physical function. 167 (55%) were classified as frail, exhibiting impairment of either cognitive or physical function, and the remaining 76 (25%) were classified as fragile, exhibiting deterioration of both physical and cognitive function.

2.2. Social functioning

Living beyond the average of life expectancy necessarily leads to the loss of family and friends. In the case of centenarians, the majority had lost the family members of the same generation (i.e., spouse, brothers, sisters, cousins) and some have even to deal with the loss of a child. Thus, the critical question about social networks and support is whether and how well they have maintained family and community connections at such extreme age (MacDonald, 2007).

The assessment of Georgia centenarians' social network showed that there were significant age differences when compared with sexagenarians and octogenarians for the number of potential visitors, talking on the phone frequency, and existence of primary caregiver: the majority of centenarians had five or more visitors but 3.9% had none, the youngest groups were much likely to talk on the phone daily (75% of the sexagenarians, 63% of the octogenarians and 35% of the centenarians did), and the cases of centenarians having the spouse as caregiver were rare, being more likely to list their offspring (Martin, Poon, Kim, Johnson, & 1996). Friends, family and government services do respond to those unique circumstances, supporting them, yet centenarians are concerned about their dependency, along with the adequacy of their own resources to meet future consumption and health needs (Martin, MacDonald, Margrett, & Poon, 2010).

In what concerns to aspects more related with the quality of their social network, centenarians were just as likely to have a confidant as younger study participants, but they were more likely to report loneliness (Martin et al., 1996). Age differences in loneliness are particularly pronounced with respect to lacking companionship and feeling isolated (Ailshire & Crimmins, 2011). The greater feelings of loneliness are related to the lack of a spouse or partner to provide companionship, and because they have health limitations that may limit their social contact.

The higher rates of widowhood, disease, and disability may lead to a disconnection from the social sphere (Ailshire & Crimmins, 2011). ADL impairment disables centenarians to go to places without help and may inhibit conversations and participation in social activities (Martin et al., 2010). Leisure seems to pose a greater challenge and the oldest old need greater persistence to stay involved with favorite activities (Nimrod, 2011). Facing more constraints to leisure, the oldest old are commonly forced to quit activities they love. Even in Japan, that is considered a culture in which elders are very respected and valued, only 7% of the centenarians took an active part in nonfamily group activities (Homma, Hirose, Inagaki Suzuki, & Wakida, 1999).

Economical resources are an additional concern since centenarians may be living well beyond the years for which their economic resources were expected to last (Martin et al., 2010). Although there were not significantly different from sexagenarians and octogenarians on most aspects of economic resource adequacy (self-assessment), about one in five centenarians reported that their resources were insufficient (Martin et al., 2010). Almost 20% report they did not have enough money for their future needs, namely to meet emergencies, whereby needing financial assistance. Also for Portuguese centenarians, economical concerns were important, since income inadequacy related to medical expenses may predispose centenarians to clinically significant anxiety and be important to their overall well-being (Ribeiro, Teixeira, Araújo, Afonso, & Pachana, 2014).

2.3. Cognitive status

Research on cognitive capacity is an area of crucial interest because centenarians challenge the assumption that almost all oldest old must be demented, given the advance in prevalence of Alzheimer's disease with age (Robine, 2007). Indeed, about one fourth of the centenarian population seems to have no cognitive deficits (Kliegel, Zimprich, & Rott, 2004, in a review of the existing reports). It seems that most of centenarians markedly delay clinical expression of dementia until very late of their long lives (Perls, 2004) and researchers have doubted if in these cases the pathologic aging process can be separated from the normal aging process or is part of it (Gondo & Poon, 2007). That is, the question becomes whether the development of dementia can be seen as an extension of the normal aging or as a separate pathological process.

Results about centenarians' cognitive capacity is one of the most controversial topics in centenarian studies (Gondo, 2013) since there is conflicting evidence about the prevalence rates of cognitive impairment and dementia among the oldest old. Prevalence

figures of cognitive impairment in 100 year olds range from 27% in Sweden (Samuelsson et al., 1997), over 51% in Denmark (Andersen-Ranberg et al., 2001), between 52-59% in Germany (Kliegel et al., 2004), 61.9% in Japan (Gondo et al., 2006) to 67–79% in New England (Silver, Jilinskaia, & Perls, 2001). The disparity among dementia rate in centenarians could be related with methodological issues. According to Poon and coworkers (2012) the variation in demographic characteristics of the study samples could definitely influence the observed prevalence of dementia among centenarians. Hence, convenient samples, which correspond to the majority of the first generations of centenarian studies, may over or underestimate prevalence of dementia. Also, the different cut-off values used to determine dementia, as well as the use of different instruments (Hagberg, Alfredson, Poon, & Homma, 2001; Kliegel et al., 2004; Gondo & Poon, 2007) contribute to the variation of results across studies. In fact, in recent years researchers have been devoted on reviewing cognitive assessment tools and cut-off values in centenarian research. Miller and colleagues (2010) proved that distinguishing between individuals with normal and non-normal (i.e., pathological) cognitive functioning is further complicated by the fact that many non-impaired centenarians as defined by global neurocognitive assessment tools may perform below thresholds for cognitive impairment established with younger samples. As Davey and colleagues (2013) found, 52 of 53 individuals (98%) in the lower cognitive functioning latent class had scores of 20 or lower on the MMSE; among those in the higher cognitive functioning latent class, 54 of 134 individuals (40%) also had a score of 20 or lower. Thus, traditional cut points on cognitive screening measures may not be as indicative of poor function in the oldest-old as they are in younger populations.

2.4. Mental health

Centenarians, as well as the oldest old in general, have not been comprehensively studied in issues related to mental health (MacDonald, 2007). It is therefore important to know more about the mood of centenarians and how they value their lives.

To present date, though scarce on evidence, there is a picture of diversity in what regards to the emotional status of the centenarian population. Whereas there are centenarians who think that they have been forgotten by God and would like to die, there are also those who are still looking forward to their next birthday (Jeune & Christensen, 2005), suggesting that it seems possible to preserve good spirits and sense of humor into very high ages, of which Jeanne Calment was an excellent example. Illustrative of this is her

response when she was asked about her advanced age, and she referred that God, knowing her too well, did not want her nearby him (Jeune & Andersen-Ranberg, 2000).

Studies about depression from the Georgia team have shown high prevalence rates of depressive symptoms. Martin, Rott, Kerns, Poon and Johnson (2000) compared centenarians' depressive symptoms to younger age groups, and also examined predictors of depression. The researchers concluded that the rate of depressive symptoms was found to be high among centenarians (about 25% of community-dwelling centenarians) and higher compared to younger age groups. Even the highly positively selected participants of the Georgia Centenarian Study revealed more depressive symptoms than representative samples of sexagenarians and octogenarians (Martin, Rott, Kerns, Poon, & Johnson, 2000).

In the Australia centenarians' study, 16% of the participants reported symptoms of depression, which was lower than the prevalence of 20% in the general population (Richmond et al., 2011). In Italy, only 12.8% were identified as being depressed, leading the authors to assume that centenarians have good capacity to adapt themselves to the stressing events of their lives (Tafaro et al., 2009). The values of depression symptomatology and the respective difference between studies must be interpreted with caution. Richmond and colleagues (2011) consider the possibility that centenarians underreported symptoms of anxiety and depression in the presence of the caregivers and support people who were present during the interviews (see methodological constraints in studying centenarians – topic 1.2.). Also, that these different prevalence rates could be related with cultural differences and with the use of different instruments in measuring depression (Richmond et al., 2011). Additionally, Martin (2007) recalls that symptoms of depression may overlap with a heightened sense of fatigue, and it is not clear to what extent the high level of general fatigue found in centenarians could be related with depression scores.

In a lesser extent way, some studies have been collecting information on the presence of anxiety symptoms. Generally, all studies agree that centenarians do not present a higher tendency to anxiety. When comparing centenarians with the general population, Richmond and coworkers (2011) presented that 10% of centenarians were found to have symptoms of anxiety, which was lower than the 25% of individuals in the general population that probably will experience an anxiety disorder at some point in their lives. Also the studies of Arnold and colleagues (2010) and Buono, Urciuou, and Leo (1998) revealed that centenarians did not experience more anxiety when compared to octogenarian controls. However, in Portuguese centenarians the rate was found to be

considerably higher (45.4%). This may be related with our cultural context (Ribeiro et al. 2014), in which very old individuals tend to demonstrate high levels of emotional distress (Paúl & Ribeiro, 2008).

Considering that mental health is more than the presence of depression or anxiety symptoms, an important reference is to be made to the well-being of this group. On the subjective well-being level, centenarians have showed lower levels of positive emotions (Poon, Martin, & Margret, 2009) and have evaluated their life satisfaction as fair more often than younger adults; but the largest proportion of them still indicated a good life satisfaction (Martin, Poon, Kim, & Johnson, 1996). The fact that most centenarians were satisfied with their lives was a consistent within the studies from Sweden (Samuelsson et al., 1997), Australia (Richmond et al., 2011), as well as from the Heidelberg Centenarian Study, in which the participants felt happy although they were clearly experiencing substantial constraints in central domains of functioning (Jopp & Rott, 2006). Moreover, centenarians revealed a high degree of valuation of life, which was almost comparable to that of septuagenarians (Rott & Jopp, 2006). This means that life seems to have meaning and appears worth living until the very end of the life span.

Martin (2007) added that on personality traits, centenarians have high scores of emotional stability, i.e., they tend to not worry much, are fairly relaxed, and show low levels of sadness and anger. Also data coming from qualitative studies focusing on what it feels like to be 100, issues about well-being are often raised (Archer et al. 2005; Hutnik et al., 2012). The presence of a good and happy life was often mentioned in their stories and was also associated with current life, as it was transmitted by one of the interviewed centenarian in Hutnik et al's study (2012) who clearly expressed that "I'm perfectly happy to go on as I am, I'm not wishing for anything and I'm glad I've got good health. That's an enormous thing" (p.5).

When looking to the effect of age in mental health, the impact of health and social factors on well-being is an issue that must be considered in further studies. About this, it has been found that very old adults were more satisfied with life than younger elderly adults but only after accounting for marital status, co-morbidities, ADL limitations, and loneliness (Ailshire & Crimmins, 2011). This means that in the absence of these factors, long-lived individuals may be equally or even more satisfied with their lives than younger elderly adults.

2.5. Quality of life

The focus on “adding years to life” of the last century was undoubtedly well succeeded. We are now in a new era of investigation and public policy that is more focused on “adding life to this years” (WHO, 2012). Thus, quality of life is an important outcome to consider in longevity research (Poon et al., 2010). In what regards the study of centenarians, the quality of life has been a largely neglected construct, verifying few publications that deal with the use of specific instruments for evaluation this issue (Serra et al., 2011).

The World Health Organization (1995) established a well-known definition of quality of life as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (p. 1405), valuing non-health associated indicators. Also for centenarian research this biopsychosocial approach is preferable and may provide an effective alternative in differentiating quality of life among persons of exceptional old age (Poon et al., 2010). The few studies that have examined this issue indicate that centenarians have positive quality of life, with most people interviewed referring to have “good” or “very good” quality of life (McCormack, 2002; Richmond et al., 2011). The Swedish Centenarian Study (Samuelsson et al., 1997), for instance, reported that 84% of the centenarians rated their life as very good or good when asked to take the whole life span into account, but only 59% gave the same rating when asked about their present life.

3. Adaptation in centenarians

This course into centenarians’ physical, social and mental functioning allows us to conclude that many centenarians experience a number of limitations. As it was presented by Baltes and Baltes (1990) life includes gains and losses, and in what regards the last years of life this could mean more losses than gains. Centenarians have to confront the challenges of aging, such as long periods of widowhood, living alone, and diminishing physical capacity, within a society that has not yet fully come to terms with the fact that is aging (Day, 1991). As “survivors” they have to face a number of risks and threats, as the loss of their spouses, children and most of their contemporaries, the move to a long-term care facility and perhaps the decrease of economic resources (Martin, da Rosa, & Poon, 2011a). Concomitantly, they have accumulated a century of life events, such as economic depression, world wars and other historical events of each country (Martin et al., 2010). By all accounts, these experiences would make centenarians more vulnerable to mental and physical health changes, leading to a decrease in their well-being. But what is remarkable is that also in well-being there is diversity. Variability is a persistent theme,

from those whose survival is robust and vital to those who are embattled and demented (Hagberg & Nordbeck, 2000).

In what regards the pathways to well-being we could think that centenarians were just lucky and had an easy and pleasured life. But the evidence shows the opposite. They didn't merely survive; instead, many centenarians had to adapt to the cumulative negative events and risks of a long-life and age successfully by maintaining good mental health until the very end of their life (Bishop, 2014; Martin et al., 2010). Different investigations are now looking closely to this issue. In the Greek Centenarian Study, Daviri and colleagues (2010) find in a selected sample a set of adaptive attributes. The participants have successfully adapted to their social environment as they have managed not only to live to 100 or over but most importantly to be happy and functional up to this age (Daviri et al., 2010). The authors conclude that being adaptive at this age means to be prepared and successful in changing ourselves each time life conditions change in order to remain functional and active and maximize our life potential.

The team from the Georgia Centenarian Study concluded that paradoxes present themselves as a matter of course when looking at centenarian's patterns. On the one hand, many centenarians have poor income and their assets are frequently below the poverty level (Martin et al., 2010). They may also lack in family and support system as they frequently outlive their families. But yet, many of them are still happy after all these years (cf. George, 2010) and have good mental health and excellent perceived quality of life (Martin et al., 2010). Also the team from Tokyo found a paradoxical trend in a study with the oldest old (85 to 103 years) about the dissociation between physical function and subjective well-being (Gondo, 2012). Although the depressive mood was higher in the more dependent group, the level of subjective well-being was not different between the dependent and the independent groups. Also, when comparing objective physical functions (grip strength, presence of illness, and instrumental activities of daily living) and subjective evaluations (subjective health and well-being) they only found a significant decline with regard to objective measures in the oldest old group (Gondo, 2012).

A range of literature confirms the critical role of psychosocial adaptation among very old adults as an important predictor of developmental outcomes such as physical and mental health. In order to better understand the individual differences and disparities among centenarians, as well as the risk, protective factors and resources that explain such variability in these outcomes across individuals, different models were proposed. Hagberg (2007), for instance, presented a psycho-physiological model of aging that aimed to explain the variation in functional capacity among centenarians, with a bearing on health,

survival, longevity and quality of life. The basic proposition in his model was that functional differences in very old age are the result of lifelong exposure to the environment but also depend on the person (i.e., the individual capacity to manage the environment as a function of his or her unique personality, psychological and biological characteristics). Therefore, the characteristics of personal disposition are decisive for centenarians' perception and handling of life situation. The Georgia team proposed a similar assumption to that of Hagberg (2007) in their Model of Adaptation (Martin, Hagberg, Poon, & 2012a; Martin, & Martin, 2002; Poon et al., 1992), proving that individual, social and economic resources, proximal life events and behavioral coping skills represent the contribution of adaptation process to positive developmental adaptation outcomes (i.e., physical health, mental health and life satisfaction; Martin et al., 2011b).

According to current theorizing, thriving health implies not merely the absence of disease, but rather older adults' intensive search for positive trajectories and improved levels of emotional, social and cognitive functioning (Fry & Debats, 2010). This could be particularly challenging for centenarians, because they have to be prepared for the hardship of very late life (Martin et al., 2010). Indeed, up-to-date studies highlight the need to examine the unique contexts of later life including the differential experiences and perceptions of octogenarians, nonagenarians and centenarians (Margrett et al., 2010).

Some authors have been questioning the existence of resilience in very advanced age, arguing that the individual's capacity for adaptation would break down in extremely old age, resulting in a phenomenon called "psychological mortality" (Baltes & Smith, 2003). However, several empirical studies have demonstrated the opposite (cf. Rott et al., 2006). Although the availability of resources likely changes over time, individuals possess or have access to a wide range of resources with which they meet the several challenges of advanced age (Hochhalter et al., 2011). Resources may come from outside the person, i.e., the external features, such as social support, social interaction, social engagement, social status and economic and monetary assets, or may be internal or human, i.e., personality-based, resources, including skills, habits, behaviors, commitments and other psychological resources related to control, self-esteem, and goal pursuits, and dispositional traits such as determination, self-confidence and mastery (Boerner & Jopp, 2010; Fry & Debats, 2010; Hagberg & Nordbeck, 2000; MacDonald & Cho, 2011; Schmitt et al., 2006; Shmotkin, 2011). Less attention has hitherto been given to key existential resources, including religion and spirituality (e.g., capacity to know god, spiritual beliefs, values) and personal meaning for life (e.g., serving others, courage).

Fry and Debats (2010) synthesize the different theoretical perspectives, as presented in Figure 5.

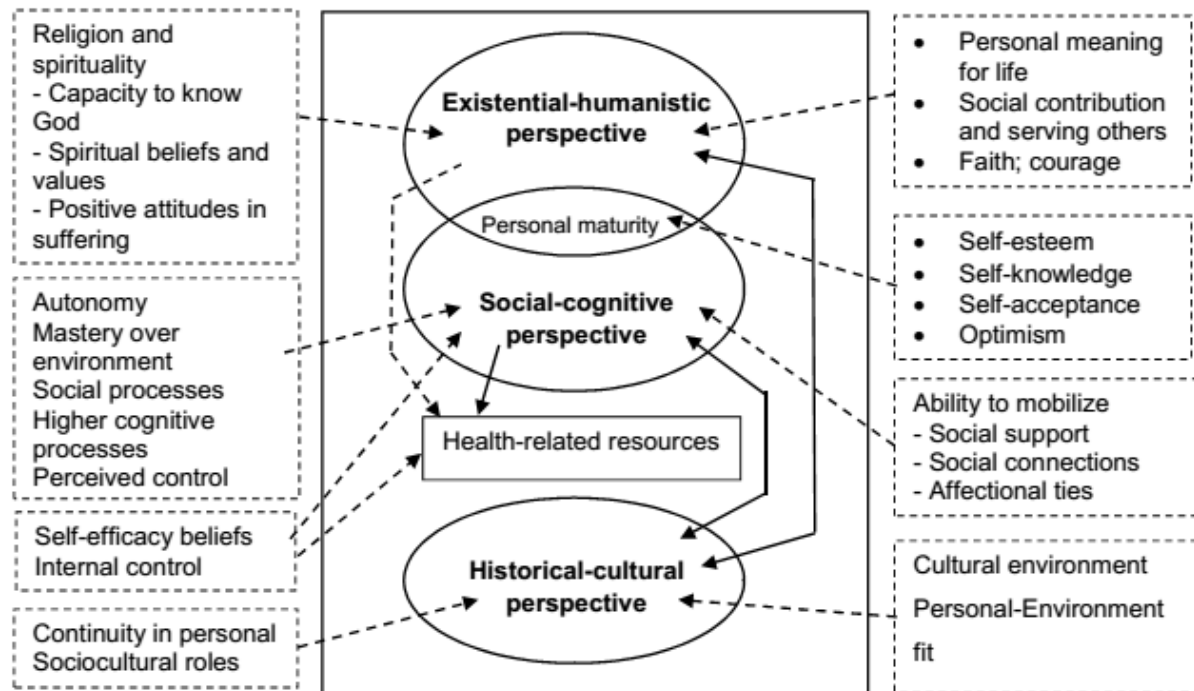


Figure 5. Theoretical perspectives (Fry & Debats, 2010)

The authors also refer to the importance of life strengths, defined as a constellation of inner resources (psychological and existential) and the ability and resourcefulness to draw on resources in the external environment (Fry & Debats, 2010).

3.1. External resources

The importance of social resources to mental and physical health in advanced old age is a well-established fact (Antonucci, Arouch, & Birditt 2014). In the specific case of centenarians, social contact, interaction and support are still important for their lives. More concretely, social support had a strong positive correlation with mental health (Martin et al., 2010«1b), and was one of the predictors for perceived health and happiness (Poon et al., 2010).

Research about centenarians' social resources has demonstrated that in overall they have fairly robust social networks, equivalent to those found in octogenarians' reports (MacDonald & Cho, 2011). Due the fact that only few centenarians still have living spouses and many have lost their children, they have to rely on extended support

networks beyond the immediate family systems (Yang, 2012). Because of their disabling conditions, the availability of social support becomes even more important and for the majority it comes from social interactions (advice, contact, confident) as well as from formal (paid) and informal (unpaid) caregiving (MacDonald, 2007). Thus, besides their own extended family, neighbors and friends, national and municipal governments and also local community members play a crucial role in providing social support to centenarians (Yang, 2012).

Despite the importance of social ties and networks in providing financial, emotional, instrumental and informational sustenance (Yang, 2012), very old adults come to rely on a fewer number of close social affiliations, yet these relationships are considered essential for meeting their goals (Randall et al., 2011). They tend to have a conditional socializing strategy, since they reported that they would keep company or have social relationships with others only under specific terms, i.e., when they identify benefits (Darviri et al., 2010). The importance of social resources can be better understood through the assumptions of conceptual approaches of optimal aging. According to Socioemotional Selectivity Theory, toward very end of life, people may prefer to seek emotionally meaningful experiences in their everyday lives, which affect their choices about whom to interact with socially (Carstensen et al., 1999). Lang and Carstensen (2002) have demonstrated that the oldest subjects reported more emotional closeness with family members and social companions than with those who gave tangible or instrumental support. Also the Social Convoy Model (Antonucci et al., 2014; Kahn & Antonucci, 1980) considers that family and friend support network provide valuable connections and interactions, as well as resources to offset critical personal setbacks.

The tribulations of very advanced age may also impact in the social activities performed, since most centenarians don't practice any productive or social activity (Araújo et al., 2013; Franceschi, Motta, Motta, Candore, & Caruso, 2008; Motta et al., 2005). The loss of physical abilities and resources and the high somatic risks can lead to give up several activities and to prefer more frequent moments of tranquility (Gergen & Gergen, 2010), which is protective in terms of maintaining positive levels of well-being (Boener, & Jopp, 2010). In very advanced age, leisure time activities didn't feature as important factors, since many elders tend to gradually withdraw from social rules and activities (Wong et al., 2014).

These results about centenarians' social functioning puts into question the applicability of the ideas from the Continuity Theory (Atchley, 1989) since the maintenance of lifestyle, life roles and goals is not easily sustainable in very advanced age (Cho, 2011). On the

other hand, the disengagement perspective (Cumming & Henry, 1961) may be more profitable to understand centenarians' well-being (Bishop & Martin, 2011). As the SOC model posits, throughout the lifespan there are changing, cumulative and discontinuous processes involving the interplay of gains and losses in strengths and resources (Baltes & Baltes, 1990). Change is to be expected, and adjustments and adaptation to changing roles and environments is fundamental to resilience functioning. Thus, centenarians tend to engage in fewer but more selected (optimized) activities, particularly the ones that permit their social and personal pursuits (MacDonald, 2007).

Income and financial resources can be important determinants of well-being and mental health. Although it is true that "money can't buy happiness," it can purchase medical services and medications, formal services, utilities, food, and other vital things (Yang, 2012). Economic resources were found to be a component of adaptation (cf. The Model of Developmental Adaptation, Martin & Martin, 2002). Centenarians with low economic status were more likely to have higher negative affect than those with high economic status, regardless of the number of negative life events (Martin et al., 2011b); economic security countered for the variance in perceived health and happiness (Poon et al., 2010); and perceived economic and status economic resource adequacy were important mediators of the influence of functional health on mental health (Martin et al., 2000; Tigani, Artemiadis, Alexopoulos, Chrousos, & Darviri, 2011; Martin et al., 2011b). Also in the Porto Centenarian Study, economic resources were important to centenarians' overall well-being, more specifically income inadequacy related to medical expenses was found to be an important predictor of anxiety (Ribeiro et al., 2014).

Bearing in mind that older adults tend to experience a decline in income after retirement and, after decades without work, centenarians might be in extremely difficult economic circumstances (Yang, 2012), a greater attention must be given to income or income adequacy in this population. In their study about Georgia centenarians' social and economic resources, MacDonald and Cho (2011) revealed that about 33% of proxy informants reported that the centenarians did not have sufficient finances to meet emergency needs, compared with only 16.7% for octogenarians, and this difference, potentially occurring in other countries and cultures, may be quite disturbing.

3.2. Internal resources

3.2.1. Cognitive skills

Presently, the predictive effect of cognitive skills on adaptation in later life is not of full agreement. The Georgia Centenarian Study found that individuals with higher levels of cognitive functioning tend to demonstrate better outcomes in mental health, ability to perform activities of daily living and lower mortality (Poon, Martin, & Margret, 2009). Cognitive functioning proved to be an essential determinant of subjective well-being among persons living 100 years and longer, since intelligence was substantially related to morale (Poon et al., 1992) and cognitive functioning was associated with greater emotional feelings of meaning and happiness (Poon et al., 2009). Also Tafaro and colleagues (2009) found that cognitive impairment corresponds to low stress adaptability and a higher tendency to anxiety. However, in the Heidelberg and Swedish Centenarian Studies the effect of cognitive status on happiness and life satisfaction was marginal (Jopp & Rott, 2006; Samuelsson et al., 1997).

3.2.2. Personality

There is ample evidence that personality traits contribute to adaptation or maladaptation in later life (Lima, 2012; Poon et al., 2009). Personality traits and states can be seen as individual resources that help centenarians to adapt and cope with their own limitations (Martin, 2007; Martin, Kliegel, Rott, Poon, & Johnson, 2008). Personality was been identified as a predictor of cognition, physical health, loneliness (Martin, Hagberg, Poon, 1997) and mental health (Martin et al., 2000). The influence of personality in overall functioning occurs in many ways. For instance, low levels of tension and high levels of extraversion predicted relatively high levels of morale (Adkins, Martin, Poon, & 1996) and valuation of life (Rott & Jopp, 2006); high levels of agreeableness were positively correlated with satisfaction with life (Vilhena, 2015); high levels of neuroticism predicted difficulties in their ADL and mental health (Martin, 2007).

Several studies have systematically assessed the personality traits of centenarians through standardized personality inventories. The comparisons of results across age groups have suggested that centenarians share particular personality traits. The Georgia Centenarian Study reported that centenarians have a “robust” personality (Martin, 2007), scoring moderately on extraversion, openness, conscientiousness and agreeableness but low in neuroticism (Martin et al., 2006). Perls and Silver (1999) described the personality of New England centenarians as “stress-resistant”, with high emotional stability,

adaptability and low levels of negative emotionality. Similarly, Japanese centenarians were reported to have higher levels of extraversion and conscientiousness (Masui, Gondo, Inagaki, Hirose, & 2006), and Italian centenarians were rated as extroverted, open-minded and presenting good emotion stability (Tafaro et al., 2009). The Swedish Centenarian Study showed that centenarians appeared more easygoing, relaxed, capable, and efficient than the Swedish mixed-age population (Samuelsson et al., 1997).

Martin, Bishop, Poon and Johnson (2006) noted that the cluster of emotional stability, conscientiousness and extraversion is particularly prevalent in long-lived individuals. Low level of neuroticism (or high levels of emotional stability), higher levels of extraversion and conscientiousness are the most consistent personality traits found in centenarian studies (Martin, 2007). Extraverted individuals may be more resourceful in obtaining social support (Rott & Jopp, 2006) and conscientiousness has been tied to healthy behaviors (e.g., engaging in physical exercise) and avoidance of risk behaviors (e.g., excessive drinking and smoking) (Chapman, Roberts, & Duberstein, 2011).

3.2.3. Coping

In addition to a robust or resilient personality, coping is considered a personal resource that helps to adjust to age-associated changes (Martin et al., 2008). Coping mechanisms employed by late life survivors (e.g., social comparison and accommodation of goals) seem to have a potential impact on reports of mental and physical health (Margrett et al., 2010).

The coping strategies that individuals use to deal with the several negative events that occur during live, which are more frequent and challenging in very old age, can reduce the consequences of the event and even contribute to the development of the individual (Afonso, 2012). Although it has already been recognized that centenarians have an active coping style (Perls & Silver, 1999), only in recent years their coping profile was more detailadly described. The results of age group differences suggest that centenarians sowed lower scores in behavioral coping but maintained high levels of cognitive coping (Martin et al., 2008). Centenarians were particularly likely to “rely on religious beliefs”, “take things a day at a time” and “to accept health problems” (Martin et al., 2001). The decrease in behavioral modes of coping may be associated with the lack of resources and skills necessary to engage in that type of coping (e.g., better mobility to seek help, larger social support system; Martin et al., 2008), and in a higher tendency to use their thoughts and reflections when coping with adversity (Poon, Martin, Margret, & 2009). The use of cognitive regulation techniques, on the other hand, allow centenarians to adapt well to the

significant changes in their lives (Poon et al., 2009). Jeanne Calment's life principle is very illustrative of a realistic and not behavioral sense of coping: "If you can't do anything about it, then don't worry about it" (Martin, 2007).

Studies about specific cognitive regulation techniques have pointed out that successful adaptation and coping were positively related to high levels of religiosity (Archer et al., 2005). Centenarians may increasingly rely on religious and spiritual modes of coping (e.g., praying and relying on religious beliefs) when dealing with problems because more direct behavioral coping modes are increasingly hard to use (Martin, 2007). Religion and spiritual beliefs are considered meaning-based coping (Wong et al., 2014) that mediate the impact of negative event outcomes on resulting emotions. The impact of positive emotions in stress and coping process, through meaning beliefs, was introduced in Folkman and Lazarus's revised model (1984 cit in Lazarus & Lazarus, 2005) which proposes that people facing an unfavourable resolution or no resolution may engage in meaning-based coping, whereby experiencing positive emotions (Lazarus & Lazarus, 2005). Another strategy identified in centenarians' studies was comparing them to people who are worse off or who had incurred greater losses than they had experienced (Groger & Leek, 2008).

3.2.4. Beliefs, attitudes and control

The restrictions verified in objective characteristics and basic resources, namely health functioning, may potentiate the effect of self-referent beliefs and attitudes toward life on happiness. That was one of the main hypothesis of the Heidelberg Centenarians Study that Jopp and Rott (2006) proved to be right. These authors emphasized that prominent studies of subjective well-being in younger populations demonstrated the influence of beliefs and attitudes (perceived control, self-efficacy, and optimism) and concluded that these psychological factors have a strong impact and remain essential for happiness in extremely old age (Jopp & Rott, 2006). Nevertheless, little was known about how this factors influence well-being in centenarians.

The sense of control reflects the extent to which individuals believe that their behavior will influence outcomes in their life (Bandura, 1997). Although the sense of control is recognized as an important source of human life-strength, its negative implications for resilient aging, as well as the preference of control across ages are only now being considered and fully addressed (Fry & Debats, 2010). As individuals age, their primary control (creating modifiable goals that conform their wishes) may decrease, but their secondary control (adjusting beliefs and goals in response to nonmodifiable conditions)

may be more stable and malleable (Hyer, Yeager, & Scott, 2011). It seems that there are some conditions of advancing age in which the perception of higher level of primary control is more likely to induce stress as opposed to having beneficial impact (Fry & Debats, 2010). Thus, it would be expected that elders who accept that declining control over environment comes with aging, and who focus on their ability to control their own internal states and their own behaviors, demonstrate a more successful adjustment to aging (Hyer et al., 2011).

The degree of tenaciousness in goal pursuits is another individual strategy that may have specific features in advancing old age. Tenacious pursuits of goals coupled with the potential for non-realization and non-accomplishment of those goals can be detrimental (Carstensen, Fung, & Charles, 2003). Instead, giving up goals was found to be protective in terms of maintaining positive levels of well-being (Boener & Jopp, 2010). This could be an example of a selection strategy, as presented in SOC model (Baltes & Baltes, 1990), i.e., reducing the number of activities, goals or domains to focus on those areas that are most important in one's life (Lang & Carstensen, 2002), according to environmental demands, individual motivations, skills and biological capacities (Bishop & Martin, 2011).

Also optimistic outlook and purpose in life are important resources of individuals' internal world (Jopp & Rott, 2006). They include believing that live as a purpose, and having aims and objectives for living (Frankl, 2012; Reker, 1977). According to Freeman and colleagues' recent study (2013), almost all centenarians were able to positively reflect on their life's achievements while recognizing that they still had a purpose and direction for the future. This optimistic outlook has a strong impact for centenarians' happiness (Jopp & Rott, 2006).

3.2.5. Religion and spirituality

Complementarily to the focus placed on individuals' psychological capacities and resources as sources of life strengths accounting for individuals' resilience, there is now emerging an alternative and compelling field of study that recognizes the importance of individuals as existential beings (Fry & Debats, 2010). In fact, investigators have already acknowledged that religious and spiritual behaviors serve as personal resources that improve adaptation and protection against poor physical and mental functioning (Pargament, 1997), and that very old adults not only have to face several physical and mental health challenges but also may fail to derive basic, conditional or personal

resources (Bishop, 2011). Thus, they tend to shift their priorities to energies, or spiritually meaningful resources and activities (Krause, 2008).

Archert and colleagues (2005) found that religiosity was one of the major themes that emerged from the qualitative analysis about adaptation and coping in the lives of the centenarians. When asked about the most important thing in their lives, 58% of the respondents mentioned the church and/or the Lord (Archert et al., 2005). Also Fairfield, Mammarella and Domenico (2013) found that centenarians remembered religious pictures better than common emotional items. Manning, Leek and Radina (2012) found that centenarians placed considerable importance on the divine support in their lives. The narratives collected in this study indicated that for these centenarians there exists an interconnectedness of spirituality with religion, or, in other words these two constructs are overlapped.

Despite some unconformity, spirituality and religiosity tend to be considered related rather than independent constructs (Hill et al., 2000; Patrick, 2014). Religion has come to be defined as a system of ideas or ideological beliefs and commitments, whereas spirituality has been commonly used in reference to the experiential and subjective identification of religious experience (Hill & Pargament, 2008). Centenarians tend to present the importance of religion in their lives, both in terms of their affiliation to the church and also on a more personal, spiritual level (Archert et al., 2005). As a coping style, their belief in God has provided a buffer of support when dealing with hardships. Specifically, centenarians from the Ohio Long-Term Care Research Project have discussed how faith, their connection with God, and the practice of Christianity have served as support mechanisms in advanced age (Manning et al., 2012).

Tornstam (2005) in his empirical Gerotranscendence Theory hypothesized that old-old adults typically maintain a propensity toward the transcendent, which can be considered as a major psychosocial resource of developing maturity. In very advanced old age, individuals demonstrate a greater preference for deriving meaning from religion and spirituality, representing energy resources that aid adaptation and allow persons to improve their well-being (Bishop, 2011; Krause, 2005; Manning et al., 2012). More specifically, religious coping behaviors (e.g., prayer, church attendance, seeking religious-based support) may reduce undesirable problems or emotions to the point of enhancing well-being (Lazarus & Lazarus, 2005). Also in relation to perceived control, a sense of control through the sacred may come when life seems out of control (Wong et al., 2014). As referred by a centenarian female in Archert's study: "You see life one day at a time... you got some people who want to live a week and a day. I live one day at a time. Let God

see about the future. The future is hold in God's hands. Whatever happen will happen" (Archert et al., 2005).

These findings herein support the notion that for centenarians, positive spirituality may very well be the so-called the "forgotten factor" in Rowe and Kahn's (1998), theory of successful aging as advocated by Crowther et al. (2002).

3.3. Successful aging

The exceptional capacity of some centenarians to deal and overcome constrains of such an advanced age, has motivated many researchers to search for associated key factors and traits. Thus, in the past decade, several papers have dealt with the examination of the centenarian' phenotype as a model for healthy aging (Andersen-Ranberg et al., 2001; Engberg et al., 2009; Hitt et al., 1999) and successful aging (Cho et al., 2012; Gondo, Nakagawa, & Masui, 2013; Motta et al., 2005).

Motta and coworkers (2005), for example, addressed this issue in a study with 602 centenarians from the Italian Multicenter Study on Centenarians. Framed by the Rowe and Kahn's original model of model of successful aging they found that 20% of the total sample were free of invalidating chronic diseases, were autonomous, with good physical and presented good cognitive capacities (Motta et al., 2005). However, even this selected group did not maintained any social or productive activity and therefore could bot be labeled as a phenotype of successful aging. This same conclusion was obtained by Gondo and his team (2006) with a sample of 304 individuals from the Tokyo Centenarian Study: only 20% met the criteria for successful aging, 2% were classified as 'exceptional', with all of their functions graded as excellent, 18% were classified as 'normal', exhibiting retention of fine cognitive and physical function, and the great majority (55%) was classified as 'frail', exhibiting impairment of either cognitive or physical function. The remaining 25% were classified as 'fragile', exhibiting deterioration of both physical and cognitive function (Gondo, 2012). Lately, Cho and colleagues (2012) analysed a sample of 234 centenarians from the Georgia Centenarian Study, and found that 29.5% had low probability of disease, 4.4% satisfied the physical and cognitive capacity criteria and 57.5% were engaged with life, but none of the centenarians satisfied all three components of successful aging at the same time (Cho et al., 2012). In face of these results, authors from the three mentioned studies suggested that current theories of successful aging may be applicable to a hight proportion of age ranges, but not the entire aging process from 60 to 100 years old and that alternative approaches are hence needed (Motta et al., 2005; Cho et al., 2012; Gondo, 2012). Based upon such need, Cho et al. (2012) suggested that

instead of low probability of disease, high cognitive/physical functional capacity, and active engagement in life, alternative criteria should include subjective health, perceived economic status, and happiness.

Based upon these criteria, their results demonstrated that from the 234 centenarians that didn't full filled all Rowe and Kahn's original criteria, 47.5% could be classified as "successful" if definitions of subjective health, perceived happiness and better perceived economic status were used as definitions of successful aging (Cho et al., 2012). Self-rated health represents the adaptability of individuals to changing health status, serving as one of the most important determinants for psychological well-being in later life (Cho, 2011). Together with happiness and perceived economic status, these criteria may represent psychological and social mechanisms that centenarians use to compensate for physiological decline, which allows some of them to age successfully (Cho et al., 2012). Also Gondo (2012) found that centenarians who were physically frail but cognitively intact showed the same level of subjective well-being as the normal group.

When physical and functional aspects are compared with psychological and well-being ones, some paradoxical results may arise. Previous research of centenarians and other very old individuals has demonstrated that oldest-old adults manage to maintain a fair to good level of well-being despite deficits in more objective measures (Araújo & Ribeiro, 2011; Pinquart & Sorenson, 2000). Martin and colleagues concluded from their experience within the Georgia Centenarian Study, that survivors into very late life celebrate age, in spite of physical decline (Martin et al., 2011a). In that sense, oldest old adults appear to overcome a false dichotomy of physical and mental state, and other attributes or reference domains become valued and important.

The fact that elderly gradually shift their priorities, strategies and concerns was one of the premises of Baltes and Baltes's SOC model (1990). While throughout adult life those resources are invested in maintenance and optimization, during old age the main challenge is the need to regulate and compensate the potential limitations and negative changes that occur in physical, cognitive and social conditions (Baltes, Freund, & Li, 2005). As compensatory mechanisms, psychological factors seem to be more important than expected. Thus, news formulations based on alternative domains of successful aging are needed. Gondo (2012) suggested as alternative non-logical models, which correspond to previous assumptions from important theories as Erikson's (1997) ninth stage of psychosocial development and Tornstam's (2005) Gerotranscendence. Specially this last one advocates that persons in exceptional old age typically remain emotionally connected to humanity, retain an affinity for the past, seek redefinition of self in space and time,

prefer solitary or meditative moments, and lack concern for material possessions (Tornstam, 2005). This can involve a decline in self-centredness and an increase in the amount of time spent in quiet reflection, which can be positive, in contrast to the negative withdrawal suggested for example by Cumming and Henry (1961) in their Disengagement Theory. Solutions may come in the form of spiritual support when other forms of social supports are lacking and a sense of control through the sacred may be provided (Wong et al., 2014).

Other alternative formulations beyond successful aging that emphasize existential issues have been present in gerontological research, namely in the works of Wong (2000), who claimed that the untold story of successful aging is about positive attitudes towards life and death, especially spiritual and existential quests. This line of reasoning was also suggested by Young and colleagues (2009) who introduced spirituality in the sociological domain of successful aging and by Crowther and coworkers (2002) who presented positive spirituality as the forgotten factor of successful aging (see Chapter 1). According to Gondo's experience on oldest old research, the means and endpoints of successful aging are different for each age range, i.e., no single theory can be applicable to the entire aging process from 60 to 100 years old (Gondo, 2012). In very advanced age, when function and cognitive capacity have declined considerably such that intentional control is no longer sufficient, a non-logical approach must be more seasonable (Figure 6). This view is more comprehensive and inclusive, since successful aging becomes attainable for everyone with positive meanings and well-being, regardless of his or her physical condition.

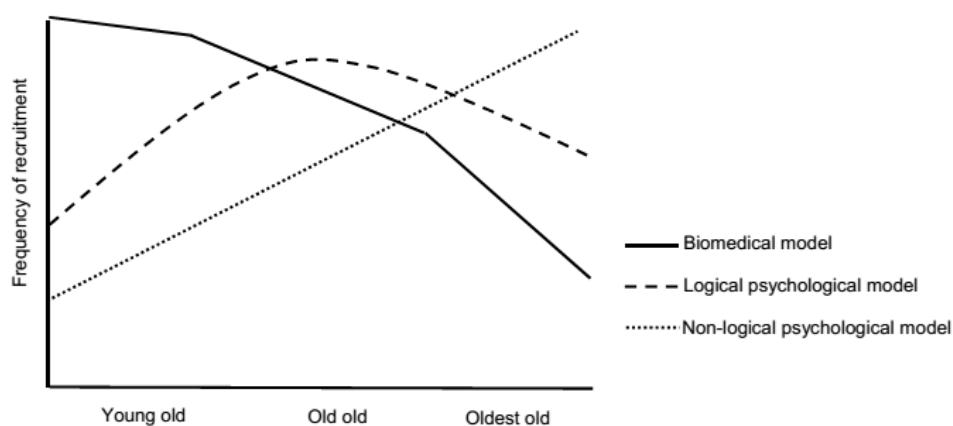


Figure 6. Shift model of successful aging (Gondo, 2012)

The study of successful aging in centenarians has been stressing that the most important for the status of “successful agers” is their tremendous resilient capacity to improve in the face of challenge, because it explains how one might move beyond usual aging toward the positive extreme of the aging continuum (Hochhalter et al., 2011). As a consequence of this, the theme of resilience has received quite a bit attention in recent centenarian’s research (Martin et al., 2010).

Resilience can be thought of as a process of successfully adaptation to maintain or regain emotional well-being in the face of adversity (Trivedi, Bosworth, & Jackson, 2011), which is positively correlated with self-rated successful aging (Lamond et al., 2008). For being resilient, i.e., to overcome distress and optimize positive outcomes, both human and social capitals are important (Clark et al., 2011). The resources within the person includes a supply of skills and abilities that can be used to moderate the bad things that happen to reduce or blunt the negative consequences of those events, or even in some cases to lead to positive growth and development (Yates & Masten, 2004). Centenarians have been presented as individuals who possess a “strong character” expressed by self-confidence, independence, and strength of will (Willcox, Willcox, & Suzuki, 2001) so they may be special phenotypes of resilience, as is reflected in their life journeys of deprivation, poverty, hardship, and oppression, which reinforce that longevity was not the result of having avoided stress but rather of having responded to it in an efficient and effective manner (Perls & Silver, 1999; Martin et al., 2011a; Bishop, 2014).

The goal of staying healthy, autonomous and productively engaged in life is not a realistic one for oldest old. The goal of a longer and positive aging is to adapt, to make the best of our situation, even in the presence of chronic illness and decline. At one hundred years old being successful and resilient is not postponing decline, but instead be prepared to the losses when they occur. And, of course, subjectively interpreting it and its consequences.

Chapter III

Goal and context of this thesis

In the preceding chapters, we have reviewed research focusing successful aging since Rowe and Kahn's first publication in 1987. These authors have ignited a discussion about the possibility of success during aging stages, including related-issues of what it means to age successfully, what should be included in a model of successful aging, and how successful aging should be measured. Despite the recognized importance of this model, this discussion still persists nowadays, as it can be seen in the most recent special issue of "The Gerontologist" (monthly leading scientific publication of the Gerontological Society of America) which was explicitly devoted to successful aging research. This special issue brings together contributes from different scholars in a multidisciplinary dialog about successful aging (Pruchno, 2015). Conceptual manuscripts, as well as empirical research recall the rich history of successful aging research and present sophisticated approaches, encouraging the future development of new conceptual ideas, research, and practice. From the identified questions that the next generation of gerontologists must address, it is highlighted (i) by Martin and colleagues (2015) the need to integrate physical and psychological aspects of successful aging and to better understand the way successful aging can encompass disability and dying; (ii) by Foster and Walker (2015) the benefits of the European perspective of "active aging" because of its comprehensive focus and emphasis on societal as well as individual responsibility; and (iii) in the papers of Fabbre (2015), Fredriksen-Goldsen, Kim, Shiu, Goldsen, and Emlet (2015) and Cho, Martin, and Poon's (2015) the interest of extending successful aging to a host of populations heretofore excluded from successful aging' studies. On this matter, Fabbre (2015) and Fredriksen-Goldsen et al. (2015) focused on Lesbian Gay, Bisexual, and Transgender (LGBT) populations, whereas Cho et al. (2014) analyzed the experiences of centenarians and octogenarians, presenting several issues that may be specific of these age groups and have been marginalized within previous research.

The new directions taken in contemporary successful aging studies have shown to be particularly important to understand the vicissitudes of very advanced age. Prior research on long-lived individuals has indeed confirmed that among individuals who survive to exceptional old age there is a high prevalence of disease and disability as well as impaired cognitive performance (Chapter II). However, some studies also point to the existence of individuals that despite experiencing health and functioning declines are still able to maintain a high quality of life with respect to their social and psychological well-

being (Poon et al., 2010; Jopp & Rott, 2006). Thus, while the predominant conceptual framework for understanding the aging process places a strong emphasis on health and functioning, a more inclusive conceptualization of successful aging, focusing on well-being and psychosocial domains, seems to be the only possible pathway to understand successful aging in centenarians.

It's the more recent discussion around Rowe and Kahn's model and the centenarians' capacity to live and deal with the constraints of such an advanced age that have motivated this study. We believe that these still require a deeper consideration and that it is a topic worth the effort to study in our Portuguese centenarians. Therefore, the present thesis brings together eight studies that were conducted in order to (i) explore the concept of "successful aging" in centenarians and (ii) to capture the underlying factors allowing centenarians to adapt successfully to very old age. The first three studies are theoretical reviews aimed to gather a deep understanding on several issues related with well-being and centenarian's research. The last five are empirical outputs that specifically analyze the criteria, domains, predictors and mediators of successful aging and well-being in centenarians. Each of the papers' objectives are presented on Table 2. The studies were conducted under a broader project of Portuguese centenarians described below.

Main goals	Outputs
Literature reviews articles	
Gather evidence on the key conceptual and empirical approaches of well-being in old age developed within positive psychology studies	Araújo, L., Ribeiro, O., & Paúl, C. (submitted). Aging and Positive Psychology: A scoping review. <i>Canadian Psychology</i> . [Chapter IV, Study 1]
Understand the particularities of social relationships in very advanced life and their adaptive value for centenarian well-being	Araújo, L., & Ribeiro, O. (2012). Centenários: que redes sociais. <i>Revista Kairós</i> , 15, 57-74. Centenarians: what about their social relationships? [Chapter V, Study 2]
Systematize what this specific age group has in common in what regards QoL, with a special focus on the contributions of psychosocial factors.	Araújo, L., Ribeiro, O., & Paul, C. (2011). Dinâmicas psicossociais e a sua contribuição na qualidade de vida dos centenários [Psychosocial dynamics and their contribution to centenarians' quality of life]. In: M.E. Chaleta et al. (Coords.), <i>Livro de Atas do II Congresso Internacional Interfaces da Psicologia</i> (pp. 195-214). Évora: CIEP. [Chapter VI, Study 3]
Empirical research articles	
Present the psychometric properties of the Portuguese version of the Positive Valuation of Life Scale (Lawton et al., 2001)	Araújo, L., Ribeiro, O., Teixeira, L., Azevedo, M.J., Jopp, D., & Paul, C. (accepted). Measuring well-being in old age: Positive Valuation of Life Scale for Portuguese older adults. <i>Quality of Life Research</i> . [Chapter VII, Study 4]
Clarify whether centenarians are able to be successful agers according to objective and subjective criteria of no major disease and disability, high cognitive and physical functioning and engagement with life	Araújo, L., Ribeiro, O., Teixeira, L., & Paul, C. (submitted). Successful Aging at 100 years: The Relevance of Subjectivity. <i>Aging & Mental Health</i> . [Chapter VIII, Study 5]
Validate a multidimensional model of successful aging in a sample of Portuguese centenarians	Araújo, L., Ribeiro, O., Teixeira, L., Afonso, R.M., & Paúl, C. (submitted). A Multidimensional Concept of Successful Aging in Centenarians. <i>Aging Clinical and Experimental Health</i> . [Chapter IX, Study 6]
Identify subgroups of centenarians sharing communalities in successful aging profiles, and determine the role of sociodemographic factors and psychological, social and economic resources on successful aging	Araújo, L., Ribeiro, O., Teixeira, L., & Paúl, C. (submitted). Predictors of Successful Aging. <i>Research on Aging</i> . [Chapter X, Study 7]
Explore the role of existential beliefs in mediating the influence of health on centenarians' well-being	Araújo, L., Ribeiro, O., & Paúl, C. (submitted). The role of existential beliefs within the relation of centenarians' health and well-being. <i>Journal of Religion and Health</i> . [Chapter XI, Study 8]

Figure 7. Main goals of the studies

The Oporto Centenarian Study

The Oporto Centenarian Study, as the first population-based centenarian study in Portugal, aimed to explore the characteristics of a sample of Portuguese centenarians using a multidimensional and comprehensive approach, as well as to contribute to the understanding of the longevity phenomenon, particularly the role of psychological and social resources (Ribeiro et al., 2014). Due to this interest on psychosocial aspects, a consortium with the Heidelberg centenarian study, known for this kind of approach was accomplished (Jopp & Rott, 2006). Such collaboration was established in 2011 between the University of Porto and the Institut für Gerontologie, Ruprecht-Karls-Universität Heidelberg, with financial support from CRUP's Luso-German Integrated Actions and from the Research Unit on Aging (UNIFAI/ICBAS-UP). The Project was entitled "Centenarians: a cultural-based approach of psychological resources".

The first year of the project was dedicated to prepare the methodological procedures of the Portuguese study, namely defining assessment tools and identifying participants. In order to compare findings in a cross-cultural perspective, the assessment protocol was defined according to that used in the second Heidelberg Centenarian Study (HD100-II) and the one adopted in the Fordham Centenarian Study (FCS), a research project from the United States (New York) that joined the partnership late 2011. In overall, the assessment protocol included information about the centenarians' general characteristics (e.g., socio-demographic and economic information), health (e.g., diseases, subjective health), cognition, functional capacity, nutritional status, well-being and psychological distress (e.g., satisfaction with life, anxiety), personal resources (e.g., personality), social network and support (e.g., family relations, use of formal services), among several others. The majority of these dimensions were evaluated through well-known and validated instruments, such as the Mini Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975; Guerreiro, Silva, Botelho, Leitão, & Garcia, 1994), the Older Americans Resources and Services Multidimensional Functional Assessment Questionnaire (OARS, Fillenbaum & Smyer, 1981; Rodrigues, 2008), and the Geriatric Depression Scale (Yesavage et al., 1983; Apóstolo et al., 2014) to name a few.

In a first stage, a pilot study with centenarians living outside Porto was conducted. A group of 8 centenarians living in the areas of Aveiro and Viseu and reflecting the similar sociodemographic characteristics as the ones' presented in literature was interviewed. This sample comprised 6 female and 2 males, the youngest with 100 years old and the oldest with 104 (mean age of 101.5, SD=1.4), with a lower level of education (mean of school years of 2.9, SD=3.5). Two centenarians were in nursing homes and 6 in the community.

The pilot study allowed testing several methodological procedures, such as the explanation of the study to the centenarians and their proxies, the invitation to participate in the study, age validation and informed consent procedures, and the adequacy and length of the assessment protocol. At the same time, progress on centenarian's identification was being made.

In order to obtain a representative sample of the general population, a geographical area was defined. This kind of methodology allows achieving comprehensive sampling, with broad distribution of cognitive abilities, living arrangements, and health and functional capacities (Sachdev, Levitan, & Crawford, 2012). Thus, the potential participants were from a defined geographical region of approximately 60 km around Porto, comprising the 16 municipalities of the Porto Metropolitan Area: Santo Tirso, Trofa, Espinho, Gondomar, Maia, Matosinhos, Porto, Póvoa do Varzim, Valongo, Vila do Conde, Vila Nova de Gaia, Arouca, Santa Maria da Feira, Oliveira de Azeméis, São João da Madeira, and Vale de Cambra¹. According with data from the last National Census, this area had a total of 1 477 440 inhabitants, 18.7% aged 65 and more years old, and 182 individuals with 100 and more years old (INE, 2011). The municipality with more centenarians was Porto (51) and the ones with the lower number were Arouca (2) and São João da Madeira (2).

In order to identify the participants, permission to access the national voter register was ensured by the *Comissão Nacional de Proteção de Dados* (CNPd). All inhabitants who were aged 100 years and more between December 2012 and December 2013 were identified through voter registration files. Since these files only have information on name, data of birth and address, and a significant amount of information was outdated (i.e., many centenarians had died a long time ago), additional methods for identifying centenarians were used. Contacts with all the nursing homes listed in the Social Security Institute (i.e., *Carta Social*), parish councils and parish churches of the Porto Metropolitan Area were made. Media announcing centenarians' birthdays were contacted. The project was presented to the general public in scientific events², in the media³, and in the web⁴. In addition, during data collection, the participants who were interviewed also contributed to identify centenarians or other people who knew centenarians. This snowball technique proved to be effective. This first step of recruitment provided 186 potential participants. Although all these centenarians, and respective families and/or caregivers, were

¹ The municipality of Paredes was congregated in the Metropolitan Area of Porto in 2013, after the data collection of this study and therefore was not included.

² E.g., "Seminário: O Envelhecimento Ativo: Moldando o Futuro", organized by the "Instituto Nacional de Saúde Dr. Ricardo Jorge".

³ E.g., report "Há 1500 portugueses com mais de 100 anos" presented in the "Jornal de Notícias"

⁴ www.pt100.pt and <https://pt-pt.facebook.com/pages/PT100-Estudo-dos-Centen%C3%A1rios-do-Porto/549593211737187>

contacted, 140 were effectively face-to-face interviewed. The other 46 centenarians were subsequently excluded because they died in the interim or their relatives refused participation because of dementia, severe health problems, or lack of interest.

Information was collected during one or two sequential sessions, directly with the centenarian and/or with proxies' respondents at their own homes or any other place of their convenience. The interviews were video and audio recorded and included two interviewers simultaneously. The proxies were family or friends with frequent and close contact with the centenarian and in case of centenarian living in a nursing home, the reference professional was also interviewed. As internationally recommended (cf. Poulain, 2001), age validation was accomplished with multiple, convergent and validated sources, such as identity card or birth certificate and crossing information on life events. An informed consent, previous approved by the CNPD and the ICBAS Ethical Commission, for participating in the study was used. In these documents, the authorization for video and audio recording the interviews was considered.

The studies presented on chapters IX, X and XI also use a subsample from the Beira Interior Study. This was a satellite study from the Porto centenarian study, developed between 2013 and 2014, in the interior part of the country, around the city of Guarda. The satellite study adopted the same methodology as the main study, and one hundred centenarians were interviewed (Afonso, 2014).

PART 2 - REVIEW AND EMPIRICAL STUDIES

Chapter IV

Hedonic and Eudaimonic well-being in old age through
Positive Psychology studies: a scoping review

Hedonic and Eudaimonic well-being in old age through Positive Psychology studies: a scoping review

Abstract

The study of aging through the lens of Positive Psychology allows looking beyond the decline normally associated with advancing of age and to consider rewarding experiences and strategies to promote a meaningful aging. In order to gather evidence on the key conceptual and empirical advancements that illustrate the commitment of Positive Psychology with aging issues a scoping review was conducted. Papers having “Positive Psychology” AND “Aging” (or similar words to aging) on their title, abstract or key-words were screened across main databases and aging related terms were searched in well-known journals of positive psychology. From the 94 results initially identified, 48 articles, 33 original scientific papers and 15 reviews, were analyzed. Main themes, study designs and instruments are presented and the endpoints are discussed according to the hedonic or eudaimonic perspective of the studies. Future directions related with the importance of more comprehensive constructs and method approaches in the study of advancing age are highlighted.

Key-words: Positive Psychology; Aging; Hedonism; Eudaimonia; Well-being; Scoping Review

Introduction

Positive Psychology has emerged in recent years as a breath of fresh air. The focus on positive aspects of human experience, like positive subjective experience, positive individual traits, and positive institutions, has been overcoming the traditional models based on pathology that had dominated different disciplines over the years (Seligman & Csikszentmihalyi, 2000). Although positive psychology has roots in the humanistic psychology, which focused heavily on happiness and fulfillment, it was only in the end of 20th century that it began as a new area of psychology. This branch of psychological sciences has been recognized thanks to several achievements of a core group of researchers and professionals that succeeded the establishment of positive psychology networks and research centers, and other structural elements of a structured discipline as

the publication of books, journal special issues and journal articles, themed conferences, specific graduated courses, among others (Linley, Joseph, Harrington, & Wood, 2006). Nevertheless, despite this great scientific development there are still inconsistencies and opposing perspectives about what well-being is, and how positive psychology should be approached (Gallagher, Lopez, & Preacher, 2009).

One of the most controversial issues in the study of positive psychology is the disagreement between hedonic and eudaimonic perspectives regarding concepts and pathways to well-being (Keyes, Shmotkin, & Ryff, 2002). This separation has its origins in philosophical traditions that are clearly different. The hedonic well-being arises in Greece, fourth century B.C, and is understood as the pursuit of sensation and pleasure (Ryan & Deci, 2001). Here, subjective well-being (SWB) is the most widely used approach, encompassing three core components: life satisfaction, the presence of positive mood, and the absence of negative mood (Diener, Suh, Lucas, & Smith, 1999). On the other hand, the eudaimonic perspective has its roots in Aristotle's postulations, and presents well-being as the realization of one's true potential (Ryan & Deci, 2001). The psychological well-being (PWB) is one of the most accepted approaches of eudaimonic well-being and according to Ryff's conceptualization, taps six distinct aspects of human actualization: autonomy, personal growth, self-acceptance, life purpose, mastery, and positive relatedness (Ryff & Keyes, 1995). Although different in their definition of well-being, emergent assumptions point to the importance of valuing simultaneously hedonic and eudaimonic perspectives instead of comparing both, since each one denotes important and complementary aspects of well-being (Henderson & Knight, 2012).

The emergence of Positive Psychology has already led the field of gerontology into a movement known as "positive aging" which has emphasized the individual responsibility on life satisfaction and happiness at old age (Hill, 2005). Therefore, the long-standing past contributions that had already a focus on positive, healthy and adaptive functioning (Ryff, 2003) were recognized and strengthened. The transition associated with the onset of aging can be particularly difficult and challenging since there may be a number of occurrences such as retirement, a slowdown of activity, the loss of loved ones, perhaps chronic illness, and even acute illnesses or disability (Paúl, 2007). Within a positive approach, studies that investigate the factors associated with a successful, fulfilled and happy aging have emerged in recent years. An example can be the Harvard Medical School's study of adult development which has reinforced many other researchers' conclusions in referring that close, long-lasting, and meaningful relationships, as well as engagement in purposeful activities are essential to happiness, and a sense of well-being and a sense of a life well lived in later years (Vaillant, 2002). This focus on successful

aging was originally developed by Rowe and Kahn (1997), which stated the three well-known components of success in advancing age: (i) freedom from disease and disability, (ii) high cognitive and physical functioning, and (iii) social and productive engagement. Also the Selective Optimization with Compensation model (Baltes, & Smith, 2003) seeks to deal with age-related changes and deficits by praising empowerment strategies, based on investment in positive aspects, like resources, styles and behaviors that are adaptive to the new constraints of aging.

The global phenomenon of population aging is a powerful and transforming demographic force with many possible repercussions. The comprehension of its' impacts at the national and global levels as well as the implications in the individual is just in the beginning. People aged 65 or older are projected to grow from an estimated 524 million in 2010 to nearly 1.5 billion in 2050, with most of the increase in developing countries (WHO, 2011). This scenario raises several questions, namely if population aging will be accompanied by a longer period of good health, a sustained sense of well-being, and extended periods of activity, or will it be associated with more illness, disability, and dependency. The urgency of rigorous and coordinated research to close gaps in the available knowledge and the need for action based on evidence-based policies have been suggested by international and well-known entities as the National Institute on Ageing (NIA, 2011) and the World Health Organization (WHO, 2011).

A perspective on positive human functioning and growth in later life allows to consider strategies of adaptation and promoting opportunities for positive change through adult life. But much effort in achieving a scientific understanding and developing effective interventions to build thriving in individuals in later life are need. It seems important to have a systematic overview of the investment of Positive Psychology research in the study of aging in order to identify what has been covered by previous scholars, indicate gaps in previous research and route the way forward for further research. For this reasons, a scoping review of scientific articles published over the last decade was conducted.

Method

Aiming to respond our research question: "*which has been the investment of Positive Psychology research in the study of aging?*" this systematic review inquires the extent, range and nature of the publications of Positive Psychology about aging, particularly analysing the two hedonic and eudaimonic approaches of well-being; complementarily it aims to summarize research findings and identifying gaps. The choose for a scoping

review is justified by the nature of this type of literature review, since the purpose was to appraise and summarize the body of available research literature without assessing study quality; furthermore, this review design allows a preliminary assessment of potential size and extent of available studies and to identify the nature and extent of research evidence (Booth, Papaioannou, & Sutton, 2012).

For this scoping review the methodological framework of Arksey and O'Malley (2005) was used. It is based on five stages: identifying the research question, searching for relevant studies, selecting the studies, charting the data, and collating, summarizing, and reporting the results. Following this steps, a brief search of literature was conducted to identify the most reasonable keywords and research strategy. A search of the electronic databases SCOPUS, Web of Science, PsycINFO and PUBMED was conducted. The terms "Positive Psychology" AND "Aging" and other expressions related to aging (e.g., "later life", "older people", "old age", "elderly") were searched in the title, abstract and keywords across the databases. Only articles from peer-review journals, published in the last ten years (2003-2013) and written in English were searched. In order to broaden the view on the aging-related research, the same criteria were used for searching "Aging" and similar words in recognized journals of the international forum for the science and application of positive psychology (Journal of Positive Psychology, Journal of Happiness Studies and Journal of Psychology of Well-being). For selecting the studies, titles, key-words, abstracts and, in some cases, the full article was read. Bearing in mind this study's main purpose, some exclusion criteria were also applied: documents that were editorials or author's commentaries or had no article available, and had considered samples of individuals aged less than 60 years old were not included in this review (see Figure 1).

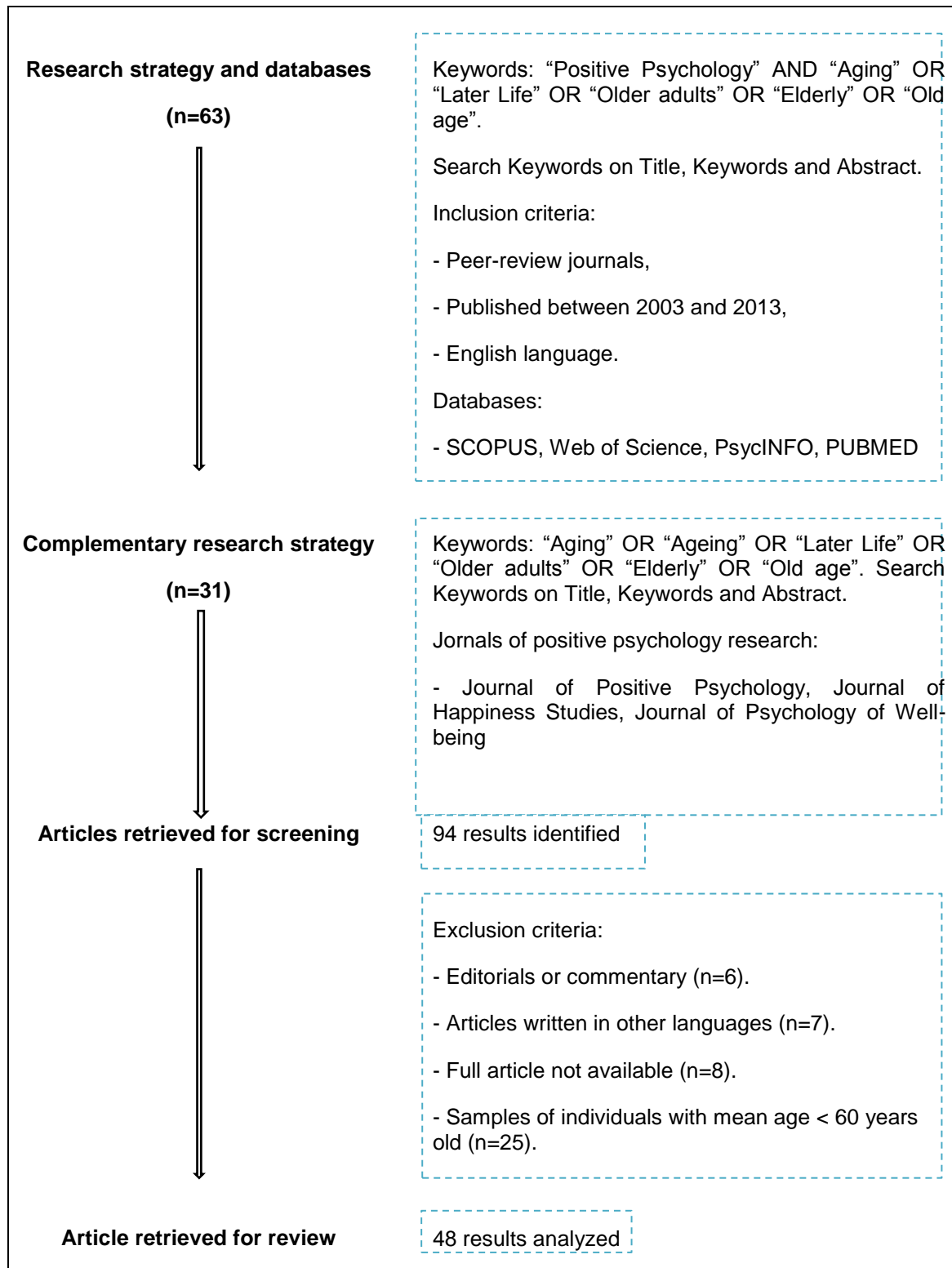


Figure 1. Search strategy and results.

The next stage of the work involved 'charting' key items of information obtained from the primary sources (original scientific papers) and secondary sources (reviews). This procedure, considered "descriptive-analytical method" within the narrative tradition (Arksey & O'Malley, 2005), involves applying a common analytical framework to all the results and collecting standard information on each study. Information was recorded as follows: positive psychology main domains (usually identified in the title, key-words, or dependent variable), type of study, sample and outcome measures (only for primary researches). Main results/conclusions of the papers were summarized and classified according to their well-being approach: (i) hedonic, (ii) eudaimonic and (iii) integration of both (in primary researches). This process had required the analysis of each paper by two researchers and was guided by important bibliographic sources that clarify the main assumptions of hedonic and eudaimonic approaches (e.g., Ryan & Deci, 2001; Henderson & Knight, 2012; Waterman, 1993).

Therefore, the studies with a clear focus on pleasure, happiness, good life, subjective well-being and related topics were classified in the hedonic category and examined as a whole. The same happened with the studies about human potential, personal growth, meaningfulness and other themes that are consistent with a eudaimonic perspective. A third category grouped the studies that sought to combine topics and measures considered by both emotional (hedonic) and psychological (eudaimonic) well-being. At the final stage of collating, summarizing and reporting the results, an attempt was made to identify patterns and directions in the findings, making a new whole out of the parts. The main topics, research methods and domains approached were highlighted, allowing having a framework of the main issues covered by Positive Psychology in the field of aging and later life.

Results

As shown in Figure 1, 94 sources were identified for review. A total of 48 results were ultimately included in the scoping review. Of these, 33 original scientific research articles (primary sources) and 15 results were reviews (secondary sources).

Studies included in this review approached different constructs of well-being and related topics under investigation. The most frequent topics were life satisfaction (n=11), happiness (n=10), subjective well-being (n=10), positive affect (n=7), optimism (n=6), perceived control (n=5), coping (n=3), hope (n=3), psychological well-being (n=3), self-concept (n=3), sense of coherence (n=3), spirituality (n=3), positive attitudes toward aging (n=2), purpose in life (n=2) and mindfulness (n=2). Altruism and humor emerged in

1 article each one. The last four topics, also referred in 1 publication, were related to very specific approaches to well-being and clearly assumed by their authors as emerging themes that should be further studied. These topics and respective references were positive health (Seligman, 2008), positive neurology (Kapur et al., 2013), positive contributory value of older workers (Peterson & Spiker, 2005) and positive life-span musicianship (Brodsky, 2011).

In relation to the methodology used in the original research articles, 29 used quantitative and 4 qualitative methods, with samples that varied substantially in terms of dimension. Well-being was often considered as outcome or dependent variable in the investigation of factors that were associated with well-being, namely health (e.g., Griffin, Mroczek, & Spiro, 2006), hope (e.g., Isaacowitz, Vaillant, & Seligman, 2003) and coping resources (e.g., Tovel, & Carmel, 2013). Some other studies looked for change in well-being with aging (e.g., Gana, Bailly, Saada, Joulain, & Alaphilippe, 2013a.). A smaller part considered well-being as a predictor of functioning (e.g., Brummett, Babyak, Grønbaek, & Barefoot, 2011), as a protector against decline (e.g., Ostir, Ottenbacher, & Markides, 2004) and as a moderator factor that enables older people to maintain mental health (Wiesmann & Hannich, 2013b).

As expected, qualitative studies had smaller samples ranging from 8 participants (Baker & Ballantyne, 2013) to 35 participants (Chaitin et al., 2013). Among quantitative studies the smaller sample had 56 individuals, aged between 60 and 93 years old and with a mean age of 71.2 (Ramírez et al., 2013); the biggest sample had 18345 individuals aged from 50 to 70 years old and with a mean age of 60.4 (Horner, 2012). This variation is related with the purpose and design of these studies, since the first one is about the effect of an intervention program using experimental and control groups, and the other is based on three National and European surveys (SHARE - Survey of Health, Ageing, and Retirement in Europe; English Longitudinal Study of Ageing; Health and Retirement Study). Most quantitative studies (n=15) included samples between 100 and 500 older adults; 3 studies used samples between 500 and 1000; and 10 studies had more than 1000 participants.

In what regards to the data collection methods, a huge diversity of well-being instruments was identified (see Table 1). The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) and the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985) were the instruments more often used, followed by the Scales of Psychological Well-Being (Ryff & Keyes, 1995) Sense of Coherence Scale (Antonovsky, 1987) and Subjective Happiness Scale (Lyubomirsky & Lepper, 1999). The other 34

instruments identified were used in only one or two different studies. The use of general questions about happiness and life satisfaction was also found.

Table 1. Summary of instruments from primary sources

Instruments of Well-being	N	References
Center for Epidemiological Studies Depression Scale (Radloff, 1977)	6	Keng & Wu, 2013; Palgi, 2013; Tweed & Tweed, 2011; Wood & Joseph, 2010; Ai, Peterson, Tice, Bolling & Koenig, 2004; Ostir, Ottenbacher, & Markides, 2004
Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985)	6	Gana, Bailly, Saada, Joulain, & Alaphilippe, 2013a ; Gana et al., 2013b; Godoy-Izquierdo, Moreno, Pérez, Serrano, & García, 2013; Palgi, 2013; Ramírez, Ortega, Chamorro, & Colmenero, 2013; Oishi, Whitchurch, Miao, Kurtz, & Park, 2009
Scales of Psychological Well-Being (Ryff & Keyes, 1995)	4	Kim, Sun, Park, & Peterson, 2013a ; Kim, Sun, Park, Kubzansky, & Peterson, 2013b; Palgi, 2013; Wood & Joseph, 2010
Sense of Coherence Scale (Antonovsky, 1987)	3	Cowlshaw, Niele, Teshuva, Browning, & Kendig, 2013; Wiesmann & Hannich, 2013a; Wiesmann & Hannich, 2013b
Subjective Happiness Scale (Lyubomirsky & Lepper, 1999)	3	Angner, Ghandhi, Purvis, Amante, & Allison, 2013; Ramírez et al., 2013; Tovel & Carmel, 2013
General Self-Efficacy Scale (Sherer & Adams, 1983)	2	Godoy-Izquierdo, et al., 2013; Tovel & Carmel, 2013
General questions about life satisfaction (e.g., “In general how satisfied are you with your life as a whole these days?”)	2	Peterson, Chatters, Taylor, & Nguyen, 2013; Schilling, Wahl, & Oswald, 2013
General questions about happiness (e.g., “Taking all things together, how would you say things are these days?”)	2	Peterson et al., 2013; Tadic, Oerlemans, Bakker, & Veenhoven, 2013
Life Orientation Test (Scheier & Carver, 1985)	2	Godoy-Izquierdo et al., 2013; Ai et al., 2004
Life Satisfaction Index (Neugarten et al., 1961)	2	Keng, & Wu, 2013; Tovel, & Carmel, 2013
Philadelphia Geriatric Center Positive Morale Scale (Lawton, 1975)	2	Tovel & Carmel, 2013; Wiesmann & Hannich, 2013b
Positive and Negative Affect Schedule (Watson et al., 1988)	2	Etezadi & Pushkar, 2013; Griffin, Mroczel, & Spiro, 2006
Self-Esteem Scale (Rosenberg, 1965)	2	Wiesmann & Hannich, 2013a; Wiesmann & Hannich, 2013b

SF-36 Health Survey (Bullinger, 1995)	2	Wiesmann & Hannich, 2013b; Brummett, Babyak, Grønbaek, & Barefoot, 2011
Affect Balance Scale (Warr et al., 1983)	1	Godoy-Izquierdo et al., 2013
Bradburn affect balance scale-positive emotion(Bradburn, 1969)	1	Tweed & Tweed, 2011
Control, Autonomy, Self-realization, and Pleasure scale (Hyde et al., 2003)	1	Horner, 2012
Dutch Scale of Subjective Well-being for Older Persons (Groningen, The Netherlands; Tempelman, 1987)	1	Koopmans, Geleijnse, Zitman, & Giltay, 2010
Dispositional Coping Inventory (Carver et al., 1989)	1	Etezadi & Pushkar, 2013
Generalized Self-Efficacy Scale (Schwarzer & Jerusalem, 1995)	1	Wiesmann & Hannich, 2013b
Goal-Management Scale (Wrosch et al., 2003)	1	Tovel & Carmel, 2013
Happiness Scale (Godoy-Izquierdo & Godoy 2006)	1	Godoy-Izquierdo et al., 2013
Hope Scale (Snyder et al., 1991)	1	Ai et al., 2004
Life Engagement Test (Scheier et al. 2006)	1	Etezadi & Pushkar, 2013
Memorial University of New Foundland Scale of Happiness (Kozma & Stones, 1980)	1	Dai, Zhang, & Li, 2013
NEO-PI (for Emotional Instability, i.e., neuroticism) (Costa, & McCrae, 1985)	1	Tweed & Tweed, 2011
Perceived Control Scale (Lachman & Weaver, 1998)	1	Etezadi & Pushkar, 2013
Personal Wellbeing Index (International Wellbeing Group, 2006)	1	Broadbent, Quadros-Wander, & McGillivray, 2013
Positive and Negative Affect (Mroczek & Kolarz, 1998)	1	Palgi, 2013
Preparation for Future Care Needs (Sorensen & Pinquart, 2001)	1	Tovel & Carmel, 2013
Questions on Life Satisfaction (Henrich & Herschbach, 2000)	1	Wiesmann & Hannich, 2013a
Religious Involvement Scale (Chatters, Levin, & Taylor, 1992)	1	Ai et al., 2004
Satisfaction with Life Scale (Carmel & Mutran 1997)	1	Tovel & Carmel, 2013
Satisfaction with Life Scale (Pavot, Diener, Colvin, & Sandvik, 1991)	1	Isaacowitz, Vaillant, & Seligman, 2003
Spirituality Perspective Scale (Reed, 1987)	1	Cowlshaw et al., 2013
State-Trait Anxiety Inventory (Spielberger, 1983)	1	Ai et al., 2004
SOC questionnaire (Freund & Baltes, 2002)	1	Tovel & Carmel, 2013
Three-Dimensional Wisdom Scale (Ardelt, 2003)	1	Etezadi & Pushkar, 2013
Using Private Prayer as a Means for Coping (Ai et al., 2002)	1	Ai et al., 2004
Will To Live (Carmel, 2011)	1	Tovel & Carmel, 2013
16-Strength Questionnaire of Values in Action Classification of Character Strengths (Peterson & Seligman, 2002)	1	Isaacowitz et al.,2003

The main endpoints of primary research were analyzed according to the well-being approach of each study as previously stated: hedonic, eudaimonic and integration of both (Table 2). This categorization of results allowed to identify 16 results with a focus on hedonic well-being, 6 on eudaimonic and 11 on both approaches simultaneously.

As presented in table 2, in the studies about subjective well-being, health was the topic more frequently investigated. Main results highlight the influence of health and functional competence in happiness and life satisfaction, and to the influence of positive affect and life satisfaction in health. Other topics further studied in association with subjective well-being (in 3 papers each) were: age/longevity, with controversial results about the influence of age in life satisfaction; external resources, with results presenting the influence of social support, family, economic resources and health insurance in subjective well-being; and retirement, showing, for instance, that working older individuals are not happier than nonworking. Another paper evaluated the outcomes of intervention, presenting an increase in life satisfaction and happiness through a program training of autobiographical memory, forgiveness and gratitude; and in another one, that associated personality with affect, was presented that higher level of extraversion contributes to higher levels of positive affect.

Within studies with a clear eudaimonic approach, health as a core topic was present in two papers, with results that point to the contribution of purpose in life in protecting against certain diseases (e.g., stroke). Other topics associated with psychological well-being were: age/longevity, showing that a sense of stability contribute to positive attitudes towards common age-related constraints; external resources, with familial and social characteristics contributing to self-concept and resilience; intervention, with an art program that had provided opportunities for autonomous engagement and congruent self-expression; and religion/spirituality, focusing on the contribution of religious faith to the agency component of hope and dispositional optimism.

Finally, in those studies that gathered hedonic and eudaimonic perspectives of well-being, health retained also a pivotal role, being the topic more often addressed, with findings about the contribution of self-efficacy, sense of coherence, social support and proactive coping to successful aging and mental health even in the presence of decline in health and functioning. Results about topics previously presented (age, external resources, intervention and religion/spirituality), were also found. Specific analysis on the relation between subjective and psychological well-being in advancing age was present in five studies, showing that perceived control, sense of coherence, hope and self-esteem

have a contribution to life satisfaction in older adults. Such relation and other associations are presented in Table 2.

Table 2. Summary of main results from primary sources

Hedonic	N	References (N=16)
<u>Health and Subjective well-being</u> Health contributes to happiness and life satisfaction; Functional competence contributes to life satisfaction; Positive affect contributes to a less decline in functional status and better health; Life satisfaction did not contribute to health; Psychiatric disorders and mood disorder were associated with life satisfaction.	9	Angner et al., 2013; Dai et al., 2013; Gana et al., 2013b; Peterson et al., 2013; Schilling et al., 2013; Brummert et al., 2011; Griffin et al., 2006; Ostir et al., 2004
<u>Age/Longevity and Subjective Well-being</u> No age-related decline of life satisfaction; Increase in life satisfaction with age; Happiness contributes to lower mortality.	3	Gana et al., 2013a; Gana et al., 2013b; Koopmans et al., 2010
<u>External resources and Subjective Well-being</u> Family and economics contribute to subjective well-being; National Health Insurance contributes to happiness and life satisfaction; Positive emotion is associated with more social support received and provided even among people reporting elevated distress.	3	Dai et al., 2013; Keng & Wu, 2013; Tweed & Tweed, 2011
<u>Personality and Subjective Well-being:</u> Higher extraversion contributes to higher levels of positive affect and lower neuroticism to higher levels of negative affect.	1	Griffin et al., 2006
<u>Intervention and Subjective Well-being</u> Program training autobiographical memory, forgiveness and gratitude leads to an increase in life satisfaction and happiness.	1	Ramírez et al., 2013
<u>Retirement and Subjective Well-being</u> Working older individuals are not happier than nonworking; Individuals facing formal retirement at age 65 or later experience an increase in subjective well-being; Retirees who value practicality factors (e.g., easy access to medical services) felt happier.	3	Tadic et al., 2013; Oishi, et al., 2009; Horner, 2012
Eudaimonic	N	References (n=6)
<u>Health and Psychological Well-being</u> Purpose in life contributes to prevent and protect against heart disease;	2	Kim et al., 2013a; Kim et al., 2013b

<u>Age/Longevity and Psychological Well-being</u> A balancing process of re-appraisal enhanced resolution and the sense of stability contribute to positive attitudes towards common age-related constraints.	1	Wolverson et al., 2010
<u>External resources and Psychological Well-being</u> Familial and social hardships that have been faced contribute to self-concept and resilience.	1	Chaitin et al., 2013
<u>Intervention and Psychological Well-being</u> Arts participation contributes to enhance eudaimonic well-being by providing opportunities for autonomous engagement, growth-related cognitive and creative challenge and congruent self-expression.	1	Swindells et al., 2013
<u>Religion/spirituality and Psychological Well-being:</u> Religious faith factors contributed to the agency component of hope and dispositional optimism indirectly through the use of prayer as a coping strategy.	1	Ai et al., 2004
Hedonic and Eudaimonic	N	References (N=11)
<u>Health and Well-being</u> Self-efficacy, sense of coherence, social support and proactive coping contribute to successful aging and mental health even in the presence of decline in health and functioning; Physical health contributes to life satisfaction; Low positive well-being contributes to depression.	4	Tovel & Carmel, 2013; Wiesmann & Hannich, 2013a; Wiesmann & Hannich, 2013b; Wood & Joseph, 2010
<u>Age/Longevity and Well-being</u> No suppression of self-control with age; Old-old participants maintain a higher general positive sense of Psychological well-being than midlife and young-old participants; Older adults had higher levels of interpersonal and self-regulatory strengths.	3	Broadbent et al., 2013; Palgi, 2013; Isaacowitz et al., 2003
<u>External resources and Well-being</u> Social support contributes to life satisfaction; Citizenship and loving relationships contribute to life satisfaction.	2	Wiesmann & Hannich, 2013a; Isaacowitz et al., 2003
<u>Intervention and Well-being</u> Song writing stimulated positive emotions and meaning.	1	Baker & Ballantyne, 2013
<u>Religion/spirituality and Well-being:</u> Spirituality contributes to a meaningful appraisal of life situation.	1	Cowlshaw et al., 2013
<u>Relationship between Subjective and Psychological Well-being</u> Primary perceived control contributes to life satisfaction;	5	Broadbent et al., 2013; Etezadi & Pushkar, 2013; Godoy-Izquierdo et al., 2013; Wiesmann & Hannich, 2013a;

Perceived control and life engagement with an increased use of problem focused and positive reappraisal coping contribute to emotional well-being associated with wisdom; Affect balance, life satisfaction, sense of autonomy contribute to happiness; Sense of coherence, everyday competence and self-esteem contribute to life satisfaction; Hope contributes to life satisfaction.		Isaacowitz et al., 2003
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Discussion

Taken together the results selected from the search process (Figure 1), we can have a broad picture of the investment of Positive Psychology in aging and later life research over the last 10 years. This review presents important clues on issues recently aroused both at a conceptual and empirical levels related to the definition and measurement of well-being. The look of Positive Psychology towards older age is still much related with happiness and life satisfaction; on the contrary, issues about the meaning and hope at this life stage, as well as the self-concept of an older adult were found to be present, but clearly in a less representative manner. Comparing specifically two of the best known models of well-being, subjective well-being (Diener, Emmons, Larsen, & Griffin, 1985) for hedonic formulation, and psychological well-being (Ryff & Keys, 1995) for the eudaimonic, there is a greater emphasis on the first one. Ten of the thirty-three primary sources analyzed had addressed “subjective well-being” as main theme and 6 has used the “Satisfaction with Life Scale” (Diener et al., 1985). On the other hand, three had specifically referred “psychological well-being” as main topic and four had used the “Scales of Psychological Well-being (Ryff & Keys, 1995).

Positive psychological traits and resources associated with adaptation to longer life constitute another theme quite examined throughout the studies presented in this review. Optimism, positive attitudes toward aging, purpose in life, resilience and coping as examples of important personal strengths and psychological processes to maintain (or regain well-being in the face of adversity) are extremely important since this life stage is characterized by diverse conditions of challenge and loss (Aldwin & Igarashi, 2012; Tovel & Carmel, 2013). Other interesting topics we’ve identified that are increasingly being studied are religion/spirituality and successful aging. Religion and spirituality have most recently become part of well-being studies as key factors of positive psychological states in old age (Cowlshaw, Niele, Teshuva, Browning, & Kendig, 2013). Conversely, the concept of successful aging has been studied extensively in last decades, with a high impact in gerontological research, since it assumes the possibility for continued growth and development in old age. Distinct formulations have been presenting this concept as

not only good physical and cognitive functioning (Rowe & Kahn, 1997), but also associated with the capacity for cognitive growth (Ryff, 1989), life satisfaction (Neugarten, Havighurst & Tobin, 1961) and adaptation to change and the achievement of personal goals (Baltes & Smith, 2003). More recently, it seems remarkable to highlight the study of this approach in the presence of decline in health and functioning. Such an approach intends to clarify resources associated with adaptation and, subsequently, be promoted through specific interventions (e.g., Tovel & Carmel, 2013).

The methodology should also be subject of consideration, namely the lack of qualitative studies which is a finding that deserves some attention since the older population might have sensory and cognitive deficits that can be better overcome through interviews and open questions about well-being issues (Rodgers & Herzog, 1992). A huge diversity of available well-being instruments was also an astonishing result, which may reflect the lack of congruence in methodologies and the difficulties of a proper comparison of findings across studies, but in other hand it also means the great interest and efforts doing in the field of the well-being study. Another fact to deserve mention relates to the three studies on intervention (Ramírez et al., 2013; Swindells et al., 2013; Baker & Ballantyne, 2013) since they prove that appropriate programs (e.g., song writing, art performance) can enhance well-being in advancing age. Although interesting and with promising results, a greater emphasis on the development of empirically validated interventions aimed to promote flourishing in older adults is required.

The confront between hedonic and eudaimonic endpoints proved to be a challenge since their motivations are often very closely linked, but in most papers it was clear the emphasis in only one perspective. Thus, also in gerontological research there is a tendency to consider separately the two general perspectives. The results also reflected a largely investment in hedonic perspectives, which is justified by Waterman (1993) who argues that this approach enjoy more scientific consensus, as it had been investigated for a longer period. Nevertheless, themes within this eudaimonic perspective were also identified, mainly referring to meaningful pursuits that promote purpose and growth in life. There were also found studies with joint investigations of feelings of happiness and its association with human strengths and virtues that produce an array of meanings in life, which leads to conclude that integrated models, which have been so acclaimed by different authors (e.g., Delle Fave, Brdar, Freire, Vella-Brodrick, & Wissing, 2011), are being considered. Recent trends are questioning if eudaimonia is a goal to be achieved or is it a means of reaching well-being (Cohen-Mansfield & Poon, 2011), reinforcing that subjective well-being (hedonic) may be reached though psychological well-being (eudaimonic). We believe that this subject deserves further research, due its potential on

adaptive functioning in aging. Although the goal of this article was not to add further commentary to this debate, it seems important to emphasize the fact that a greater investment in integrated models remains essential in aging studies for detecting differences and synergies among them and their specificities in old age.

Some reflections about the limitations of this review are required: firstly, a several issue is the restriction to sources related with positive psychology. This approach may exclude important research on well-being in old age that did not mention "positive psychology" or was not published in positive psychology related journals but this scope review aims, precisely, to analyze the specific focus of positive psychology on aging issues. Other limitations are related with the fact that only the databases of scientific papers were searched and probably important results could be found in books and grey literature on the topics under analysis. Also the fact that only English language sources were retrieved and reviewed can be seen as a limitation and must be considered in future reviews. The review did not account for study quality, relying on peer review. The reconstruction of findings presented in the review did not account for cultural influences, which is something often neglected though an important issue in aging research, since being old has different meanings across family and society organizations.

A final word is to be said on the importance of looking forward our obtained results, and in that sense we believe a special attention is ought to be given to the following aspects: (i) the unique characteristics of later life, as well as the phenomenon of population aging that is occurring in all countries over the world justify a greater investment and attention on issues related to well-being; (ii) new methodological developments concerning multilevel modeling and construct comparisons (hedonism and eudaimonism) and studies with new approaches that are coming up (namely flourishing and optimal experience) must be developed; (iii) the mixed method approach may have more advantages in studies of this kind, since they combine the benefits of validated instruments with the potential of open questions and answers, of particular value to an older population.

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Chapter V

Centenários: que redes sociais

[Centenarians: what about their social relationships?]

Centenários: que redes sociais⁵

Centenarians: what about their social relationships?

Lia Araújo e Oscar Ribeiro

Resumo: As relações sociais têm sido apontadas como um inigualável recurso de adaptação, principalmente na fase mais avançada da vida, em que os constrangimentos e perdas são crescentes. A revisão dos principais estudos que focam a dimensão social do envelhecimento no grupo dos muito idosos, com ênfase especial nos centenários, permite apresentar as especificidades que as relações sociais assumem nesta fase da vida, bem como reconhecer o seu valor adaptativo, enquanto estratégia de compensação de perdas e aumento do bem-estar.

Palavras-chave: Centenários; Relações sociais; Longevidade.

Abstract: Social relationships have been identified as a crucial coping resource in later life due to the increasing number of losses and constraints that characterize that period. The present review shows the characteristics of social relations in advanced age, with a special focus on centenarians, and confirms both their adaptative value and their contribution in enhancing well-being.

Keywords: Centenarians; Social relationships; Longevity.

Introdução

As consequências de uma longevidade sem precedentes têm feito emergir uma série de estudos sobre as características e especificidades da população idosa e muito idosa, designadamente sobre as relações sociais e emocionais que caracterizam aqueles que são considerados os “sobreviventes únicos” de uma geração, os centenários. Seja pela estimada redução progressiva das redes sociais horizontais e aumento das relações

⁵ Araújo, L., & Ribeiro, O. (2012). Centenários: que redes sociais. *Revista Kairós*, 15(2), 57-74.

intergeracionais no seio familiar, seja pelos constrangimentos decorrentes da acrescida vulnerabilidade física que compromete uma articulação mais estreita com o mundo exterior, o certo é que o carácter distinto e único destas relações sociais tem suscitado um inegável interesse científico, sobretudo quando se reconhece o peso significativo que as mesmas têm na qualidade de vida (Bowling & Browne, 1991; Wagner, Schutze & Lang, 1999).

Com efeito, as relações sociais têm sido identificadas como um recurso primordial ao longo de toda a nossa vida (Antonucci & Ajrouch, 2007), e atualmente sabe-se que com o avanço da idade surgem inegáveis alterações na sua qualidade e quantidade, fruto das próprias particularidades do envelhecimento. A diminuição da capacidade física, com consequente redução da mobilidade, e a perda de pessoas conhecidas e/ou significativas resultam numa redução dos contactos sociais, tornando-se cada vez mais difícil permanecer socialmente ativo. Vários estudos transversais (Baltes & Myer, 1999) e longitudinais (Palmore, 1981) dão conta desses fatos ao concluir que os níveis de interação social declinam com o envelhecimento. No entanto, é de notar que uma grande parte destes estudos analisa o grupo dos idosos como um todo, negligenciando as especificidades das várias idades que se enquadram na categoria “pessoas idosas”. Num cenário de profundas alterações na distribuição de idades da nossa população, e que resultam não só no aumento do número de pessoas idosas, mas principalmente, do número de membros na categoria de pessoas mais velhas, torna-se essencial estudar isoladamente este grupo. O aprofundamento acerca dos contornos das relações sociais em idades muito avançadas e acerca do modo como os recursos sociais contribuem para a adaptação ao dia a dia constitui uma necessidade evidente na investigação gerontológica, onde emergem várias questões como: Terá o prolongamento dos anos de vida implicações na forma como os muito idosos se relacionam socialmente? As reduções dos contactos sociais devem ser entendidas como uma consequência negativa e involuntária do envelhecimento ou, pelo contrário, como uma estratégia de sobrevivência que permite minimizar os riscos e aumentar o bem-estar?

É na linha destas inquirições que se situa o presente artigo ao sistematizar, de modo compreensivo, as especificidades das relações sociais no grupo dos muito idosos. Recorrendo a uma pesquisa em editoras internacionais de publicações científicas, realizada através da biblioteca de conhecimento on-line (b-on), seleccionaram-se para análise os principais estudos que focam a dimensão social do envelhecimento em idades avançadas, com ênfase especial nos centenários entendidos como exemplo de envelhecimento bem sucedido. Os principais resultados desta revisão são apresentados por secções que partem de uma contextualização do fenómeno da longevidade para a

análise das características das relações sociais no grupo dos muito idosos e dos centenários. Concretamente para estes últimos é ainda analisada a contribuição dos recursos sociais para a sua longevidade, adaptação e bem-estar. Os resultados apresentados são, finalmente, discutidos à luz de dois modelos teóricos, o “modelo em comboio” (Antonucci & Ajrouch, 2007) e a teoria da seletividade sócio-emocional (Carstensen, 1993), tidos como particularmente relevantes para a leitura da problemática em causa.

O interesse mundial pelos “sobreviventes únicos”

No grupo dos muito idosos, os centenários assumem-se como “sobreviventes únicos”. O fato de que o número de centenários está a aumentar é comprovado por uma série de estudos demográficos (Robine, 2011). Este aumento é mais significativo nos países desenvolvidos, onde se tem registado um aumento de 20 vezes no número de centenários dos últimos anos, fato que está relacionado com as melhores condições de vida e o avanço dos tratamentos médicos, que contribuíram para que as pessoas idosas mantenham uma boa condição física e cognitiva durante mais tempo (Jeune & Andersen-Ranberg, 2000).

Na Europa, dados de 2006 revelaram existir 57306 pessoas com 100 e mais anos, com uma diferença entre sexos género surpreendente e significativa de 8228 homens para 49078 mulheres (Robine & Saiko, 2009). Concretamente em Portugal, dados do Instituto Nacional de Estatística (2001) referiam existir 589 pessoas com 100 e mais anos, sendo que dados mais recentes (Human Mortality Database, 2006, citado em Robine & Saiko, 2009) situam Portugal em 11º lugar (Europa dos 27) relativamente ao número de centenários, com 390 centenários com 100 anos exatos (320 mulheres e 70 homens) e 870 com 100 e mais anos (139 homens e 731 mulheres). Segundo dados da mesma fonte, num período de 10 anos, verificou-se uma duplicação no número de centenários em Portugal, que passou de 414 em 1996 para 870 em 2006, aumento este superior à média Europeia.

Apesar do rápido aumento da representatividade demográfica dos centenários, são ainda escassos os estudos sobre este grupo etário, particularmente no contexto Português (Araújo, Ribeiro, & Paúl, 2011) onde este grupo já se assume como um dos novos desafios para a medicina e para as ciências sociais (Paúl, 2011). Em nível internacional, tem-se vindo a verificar, ao longo das últimas duas décadas, o aparecimento de várias investigações sobre centenários, sendo de destacar os estudos de Heidelberg (Alemanha), Georgia (EUA), New England (EUA), Sardenha (Itália), Okiwana (Japão) e o

Chinese Longitudinal Healthy Longevity Survey (China) (Kumon, Silva, Silva & Gomes, 2009). Seguindo uma abordagem mais biomédica ou psicossocial conforme os interesses dos investigadores, a grande maioria destes estudos procurou identificar os fatores que explicam a sobrevivência dos centenários e avaliar a qualidade com que vivem o segundo século de vida, i.e, após a celebração do centésimo aniversário. No entanto, é de realçar que, tal como afirmam Martin, Poon, Kim e Johnson (2002), a investigação dos aspectos-chave das experiências de vida na idade extrema é ainda precoce e incompleta, especialmente do que diz respeito aos recursos sociais.

Os efeitos de uma longevidade sem precedentes nas relações sociais

Um marco no estudo da fase mais avançada de vida, e que em muito contribuiu para distinguir as chamadas terceira e quarta idade de vida, foi o *Berlin Aging Study* (BASE). Este estudo longitudinal de cariz multidisciplinar procurou analisar as várias dimensões de vida em 516 indivíduos com idades entre os 70 e os 100 anos (Baltes & Mayer, 1999). Ao questionarem-se sobre a influência que a viuvez e a perda de filhos teriam no isolamento social e na solidão de pessoas muito idosas, Wagner, Schutze e Lang (1999) selecionaram uma amostra de 221 pessoas com idades entre os 80 e os 105 anos, tendo verificado que as relações mais significativas, ao providenciarem sentido de segurança e oportunidades para companhia e intimidade, são importantes para o bem-estar das pessoas idosas. Conforme seria de esperar, a reduzida capacidade de *performance* nas atividades de vida diária, frequente no grupo etário em causa, parece influenciar a oportunidade para contactos sociais, ao mesmo tempo que as pessoas experienciam diminuição da vitalidade e da saúde e aumento de perdas de pessoas próximas (como o cônjuge e amigos). É por isso surpreendente verificar a existência de níveis de solidão mais elevados entre indivíduos com 80 a 89 anos quando comparados com aqueles com 90+ anos (Wagner et al., 1999). Este dado leva a crer que o fato dos indivíduos com mais idade terem lidado com um maior número de eventos de vida stressantes poderá levá-los a experienciar a sua solidão de forma mais pacífica, relativizando-a e aceitando que é normal estar só nesta fase da vida (Bondevik & Skogstad, 2000), o que reforça a premissa de que a solidão é uma experiência subjetiva e não sinónimo de isolamento social objetivo (Bondevik & Skogstad, 1998; Victor, Scambler, Bond & Bowling, 2000).

O *Chinese Longitudinal Healthy and Longevity Survey* é outro exemplo a evidenciar, uma vez que procurou estudar as variáveis associadas à sobrevivência humana na fase mais avançada de vida (Yi, Poston, Vlosky & Gu, 2008). Baseando-se numa amostra constituída por 894 idosos que, à semelhança da amostra do BASE, tinham idades entre

os 80 e os 105 anos de idade, este estudo demonstra, de um modo geral, um efeito significativo das variáveis “estado civil” e “número de filhos vivos” na mortalidade (o risco de morte para os idosos casados foi 47% menor que para os não casados; cada filho diminui o risco em 4%). Na avaliação da importância da participação e do envolvimento em atividades físicas parecem não existir dúvidas do seu valor nos aspetos do bem-estar, sendo este um fato bem estabelecido e documentado na literatura (Rowe & Kahn, 1998). Já a importância do envolvimento social parece ser menos conclusiva: apesar deste se mostrar positivamente associado à sobrevivência (o envolvimento em atividades sociais diminui o risco de mortalidade em 26%), resultados do referido estudo apontam para uma diminuição dos benefícios da participação em atividades sociais na mortalidade com o avançar da idade, podendo mesmo esse efeito ser negativo em idades muito avançadas (nomeadamente para os centenários). Estes resultados demonstram que um maior envolvimento social não é necessariamente melhor para o bem-estar dos idosos mais velhos.

No que diz respeito ao papel da família e amigos na fase mais avançada de vida, o *Swiss Interdisciplinary Longitudinal Study on the Oldest Old* (WsILSOO) ao investigar esta temática numa amostra de 306 octogenários revelou que os contactos familiares promovem a manutenção da independência, e que a presença de um amigo próximo aumentou a probabilidade de se ser independente no follow-up que decorreu 12 a 18 meses depois da primeira avaliação (Pin, Guilley, Spini & Lalive d’Epinay, 2005). Confirmava-se, assim, o impacto da rede de amigos, e em especial de confidentes, na mortalidade e bem-estar, relação já avançada anos antes por outros estudos que se debruçaram sobre os muito-idosos (Johnson & Barer, 1997; Bowling & Browne, 1991) e que enfatizaram a importância da qualidade das relações de amizade em detrimento da frequência do contacto com os amigos (que não se mostrou uma variável significativa).

Relativamente à situação Portuguesa, destacam-se dois estudos que contribuem para um maior conhecimento das pessoas de idade avançada residentes neste país recorrendo a amostras significativas. O primeiro, ao inquirir um total de 1266 pessoas com 50 e mais anos residentes na comunidade, verificou um aumento da proporção de pessoas que se sentiam sós com a idade (9.9% no grupo de idades entre os 50 e os 64 anos, 16.3% no grupo dos 65 aos 74 anos, 20.9% no grupo dos 75 aos 84 anos e 26.8% no grupo dos 85 e mais anos) e uma diminuição da rede social com a idade (mais significativa para o grupo familiar) (Paúl & Ribeiro, 2009). Os autores deste estudo descobriram que, independentemente das restantes condições, quando ocorre a perda de uma relação íntima (viuvez) as pessoas idosas ficam mais vulneráveis à solidão. A perda desta relação não só leva à redução dos recursos sociais e desconexão social, como terá

implicações na forma como o sujeito lida com os desafios do envelhecimento (Paúl & Ribeiro, 2009). O segundo estudo, baseando-se numa amostra de 2516 sujeitos com idade igual ou superior a 55 anos, observou uma associação significativa entre o score de rede social e o grupo etário, tendo-se registado a percentagem mais elevada de indivíduos em situação social desfavorável no grupo das pessoas com 75 e mais anos (23.9%) e a mais baixa no grupo etário dos 55 aos 64 anos (6.7%) (Oliveira et al., 2008). Para estes resultados terão contribuído, segundo os autores, o fato da percentagem de pessoas a viver sozinhas ter aumentado com a idade (32.7% das pessoas com 75 e mais anos) e de se verificar um aumento do número de pessoas em isolamento social (estar só mais de 8 horas diárias), que aumentou de 31.6% (55 aos 64 anos) para 38.8% (pessoas com 75 e mais anos).

Relações sociais dos centenários, o que sabemos?

Caracterização da rede e suporte social

O aumento da heterogeneidade que acompanha o avançar da idade é um dado recorrente de todos os estudos já referidos, o que se traduz na existência de especificidades e dados únicos no grupo dos muito-idosos. Como sobreviventes únicos, será de esperar que os centenários variem muito no que diz respeito aos seus recursos pessoais e sociais, o que poderá ter implicações na sobrecarga social e económica associada ao seu cuidado, mas também afetar o seu bem-estar. Partindo desta convicção, apresentar-se-ão os resultados dos principais estudos de centenários no que diz respeito à estrutura da rede social (i.e, número de membros e frequência de contactos), bem como ao suporte social (i.e, tipo e qualidade de ajuda prestada e disponível) (Antonucci & Ajrouch, 2007; MacDonald, 2007).

O estudo de centenários de Georgia (*Georgia Centenarian Study*) iniciou-se em 1988, constituindo um dos primeiros e mais relevantes estudos sobre esta população (Kumon, Silva, Silva & Gomes, 2009). Desde o seu início já foram desenvolvidas três fases do estudo, que variam nos objetivos e na constituição da amostra. Na avaliação da dimensão social, este estudo, à semelhança do estudo de centenários de Heidelberg, utilizou algumas questões da secção de recursos sociais do *Older Americans Resources and Services Program* (OARS), que se trata de um questionário de avaliação funcional multidimensional de idosos, desenvolvido pela Universidade de Duke (Fillenbaum, 1994). As nove questões que constituem esta secção centram-se na quantidade e adequação da interação social e na disponibilidade de ajuda em caso de doença ou incapacidade, e

versam sobre o estado civil, a composição do agregado familiar, a existência de confidente, sentimento de solidão e autoavaliação dos recursos sociais.

Uma das primeiras publicações desta equipa, com descrição da dimensão social da vida dos centenários data de 1996, tendo sido recolhida informação com sexagenários, octogenários e centenários, possibilitando-se, assim, a comparação transversal entre gerações. Em linha com os resultados de outros estudos, nos três grupos de idade considerados, 60-69 (35%), 80-89 (36%) e 100 e mais (30%), verifica-se uma maioria do sexo feminino, com uma diferença mais significativa no grupo dos centenários (76% mulheres vs 24% homens). No que diz respeito ao nível de escolaridade, enquanto nos dois grupos mais novos o grau mais representativo é o ensino secundário (30% e 29%), nos centenários 30% apresentam menos de 9 anos de escolaridade. Como seria de esperar, apenas 2% dos centenários são casados, contrapondo-se com os 37% dos octogenários e os 61% dos sexagenários. Da mesma forma, no que diz respeito à composição do agregado habitacional, verifica-se que no grupo dos mais novos a maioria (60%) vive com o cônjuge, verificando-se uma diminuição para 36% nos octogenários e para 3% nos centenários. É no grupo dos centenários que se encontram as maiores percentagens de pessoas a viver sozinhas (42%) ou a viver com os filhos (36%).

No âmbito das relações extra-familiares, diferenças significativas foram encontradas para as questões: “número de pessoas que visitam”, “falar ao telefone”, “cuidador principal”, “ajuda informal nas refeições”. Os principais resultados demonstram que a percentagem de pessoas que fala diariamente ao telefone diminui com o avançar da idade (75% - 63% - 35%); são raros os casos de centenários que têm como cuidadores o cônjuge, sendo mais frequente esse papel ser desempenhado pelos descendentes; verifica-se que a maioria das pessoas tem 5 ou mais visitantes, mas 3.9% dos centenários diz não ter ninguém; 75% dos centenários refere ter ajuda de familiares e amigos na preparação de refeições, comparando com 5.6% dos sexagenários e 20% dos octogenários, e 32.1% refere ter ajuda formal, comparando com 0% dos sexagenários e 26.7% dos octogenários; 90.5% da amostra refere ter pelo menos uma visita por semana, sendo maior a heterogeneidade de respostas no grupo mais velho (39.3% recebe 1 visita por semana, 43.6% 2 a 6 visitas e 37.2% visitas diárias) (Martin, Poon, Kim & Johnson, 1996).

Finalmente, no que diz respeito à solidão, a maioria da amostra deste estudo refere raramente sentir-se só (71.4% dos sexagenários, 72.8% dos octogenários e 57.7% dos centenários), sendo a percentagem de pessoas que se sentem sós com mais frequência

superior no grupo dos centenários (11.5% refere sentir-se “frequentemente” e 30.8% refere “às vezes”) (Martin et al., 1996).

De um modo global, a figura seguinte sintetiza os resultados do *Georgia Centenarian Study*, em que é possível verificar que alguns indicadores das relações sociais se mantêm estáveis com o avançar da idade, mas que determinados aspetos são específicos e únicos do grupo dos centenários.

60 – 69 anos	100 e mais anos
	<i>versus</i>
80 – 89 anos	<p><u>Diminuem os casos de:</u></p> <ul style="list-style-type: none"> < casados < viver com cônjuge <p><u>Aumentam os casos de:</u></p> <ul style="list-style-type: none"> > viúvos > viver sozinho ou com descendentes > ajuda de familiares e amigos na preparação de refeições > cuidado formal > solidão <p><u>Mantêm-se os casos de:</u></p> <ul style="list-style-type: none"> = ter visitante diário = ter confidente = receber apoio em caso de necessidade

Figura 1 – Síntese dos principais resultados do *Georgia Centenarian Study*

Resultados similares foram apresentados em outras publicações (Poon et al., 2000), concluindo-se que os centenários têm menor probabilidade de falar ao telefone ou de ter o cônjuge como cuidador primário, sendo mais comum que este papel seja assumido pelos filhos, mas maior de receber ajuda nas refeições por parte de familiares ou amigos. A probabilidade de ter alguém com quem contar na eventualidade de ficarem doentes ou incapazes e de ter um confidente e visitante diariamente é a mesma de uma pessoa na casa dos 60 ou 80 anos. A diminuição de alguns aspetos dos recursos sociais verificada dos centenários para octogenários e sexagenários, não foi encontrada por Randall, Martin, McDonald e Poon (2010), quando colocaram as mesmas questões aos informantes próximos dos centenários, na medida em que os cuidadores fazem uma avaliação mais positiva dos recursos sociais dos centenários. Em conjunto, estes resultados confirmam a importância da diferenciação entre centenários e não centenários, e de evitar recorrer a outros informantes quando se avalia a dimensão social.

Com vista a avaliar a influência das características sociais e individuais na predição da solidão e identificar possíveis diferenças interculturais a este nível, as equipas de estudo de centenários da Georgia e da Suécia desenvolveram um estudo em parceria (Martin, Hagberg & Poon, 1997). Os resultados revelam que aproximadamente 10% dos centenários de cada país refere sentir-se frequentemente só. Mais de 55% refere não se sentir ou sentir-se raramente só, 19.2% da Georgia refere sentir-se só muitas vezes e 33.8% da Suécia algumas vezes. Estes dados vieram confirmar que os centenários estão mais propensos à diminuição da rede e suporte social, visto muitos serem viúvos e terem perdido amigos e até mesmo filhos, a maioria refere não falar de todo ao telefone (o que pode estar relacionado com os problemas de audição), mas que um número elevado de centenários (93.6%) refere ter um confidente. Os restantes grupos etários revelaram resultados mais positivos, sendo que o grupo dos octogenários se assemelha mais ao dos sexagenários que ao dos centenários.

A importância dos recursos sociais na sobrevivência, adaptação e bem-estar psicológico

Impulsionados pela ausência de estudos que examinassem os fatores que contribuem para a sobrevivência e capacidade de adaptação das pessoas com 100 e mais anos, Poon e colaboradores (2000) desenvolveram um estudo que conjuga variáveis de cariz genético e ambiental na avaliação da predição da sobrevivência depois dos 100 anos. O género, a longevidade familiar, o suporte social (e.g., falar ao telefone; ter alguém que possa ajudar; ter um cuidador) a antropometria e a cognição, revelaram importantes contribuições a este nível, o que comprova que a disponibilidade de suporte social é importante na sobrevivência dos centenários (Poon et al., 2000).

De forma a aprofundar a leitura destes resultados, Poon e colaboradores (2010) procuraram investigar os preditores da saúde dos centenários, desenvolvendo dois modelos, um para a saúde mental e outro para a autoperceção de saúde física. Os resultados demonstram que os recursos sociais têm uma contribuição significativa na explicação da saúde mental e da autoperceção de saúde física (Poon et al., 2010), o que vai ao encontro daquilo que fora teorizado por Antonucci e Ajrouch (2007) ao apresentar as relações sociais como um indicador mas, também, como um potencial preditor de bem-estar geral. Num estudo idêntico e consideravelmente mais recente, Margrett e colegas (2011) procuraram identificar os fatores que determinavam as emoções negativas, concluindo que, ao contrário dos octogenários em que o funcionamento social não teve qualquer influência, nos centenários uma boa provisão social estava associada

a menos emoções negativas. Já na identificação das emoções positivas, para ambos os grupos o provisionamento social mostrou-se significativo.

Numa tentativa de explicar a forma como os centenários conseguem viver até uma idade tão longa e, na maioria dos casos, com qualidade e satisfação, esta equipa formulou o modelo de adaptação de Georgia (*The Georgia Adaptation Model*), que parte da assunção geral de que variáveis individuais e externas contribuem para otimizar a adaptação à fase mais avançada de vida (Martin et al., 2002; Martin, Deshpande-Kamat, Poon & Johnson, 2011). É nas variáveis internas que, a par dos recursos individuais, económicos, os eventos de vida próximos e as competências de coping comportamentais, situam-se os recursos sociais, parte integrante deste modelo de adaptação. Ao estudar a associação que se estabelece entre esta multiplicidade de variáveis e a sua contribuição da adaptação, Martin e colaboradores (2002) concluíram que quanto maior o número de eventos passados adversos, menor a disponibilidade de ter recursos sociais e económicos no presente, sendo esta influência restrita aos grupos mais novos, o que leva a pensar que talvez os centenários já tenham ultrapassado o impacto desses eventos negativos. Simultaneamente, os recursos sociais parecem ter uma influência direta e positiva nas AVDs e, principalmente, na saúde mental (Martin et al., 2002), ambas componentes de uma adaptação bem sucedida.

No *Heidelberg Centenarian Study*, a análise dos preditores da felicidade e satisfação de vida das pessoas com 100 e mais anos, permitiu verificar que os recursos sociais assumem-se como uma variável significativa, com um efeito indireto na felicidade, através da sua influência positiva na autoeficácia e no pensamento otimista (Jopp & Rott, 2006). Os autores deste estudo afirmam que os centenários que gostam de sair e de ter contactos sociais têm maiores sentimentos de competência e eficácia, uma vez que essas interações podem possibilitar a partilha das suas experiências de vida e admiração por terem alcançado uma idade tão avançada. Estar envolvido numa rede social parece promover um pensamento mais otimista, talvez porque o indivíduo se sinta mais seguro e rodeado por pessoas que lhe providenciam suporte. Este sentimento, aliado ao de competência e eficácia, talvez suavizem o medo de perdas futuras e permitam encarar a adversidade do dia a dia como um desafio, o que poderá resultar em mais felicidade (Jopp & Rott, 2006).

Por fim, apresentam-se os resultados do estudo de centenários da Grécia, que partindo de um estudo quantitativo com 47 centenários (Darvini et al., 2008), selecionaram 9 centenários com boa saúde física, capacidade cognitiva e capazes de comunicar (Darvini et al., 2009). Esta amostra seletiva foi entrevistada através de 87 questões abertas, que

procuravam extrair, sobretudo, reflexões autobiográficas e pequenas narrativas sobre as experiências quotidianas do passado e presente, incluindo aspetos como a experiência e o estilo de vida, as relações sociais e sociabilização, entre outros. Relativamente à temática em foco nesta análise, o estudo revelou que apesar de ter existido muita variação nas respostas, todos os respondentes eram sociáveis e nenhum deles reportou não gostar da companhia de outras pessoas.

Um dos elementos centrais e recorrentemente referido foi o fato das relações sociais serem mantidas sob termos muito específicos e bem definidos, na medida em que a maioria dos respondentes reportou espontaneamente que manteria a companhia dos outros apenas e quando certas condições fossem cumpridas. Apesar dessas condições e requisitos refletirem várias idiossincrasias normalmente incluíam escolher pessoas que lhes pudessem ser úteis, fossem prudentes e tivessem boas intenções, e, por outro lado, evitar sociabilizar com pessoas arrogantes e imprudentes (Darvini et al., 2009). Um outro elemento das estratégias de sociabilização a realçar enquanto resultado deste estudo é a orientação dos respondentes para si próprios a par de uma tendência para não investir emocionalmente nas relações com os outros (pelo menos aqueles fora da sua família). Um dos centenários entrevistado chega mesmo a referir “não é importante pensar quem é o outro e quem somos nós, basta saber quem nós somos” (Vasiliki, citado em Darvini et al., 2009).

Aparentemente os centenários entrevistados percebem a sociabilização, sobretudo em termos cognitivos, como uma troca de recursos, e não de forma emocional, como um campo no qual devem investir emocionalmente. Daí que percebam as relações como ferramentas que devem ser mantidas enquanto os benefícios forem maiores que os custos da sua manutenção (Darvini et al., 2009).

Reflexões sobre os resultados em análise

A ideia de que o avançar da idade é acompanhado por perdas em diversos níveis, nomeadamente de entes queridos, é confirmada pelos resultados analisados; estes revelam um aumento do número de pessoas que são viúvas, não têm o cônjuge como cuidador principal e vivem sozinhas. No entanto, verifica-se uma tendência para outras pessoas substituírem estas perdas, nomeadamente os descendentes, com quem grande parte dos centenários vive, e os serviços de cuidado formal, que passam a ser mais frequentemente ativados nesta fase de vida. Comprova-se este fato pela percentagem idêntica, em todos os grupos etários, de pessoas que têm um confidente, pelo menos

uma visita diária e alguém que os possa ajudar nas tarefas do quotidiano (Poon et al., 2000).

A associação entre a idade e o tamanho da rede social tem-se mostrado significativamente negativa, na medida em que nas idades mais avançadas verifica-se uma redução dramática dos contactos com as pessoas mais distantes e uma tendência para se limitarem os contactos sociais às relações mais íntimas e próxima (Lang & Cartensen, 1994). Analisados segundo o modelo em comboio - *Convoy Model* - (Antonucci & Ajrouch, 2007), no qual as estruturas da rede social do indivíduo são organizadas em três círculos concêntricos diferenciados pela sua proximidade com o indivíduo que está no centro, estes resultados demonstram que as relações mais próximas (como o cônjuge e outros familiares), representadas pelo círculo interior, tendem a ser altamente valorizadas pelo indivíduo e estáveis ao longo da vida. Os outros dois círculos periféricos, que representam os amigos, vizinhos e colegas, são mais instáveis e sujeitos às alterações dos papéis dos indivíduos. É por isso fundamental não entender a redução da rede social dos centenários de forma simplista e genérica, procurando-se analisar não só o número de relações que se perdem, mas, principalmente, o tipo e a qualidade das relações que ficam.

A orientação cognitiva que domina o modo como os centenários gerem, entendem e selecionam conscientemente as suas relações foi um dado surpreendente demonstrado no estudo com centenários da Grécia (Darvini et al., 2009). Este dado já havia sido sugerido por Carstensen, baseada em estudos com a população idosa, na Teoria da seletividade sócio-emocional, segundo a qual as pessoas investem seletivamente os seus recursos cada vez mais limitados nas suas relações mais íntimas e importantes e deixam de investir nas menos significativas (Carstensen, 1993). Tendem a manter-se as relações mais compensatórias, daí a existência de confidentes na maioria dos centenários (Poon, 2000). Mas, por outro lado, tendem a reduzir as menos importantes, ou seja, aquelas que já não trazem tantos benefícios e que normalmente correspondem aos círculos mais exteriores do modelo de comboio (amigos e organizações sociais). Segundo a autora desta teoria, essa seleção não ocorre por acaso, são os próprios indivíduos que têm um papel ativo no estreitamento do seu ambiente social, e que ao verem a sua vida mais constrangida e próxima no fim, referem não ter tempo para as pessoas que não conhecem (Carstensen, 1993).

Também Johnson e Barer (1997) observaram resultados similares aos de Darvini e colegas (2009), na medida em que os muito idosos são agentes ativos que se readaptam continuamente às mudanças do dia a dia. Para lidar com as crescentes restrições que

acompanham o processo de envelhecimento, os mais velhos anulam seletivamente algumas relações sociais, simplificando e estreitando os limites do seu mundo social. Ao entrevistarem pessoas com 85 e mais anos de idade, obtiveram testemunhos que ilustram esta ideia: “Eu não quero mais amigos, quero poucos”; “Eu aprecio a minha privacidade” (Johnson & Barer, 1997: 155). Uma mulher com 102 anos chega mesmo a dizer “As pessoas colidem consigo na minha idade; Eu preciso de estar mais tempo comigo mesma” (Johnson & Barer, 1997: 155).

Conclusão

As investigações em torno dos mais velhos aqui analisadas têm sobrevalorizado as perdas e os aspetos negativos do processo da fase avançada de vida. Quando pensamos nos centenários, facilmente os imaginamos como pessoas “especiais”, que vivenciaram os principais momentos da nossa história, que assistiram à exponencial evolução da nossa sociedade e que ultrapassaram grandes desafios. Mas que agora, por serem os “sobreviventes únicos”, assistiram à morte da maioria das pessoas da sua geração e até mesmo de alguns descendentes, estando, por isso, sozinhos.

Reverter esta imagem negativa, comum à maioria das imagens sociais sobre o envelhecimento, implica investigar as especificidades deste grupo etário, focando as forças e os aspetos positivos que podem surgir e que se mostram importantes no processo de adaptação. Prova disso é a dinâmica das relações sociais que se apresentou nesta análise. Surpreendentemente, a redução das relações e dos contactos sociais que a nossa sociedade associa inexoravelmente à solidão e à melancolia, é sugerida como uma estratégia para compensar as perdas e aumentar o bem-estar, tendo por isso um valor, sobretudo adaptativo. A relação entre os recursos sociais e a saúde mental enfatiza a importância do contexto social, sendo por isso importante continuar a investir em contactos e interações significativas para este grupo de idade tão avançada.

Uma nota final impõe-se sobre a importância de aumentar o conhecimento sobre os contornos que as relações sociais assumem na vida dos centenários e na forma como este tipo de recursos pode ser determinante para a sua adaptação e bem-estar. Aguarda-se assim um estudo sobre o contexto Português que analise a qualidade das relações sociais em detrimento da sua quantidade e que distingam diferentes papéis individuais e características sociais.

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Chapter VI

Dinâmicas psicossociais e a sua contribuição na qualidade de vida dos centenários

[Psychosocial dynamics and their contribution to centenarians' quality of life]

Dinâmicas psicossociais e a sua contribuição na qualidade de vida dos centenários⁶

Lia Araújo, Oscar Ribeiro e Constança Paúl

Resumo: Viver para além dos 100 anos sempre pareceu ser uma meta inalcançável para a maioria das pessoas, mas está a tornar-se numa realidade cada vez mais comum. Os centenários são o grupo etário que regista um maior crescimento demográfico na maioria dos países desenvolvidos (Vaupel, 2010), sendo que para Portugal, dados oficiais de 2001 apontavam para a existência de 589 idosos nessas circunstâncias, concretamente 494 mulheres e 95 homens (INE, 2001). Em oposição aos estereótipos que frequentemente associam o avançar da idade à incapacidade e desesperança, os centenários demonstram-nos que o envelhecimento também pode ser positivo e satisfatório (Koch et al., 2010). O presente trabalho procura reunir os principais resultados e contributos dos estudos internacionais sobre esta população, designadamente dos estudos de Georgia, de Heidelberg e de Okinawa, entre outros, que definem os aspetos que este grupo tem em comum, para além da idade, e os determinantes da longevidade, enfatizando-se a contribuição dos fatores psicossociais na qualidade de vida. Os resultados demonstram diferenças significativas de classe social, estatuto económico, educação e atividades ocupacionais entre as pessoas com 100 e mais anos (Koch et al., 2005); por outro lado, aproximam-se na capacidade de lidar com as situações adversas, o que poderá ser considerado um fator de longevidade (Perls et al., 1999). As pessoas com 100 e mais anos revelam maior resiliência que as pessoas com 70, 80 e 90 anos (Yi & Shen, 2010), facto que ilustra a importância do coping e dos mecanismos de adaptação na longevidade. Os resultados dos estudos analisados reforçam a importância de políticas e programas que promovam as características verificadas nos centenários, bem como a continuidade do seu estudo a nível internacional.

Palavras-chave: longevidade, centenários, qualidade de vida, bem-estar, fatores psicossociais

⁶ Araújo, L., Ribeiro, O. & Paul, C. (2011). Dinâmicas psicossociais e a sua contribuição na qualidade de vida dos centenários. In: M.E. Chaleta, N.R. Santos & M.L. Grácio (Coords.), *Livro de Atas do II Congresso Internacional Interfaces da Psicologia – Qualidade de vida... Vidas de qualidade* (pp. 195-214). Évora: Centro de Investigação em Educação e Psicologia. ISBN: 978-989-8339-12-6.

Psychosocial dynamics and their contribution to centenarians' quality of life

Abstract: Living beyond 100 years old always seemed to be an unattainable goal for most people, but is now becoming an increasing commonplace. Centenarians are the fastest growing demographic group in most developed nations (Vaupel, 2010) and in Portugal, in 2001, there were 589 individuals aged 100 and over, 494 women and 95 men (INE, 2001). In opposition to the negative stereotypes that are frequently associated with advancing age, namely incapacity and desperation, centenarians have shown us that reaching such age can be positive and satisfying (Koch et al., 2010). The present study combines results and contributions of main international studies on centenarians, namely the studies of Georgia, Heidelberg, Okinawa and others, that define what this specific age group has in common other than their age and the longevity determinants, emphasizing the contributions of psychosocial factors on quality of life. Class, economic status, education and occupational differences were observed between persons with 100 and more years old (Koch et al., 2005). However, important similarities were found in the way centenarians cope with adverse situations, which may be a factor of longevity. People aged 100+ are more resilient than younger elders in their 90's, 80's or 70's (Yi & Shen, 2010), which illustrates the importance of coping and adaptation mechanisms in longevity. These findings highlight the need for specific policies and programs that may promote such psychosocial characteristics in very old age and emphasize the need for more international studies on this growing population.

Key-Words: longevity, centenarians, quality of life, well-being, psychosocial factors

Introdução

Atualmente, países de todas as partes do mundo e com diferentes graus de desenvolvimento deparam-se com o rápido envelhecimento das suas populações, facto que se traduz num prolongamento da vida humana e do número de pessoas que alcançam a fase mais avançada de vida. Exemplo claro é o aumento do número de centenários que na Europa, em 2006, já constituíam um grupo de 57306 pessoas, com uma diferença entre sexos surpreendente e significativa de 8228 homens para 49078 mulheres (Robine & Saiko, 2009). Concretamente em Portugal, dados do Instituto Nacional de Estatística (2001) referiam existir 589 pessoas com 100 e mais anos em 2001, mas dados mais recentes, do Human Mortality Database (2006, cit in Robine &

Saiko, 2009) apontavam para a existência de 870 pessoas com 100 e mais anos (139 homens e 731 mulheres) no nosso país.

Como facilmente é possível projetar, a realidade deste rápido crescimento terá implicações socioeconómicas significativas, bem como ao nível da prestação de cuidados de saúde, não só para os próprios indivíduos mas também para as suas famílias e sociedade em geral. Torna-se, assim, impreterível saber quem são as pessoas com 100 e mais anos e com que qualidade de vida é que atingem este patamar de idade, para que seja possível desvendar se esta transição demográfica adicionou vida aos anos ou só anos à vida. Não obstante, é ainda notável o reduzido interesse em estudar este grupo ou até mesmo em representá-lo nos trabalhos realizados com a população idosa, verificando-se que a grande maioria das publicações sobre envelhecimento estuda conjuntamente toda a população idosa.

Partindo da convicção de que existe muito a ser aprendido sobre o processo de envelhecimento através dos grupos mais velhos, mais recentemente começaram a surgir investigações específicas sobre centenários, onde se destacam os estudos dos Estados Unidos (Poon et al., 1992; Perls et al., 1999), Japão (Willcox et al., 2008), Alemanha (Rott & Jopp, 2006), Itália (Buono et al., 1998), Suécia (Samuelsson et al., 1997), Dinamarca (AndersenRanberg et al., 1999), Grécia (Darvini et al., 2009) e Austrália (Koch et al., 2010). A sua grande maioria foi impulsionada pelo desejo de identificar os fatores associados à extensão da longevidade, através de avaliações realizadas a pessoas com 100 e mais anos, segundo uma abordagem biomédica e, menos frequentemente, psicossocial (Poon et al., 2010). Na realidade, como um número crescente de estudos atesta, apenas muito recentemente se tem vindo a constatar a importância central destas variáveis senão na longevidade *per se*, na sua gestão do ponto de vista prático e emocional.

O presente trabalho visa apresentar os principais resultados dos referidos estudos internacionais, especificamente aqueles que analisam a qualidade com que é possível viver a vida numa fase tão avançada, com especial interesse sobre a importância que os fatores psicossociais têm na sua adaptação bem sucedida.

Vidas longevas com qualidade

O estudo da qualidade de vida remete para longos anos de pesquisa e publicações científicas, no entanto ainda hoje nos deparamos com divergências na sua conceptualização e avaliação, o que faz com que este construto seja considerado um

“mistério idiossincrático”, devido à elevada variabilidade entre indivíduos (Netuveli & Blane, 2008). Apesar de não existir nenhuma definição universal que descreva ou meça este conceito, é possível referir algumas posições teóricas que se distinguem neste campo, nomeadamente a já clássica definição de qualidade de vida da Organização Mundial de Saúde (WHO, 1995:1405), como sendo *“a percepção do indivíduo da sua posição na vida, no contexto cultural e sistema de valores no qual vive, e a relação com os seus objectivos, expectativas, padrões e preocupações”*. Decorrente desta definição, foram identificados domínios de qualidade de vida associados ao bem-estar a nível físico, espiritual, cognitivo, social e emocional, bem como formas de avaliação, baseadas em aspetos objetivos (e.g., ambiente físico) e subjetivos (e.g., bem estar psicológico).

Concretamente no que diz respeito ao estudo dos centenários, a qualidade de vida tem sido um constructo amplamente negligenciado, verificando-se apenas quatro publicações que a abordam em concreto, com utilização de instrumentos específicos para a sua avaliação (Buono et al., 1998, McCormack, 2002, Lapid et al., 2011, Richmond et al., 2011). Nos motivos apresentados, encontra-se o fato de ser muito complicado avaliar a qualidade de vida numa amostra tão heterogénea de indivíduos, alguns perfeitamente funcionais, outros fisicamente incapazes e dependentes e outros com desorientação temporal e espacial comprometedoras de avaliações fidedignas (McCormack, 2002). Por outro lado, as investigações em torno dos mais velhos têm sobrevalorizado as perdas e os aspetos negativos do processo da fase avançada de vida, que realçam sobretudo o acumular de doença e a perda de funcionalidade (Andersen-Ranberg et al., 1999). Deste modo, as pessoas muito idosas são tidas como tendo uma qualidade de vida “pobre” devido à elevada percentagem de comorbilidade de condições médicas crónicas, incapacidades físicas e declínio cognitivo (Lapid et al, 2011).

Partindo do princípio de que é essencial evidenciar as forças e os aspetos positivos que podem surgir na fase muito avançada de vida, e que se mostram importantes no processo de adaptação, apresentar-se-ão os principais resultados relativos à qualidade de vida dos centenários, de forma a perceber se apesar dos constrangimentos associados ao avançar da idade e à própria avaliação do conceito nesta população, os centenários têm uma visão positiva da vida.

Como é viver com 100 e mais anos de idade

O envelhecimento tem sido associado a um inevitável aumento da vulnerabilidade à doença e à perda progressiva da capacidade funcional. Apesar de se verificar uma

tendência para estas manifestações aparecem tardiamente na vida dos centenários, de fato elas surgem. Dados dos principais estudos que comparam os centenários com grupos etários mais novos indicam um aumento da incapacidade e das doenças associadas ao envelhecimento (Tafaro et al., 2009; Yi & Vaupel, 2002; Andersen-Ranberg, Schroll, & Jeune, 2001; Rott & Jopp, 2006; Motta et al., 2005; Gondo et al., 2006; Evert et al., 2003; Poon et al., 2010; McCormack, 2002; Richmond, et al., 2011).

Complementarmente à avaliação física e funcional, alguns destes estudos avaliaram a percepção que os próprios centenários tinham da sua saúde. Surpreendentemente, verificaram que, apesar da sua pior saúde objetiva, os centenários apresentaram uma autopercepção de saúde consideravelmente positiva. McCormack (2002) reporta que 32% da amostra que estudou avaliou a sua saúde como “muito boa”; Poon e colaboradores (2010) referem que 19.4% considerou a saúde como “excelente” e 52.7% “boa”; Richmond, Law e Kay-Lambkin (2011) obtiveram 75% da amostra a referir ter “boa saúde” e Yi e Vaupel (2002) 54.3%. No que diz respeito ao domínio da qualidade de vida associado ao funcionamento cognitivo, os resultados dos estudos internacionais demonstram que apesar da probabilidade de demência estar associado ao avançar da idade (Thomassen et al., 1998), esta condição não é transversal a todos os centenários. Com efeito, na amostra de centenários estudada por Kliegel e colaboradores (2004), verificou-se que cerca de metade dos centenários revelam défice cognitivo moderado a severo mas cerca de 25% estaria cognitivamente intactos, o que foi confirmado pela equipa de Gondo (2006), que identificou 24.3% sem demência, 13.8% como não tendo demência provável e 61.8% classificados como tendo demência severa a moderada. Porém, na leitura destes resultados é ainda de realçar as advertências da equipa do Georgia Centenarian Study (Poon et al., 2010) relativamente à avaliação do funcionamento cognitivo.

Estudos desenvolvidos nos Estados Unidos (Poon et al., 2010), e corroborados pelo Japão (Gondo et al., 2006) e Suécia (Samuelsson et al., 1997), apresentam uma grande variabilidade e dispersão nos resultados da avaliação do desempenho cognitivo de centenários, o que poderá estar relacionado com a grande dificuldade da sua avaliação, uma vez que a maioria dos testes utilizados não se adequam às características dos centenários (Miller et al., 2010). Poon e colaboradores (2010) verificaram que, apesar da pior cotação total dos centenários nos testes cognitivos, quando se avalia a capacidade cognitiva para se resolver as tarefas do dia a dia ou se evoca a memória episódica com aspetos familiares não se verificaram diferenças significativas entre centenários e grupos mais novos.

No funcionamento social, as especificidades dos centenários têm sido bem documentadas pela equipa do estudo de Georgia, que analisou extensivamente variáveis relacionadas com os recursos e suporte social (e.g., Randall et al., 2010). Os principais resultados apresentados por estes autores revelam que conforme seria de esperar verifica-se a perda de pessoas familiares e amigas de referência, traduzida na menor probabilidade de ter o cônjuge como cuidador primário, mas que os centenários apresentam a mesma probabilidade que uma pessoa na casa dos 60 ou 80 anos de ter alguém com quem contar na eventualidade de ficarem doentes ou incapazes e de ter um confidente e visitante diariamente.

Relativamente ao último domínio da qualidade de vida considerado pela abordagem privilegiada nesta análise (WHO, 1995), o bem-estar emocional, os resultados apontam para elevados níveis de felicidade e satisfação de vida. Investigadores do Heidelberg Centenarian Study, demonstraram que 71% dos centenários entrevistados sente-se feliz a maior parte do tempo (Rott & Jopp, 2006). No que diz respeito à presença de depressão, Tarafo e colaboradores (2009) verificaram que mais de metade (54.8%) não tinha sintomas de depressão e que 12.8% foram considerados casos de depressão clínica. No mesmo estudo, verificaram que os longevos têm menos traços de ansiedade, apresentando uma tendência a reagir emocionalmente aos eventos stressantes com baixo nível de ansiedade.

Depois de analisarmos os domínios da qualidade de vida associados à saúde, capacidade funcional, funcionamento cognitivo, relações sociais e bem-estar subjetivo, resta saber qual a avaliação geral que os centenários fazem da sua qualidade de vida. Os poucos estudos que analisaram esta questão em concreto apontam para resultados significativamente positivos, com a maioria das pessoas entrevistadas a referir uma qualidade de vida “boa” ou “muito boa” (McCormack, 2002; Richmond et al., 2011). Em conjunto com os dados anteriores, estes resultados indicam que apesar do aumento dos constrangimentos que surgem na vida dos centenários, estes não deixam de demonstrar, por vezes surpreendentemente, elevados níveis de bem-estar subjetivo. Este dado é a evidência de que os centenários conseguem adaptar-se às grandes exigências de tantos anos de vida, o que poderá indicar que não são apenas mais velhos, mas que poderão representar um grupo especial de indivíduos (Rott & Jopp, 2006).

Fatores psicossociais e adaptação em centenários

A forma como o ser humano se adapta às mudanças com que constantemente é confrontado ao longo de toda a sua vida é uma parte crucial do estudo do envelhecimento, presente em concepções cientificamente reconhecidas, como o modelo de Seleção, Otimização e Compensação (Baltes, 2003) e o modelo de Envelhecimento Bem Sucedido (Rowe e Kahn, 1998). No âmbito do estudo específico de centenários, a explicação da sua excecional adaptação tem merecido especial atenção nos últimos anos. Com base nos resultados recolhidos ao longo de 23 anos junto de centenários, respetivos familiares, bem como em grupos de controlo (octogenários e sexagenários), a equipa do estudo de Georgia têm vindo a testar diversas associações, de modo a encontrar resposta para a razão das pessoas com 100 e mais anos conseguirem viver até uma idade tão longa e, na maioria dos casos, com qualidade e satisfação.

É nesta tentativa que surge o modelo de adaptação de Georgia (The Georgia Adaptation Model), segundo o qual as medidas de desenvolvimento adaptativo positivo são a capacidade funcional, autoperceção de saúde, capacidade cognitiva, saúde mental, custos e desgaste económico, bem-estar psicológico e longevidade. Por sua vez, para o processo de adaptação contribuem variáveis internas a este processo, nomeadamente os recursos individuais, sociais e económicos, os eventos de vida próximos e as competências de coping comportamentais, e variáveis exógenas, que incluem os acontecimentos de vida distais e as realizações pessoais passadas (Martin et al., 2011).

Este modelo conceptual introduziu várias implicações importantes para o estudo do bem-estar de pessoas idosas e muito idosas, pois para além de demonstrar a importância dos fatores psicossociais na longevidade e adaptação, reforçam a importância de se pensar além de causas únicas, uma vez que está implicada neste processo uma rede de variáveis distintas. A inclusão destas variáveis a par dos mecanismos biomédicos pode enriquecer a compreensão sobre como e porquê alguns indivíduos sobrevivem até uma idade tão avançada com elevada qualidade de vida enquanto outros não.

Conclusões e implicações na promoção da qualidade de vida

A análise dos domínios e fatores de qualidade de vida das pessoas centenárias permitiu concluir que as várias perdas e incapacidades não levam necessariamente à desmoralização, na medida em que a maior parte dos respondentes dos vários estudos analisados mantiveram um senso de bem-estar e satisfação. A curta revisão aqui apresentada afirmou a importância dos fatores psicossociais no número de anos de vida

e na vida desses mesmos anos. Acreditamos que o modelo de adaptação desenvolvimental pode ser muito frutífero para propósitos de intervenção, na medida em que as variáveis que conduzem a uma maior adaptação devem ser reconhecidas e implicadas na prática profissional com as várias gerações. Para terminar, reforçamos a importância da realização de um estudo com centenários Portugueses, que siga as principais diretrizes de investigação dos estudos internacionais de centenários, possibilitando-se assim uma comparação intercultural da influência destas variáveis na adaptação bem sucedida ao envelhecimento.

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Chapter VII

Measuring Attachment to Life in Old Age: The Portuguese
Version of the Positive Valuation of Life Scale (Positive VOL)

Measuring Attachment to Life in Old Age: The Portuguese Version of the Positive Valuation of Life Scale (Positive VOL)⁷

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Abstract

Purpose: This study aims to present the psychometric properties of the Portuguese version of the Positive Valuation of Life Scale (Lawton et al., 2001). **Method:** Sample included 207 community-dwelling elders (129 women; $M_{Age} = 77.2$ years, $SD = 7.5$). The data collection included the translated and adapted Portuguese version of Positive Valuation of Life Scale, Life Satisfaction Index Z, Meaning in Life Questionnaire and Geriatric Depression Scale. **Results:** From exploratory factor analysis two factors emerged, *existential beliefs* and *perceived control*, explaining 49% of the total variance. Both factors were positively related with meaning in life and life satisfaction and negatively related with depression ($p < 0.05$). The values obtained for internal consistency for the total scale and for each subscale were good ($\alpha > 0.75$). **Conclusion:** The Portuguese version of Positive VOL Scale represents a reliable and valid measure to capture the subjective experience of attachment to one's life. The two-factor structure is an update to Lawton's previous work and in line with findings obtained in the USA (Dennis et al., 2005) and Japan (Nakagawa et al., 2013). Future research is required to investigate VOL predictors and the potential changes towards the end of the life span.

Keywords: Quality of Life; Validation studies; Portugal; Old and very old age.

Introduction

For a long time, the overwhelming emphasis in research on health, quality of life and aging has been on disabilities and disease [1]. Lawton [2] turned to the domains that may be associated with positive aspects and developed the concept of "valuation of life" (VOL). VOL is defined as the subjectively experienced worth of a person's life, that results from

⁷ Araújo, L., Ribeiro, O., Teixeira, L., Azevedo, M.J., Jopp, D., Rott, C., & Paúl, C. (accepted). Measuring Attachment to Life in Old Age: The Portuguese Version of the Positive Valuation of Life Scale (Positive VOL). *Quality of Life Research*.

both environmental and personal factors, positive and negative features. All these aspects are processed by the individual and jointly determine how much people value their lives [3]. The construct only covers a minimum of content directly related to mental health or pathology [4] and mediates the association between quality of life and the years of desired life [5].

The VOL Scale intends to examine the factors that may influence a person's wishes to continue to live and that may affect own end-of-life attitudes and behaviors [3]. After an exhaustive process of literature review, research staff discussions and analysis of other scales that represent positive mental health, a 13 items positive VOL factor and a 6 item negative VOL factor emerged [3]. The positive VOL items seems to have better psychometric properties [3] and are highly recommended in heterogeneous or culturally deprived samples with lower education levels, as it turned out that the negative items were easily misunderstood. Accordingly, most publications have focused on the 13 positive items from the VOL scale, which has demonstrated good psychometric properties (Cronbach's alpha between 0.85 – 0.88) and high reliability [6,7]. Two studies had examined its' dimensionality, one conducted in the USA [8] and one using a Japanese sample [9]. Two factors entitled as "spiritual self-efficacy" or "spiritual well-being" (factor 1) and "personal agency" or "positive VOL" (factor 2) had been identified within these two studies [8,9].

In Portugal the interest for well being research is booming but there is lack of well-established instruments for studying the older population and there is no validated instrument to assess the VOL construct. The purpose of this study was to report on the development and psychometric properties of the Portuguese version of Positive Valuation of Life Scale.

Methods

Participants

Participants were 207 community-dwelling elders (129 women; $M_{age} = 77.2$ years, $SD = 7.5$) living in the North and Center regions of Portugal, randomly selected through local agencies and NGOs, and using the snowball method. 48.3% were married/partnered, 44% were widowed, 5.3% were single and 1.4% divorced. The mean of school years attended was 3.02 ($SD = 2.81$). A total of 65 persons (31.4%) never went to school and 58.4% had up to 4 years of education (elementary school).

Measures

Positive Valuation of Life Scale [3] - The original English items were translated into Portuguese independently by one experienced translator, two psychologists and one

gerontologist. These versions were compared and after reaching a consensus, a translated full version of the scale was proposed. This version was then back translated by an independent experienced professional translator. In order to further establish the adequacy of the instrument, two external gerontologists acted as independent raters, and evaluated the instrument in terms of item pertinence and formulation, confirming its face validity. Pilot testing with four elders was performed in order to determine the clarity of the instructions and of item formulation. As in the original scale, each item is rated on a 5-point scale, ranging from 1 (disagree very strongly) to 5 (agree very strongly), with higher values meaning higher valuation of life.

Meaning of Life Questionnaire [10,11] - Includes items related with the presence and search of meaning (e.g., "I am looking for something that makes my life feel meaningful") scored on a five-point likert-type scale that ranges from 1 (almost never) to 5 (almost always).

Life Satisfaction Index – Z [12,13] - Asks participants to rate themselves on statements such as: "When I think back over my life, I didn't get most of the important things I wanted". Each statement is assessed on a three-point scale (2 = agree, 1 = uncertain, 0 = disagree).

Geriatric Depression Scale [14,15] - Measures affective and motivational/cognitive components of depression in older adults (e.g. "Are you basically satisfied with your life?") using a yes-no response for a possible score of 0 to 15.

Statistical Analysis

Confirmatory factor analysis (CFA) was conducted to test the dimensionality found in USA and Japanese studies [8,9]. Goodness of fit was evaluated using the recommended criteria, namely the normed squared (χ^2/df), the root of mean square error of approximation (RMSEA), the comparative fit index (CFI), and the Akaike's information criteria (AIC) [16]. A principal components analysis was performed to determine whether the 13 items in the questionnaire could be combined into separate components reflecting different aspects of valuation of life. To test the reliability, the internal consistency of the questionnaire was assessed by Cronbach's alpha coefficient; alpha equal to or greater than 0.50 was considered satisfactory. Validity was evaluated by determining the extent to which the Positive VOL correlates positively with meaning of life and life satisfaction, in addition to a negative correlation with depression. This was assessed by the Pearson's correlation coefficient and r close to 0.50 was considered satisfactory. A CFA to validate the Portuguese structure was conducted. Analyses were performed using IBM SPSS Statistics Software Version 21 and AMOS 18 for Windows.

Results

The confirmatory analysis of USA and Japanese structures resulted in $\chi^2(64)= 205.104$, $p<0.001$, CFI=0.828, RMSEA=0.103, and $\chi^2(64)= 250.727$, $p<0.001$, CFI=0.772, RMSEA=0.119 respectively, indicating that the fits of both models are poor.

Factor Structure of the Positive Valuation of Life Scale (Positive VOL)

Table 1. Distribution of the items of the Positive Valuation of Life as a function of mean score, standard derivation, percentage of 1 to 5 scores, and rate of correlation with the total score in a sample of community-dwelling elders ($n=207$)

Item	<i>M</i>	<i>SD</i>	Percent Score Endorsed (%)					Item-total correlation
			1	2	3	4	5	
1. I feel hopeful right now.	3.26	1.36	12.1	24.2	8.7	34.8	20.3	0.70
2. Each new day I have much to look forward to.	2.96	1.25	13.5	29.5	14.0	33.3	9.2	0.61
3. My life these days is a useful life.	3.46	1.34	13.5	13.0	10.1	40.1	22.7	0.66
4. My life is guided by strong religious or ethical beliefs.	4.40	0.85	1.4	3.9	3.9	35.3	55.6	0.18
5. I have a strong will to live right now.	4.23	1.09	2.9	8.2	7.2	25.6	55.6	0.51
6. Life has meaning for me.	4.16	1.06	3.9	6.3	5.8	38.6	45.4	0.57
7. I feel able to accomplish my life goals.	3.12	1.28	14.5	18.4	21.3	31.9	13.5	0.66
8. My personal beliefs allow me to maintain a hopeful attitude.	3.91	0.98	3.4	5.8	13.5	50.2	23.1	0.57
9. I intend to make the most of my life.	4.17	1.03	3.4	4.3	12.1	31.9	47.8	0.64
10. I can think of many ways to get out of a jam.	3.47	1.29	12.6	11.1	14.0	41.5	20.8	0.48
11. I can think of many ways to get the things in life that are most important to me.	3.57	1.25	10.1	9.7	17.4	37.7	25.1	0.56
12. Even when others get discouraged, I know I can find a way to solve the problem.	3.76	1.15	6.3	7.7	19.3	36.2	30.4	0.53
13. I meet the goals that I set for myself.	3.25	1.25	12.6	16.9	16.4	40.6	13.5	0.58

Note. SD = Standard deviation; % = Percentage, Scores: 1 = Disagree very strongly - 5 = Agree very strongly

Mean scoring, standard deviation, percentage of scores from 1 to 5 and correlations with total score are presented in Table 1. Single item mean scores ranged from 2.96 to 4.40. In general, the higher means were obtained for items 4, 5, 6 and 9, meaning higher positive VOL. Also for these four items, more that 25% of the sample agreed very strongly. The items with the lowest means were 2 and 7, with at least 30% of the scores being between 1 and 2, indicating a lower VOL.

Table 2. Factor structure of the Positive VOL for Portuguese, USA and Japan versions

Items	Portuguese		USA		Japan	
	1	2	1	2	1	2
1. I feel hopeful right now	0.63	0.37	✓		✓	
2. Each new day I have much to look forward to	0.53	0.34	✓		✓	
3. My life these days is a useful life	0.35	0.58	✓		✓	
4. My life is guided by strong religious or ethical beliefs	0.48	-0.37	✓			✓
5. I have a strong will to live right now	0.78	0.05	✓		✓	
6. Life has meaning for me	0.77	0.23	✓		✓	
7. I feel able to accomplish my life goals	0.23	0.69		✓	✓	
8. My personal beliefs allow me to maintain a hopeful attitude	0.68	0.26	✓			✓
9. I intend to make the most of my life.	0.64	0.39	✓		✓	
10. I can think of many ways to get out of a jam	-0.03	0.74		✓	✓	
11. I can think of many ways to get the things in life that are most important to me	0.19	0.62		✓	✓	
12. Even when others get discouraged, I know I can find a way. to solve the problem	0.19	0.55		✓	✓	
13. I meet the goals that I set for myself	0.22	0.63		✓	✓	
Eigen values	4.76	1.61				
% of variance	36.6%	12.4%				

Two independent factors were obtained using the oblique rotation solution with eigenvalues greater than one (i.e., Kraisser rule [17]). The two dimensions solution accounted for 49% of the total variance (see Table 2) and the eigenvalues were 4.76 (Factor 1) and 1.6 (Factor 2).

Seven items (Factor 1) describing personal and existential beliefs (e.g., Item 4. *My life is guided by strong religious or ethical beliefs*; Item 8. *My personal beliefs allow me to maintain a hopeful attitude* – see table 2) defined the first factor and explained 36.6% of total variance. Six items (Factor 2) that focus on personal agency and control (e.g., Item 7. *I feel able to accomplish my life goals*; Item 10. *I can think of many ways to get out of a jam*) defined the second factor and explained 12.4% of the total variance.

Although the model fit indices from the confirmatory analysis of our structure didn't fit all the established indices, they were slightly improved when compared to USA and

Japanese structures (see Table 3), with a lower χ^2 , better values of CFI and GFI and lower RMSE and AIC. Furthermore, the items with low loading (e.g., item 4 about religious or ethical beliefs) were not excluded since they were important for VOL conceptualization and for Portuguese cultural aspects.

Table 3. Goodness-of-fit statistics for confirmatory factor analysis of Japan, USA, and Portugal structures

Structures	χ^2	df	χ^2/df	CFI	GFI	PCFI	PGFI	AIC	BCC	RMSEA
Japan ^a	250.727	64	3.918	0.772	0.825	0.634	0.580	304.727	308.664	0.119
USA ^b	205.104	64	3.205	0.828	0.865	0.679	0.608	259.104	263.042	0.103
Portugal	179.138	64	2.799	0.860	0.880	0.705	0.619	233.138	237.075	0.093

^a Nakagawa et al., 2013; ^b Dennis et al., 2005

Reliability and internal consistency

The Cronbach's alpha was used to determine the internal consistency of the scale. The values obtained were 0.85 (Positive VOL total scale), 0.80 (Factor 1) and 0.76 (Factor 2). The average inter-item correlation was 0.54 for the first factor, and the range was 0.18 to 0.70. For the second one, average was 0.58, range 0.48 to 0.66 (Table 1). Alpha values did not increase by removal of any tested item.

Validity

Positive VOL was significantly and positively correlated with Meaning in Life, $r = 0.42$, $p < 0.01$, measuring a similar construct, and with Life Satisfaction, $r = 0.50$, $p < 0.01$, measuring subjective well-being. A significant negative correlation was found with Geriatric Depression, $r = -0.63$, $p < 0.01$ (Table 4). At the level of the subscales, the correlations were somewhat less strong relative to the total Positive VOL scale, and surprisingly quite similar in terms of size across both factors. The only exception was the correlation to Meaning in Life, which correlated higher with the second subscale ($r = 0.27$, $p < 0.01$ for subscale 1 and $r = 0.47$, $p < 0.01$ for subscale 2).

Table 4. Inter-Correlations between total Positive VOL score, its sub factors, and other scales

	Positive VOL total	Factor 1	Factor 2
Positive VOL	-	-	-
Factor 1	0.88	-	-
Factor 2	0.87	0.52	-
Life satisfaction	0.50	0.40	0.46
Meaning in Life	0.42	0.27	0.47
Depression	-0.63	-0.51	-0.60

Note. All the correlations are significant at the 0.01 level

Discussion

From the factorial analysis of the Portuguese version of the Positive Valuation of Life Scale two factors were obtained, one related to personal/existential beliefs and the other with personal agency/control, accounting for 49% of the total variance. The values obtained for internal consistency were quite close and satisfactory, being higher than 0.75. Also previous studies (e.g., US, Japan) have agreed that VOL incorporates these factors [8,9], which have been extensively studied in the health psychology literature, since they are related with how individuals cope. Control and existential beliefs are important internal resources that together with external ones (e.g., social support), help to determine how individuals overcome and adapt to adverse situations [18].

These validation findings indicate that the Portuguese version of the Positive VOL Scale is a reliable measure, with a good internal consistency and good construct validity ready to use to evaluate attachment to life [3]. Although the fit indices were not totally acceptable, there is theoretical support for Positive VOL structure and further studies should replicate the above findings in other countries.

Furthermore, as it has only 13 items, the scale is less likely to cause respondent burden, which is particularly important in the areas of developmental, clinical and counseling psychology, as well as in health care settings. VOL seems to have a special potential in the study of very old age [6] and the present data suggests possibilities for further research, namely with functionally limited groups in order to identify possible predictors of a positive evaluation of life even in the presence of constraints and adversity.

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Chapter VIII

Successful aging at 100 years: the relevance of subjectivity
and psychological resources

Successful aging at 100 years: the relevance of subjectivity and psychological resources

Abstract

Background: Very old individuals seem to present an admirable capacity to overcome adversities and adapt to the challenges of advanced age. However, studies focusing successful pattern of centenarians found that they may easily fail to be categorized as successful agers when objective criteria are applied. The present study examines if centenarians can be considered successful agers. Following Rowe and Kahn's successful ageing model, the primary goal was to clarify whether centenarians are able to be successful agers according to objective and subjective criteria of no major disease and disability, high cognitive and physical functioning and engagement with life. The second goal was to investigate whether sociodemographic factors, psychological, social and economic resources are related to objective and subjective successful ageing profiles.

Method: We examined different profiles of successful ageing in a high selected sample of individuals aged 100 and more years old from the population-based Oporto Centenarian Study.

Results: Main findings reveal that centenarians do not represent the prototype of successful ageing but self-ratings demonstrate that many of them feel successful despite not being objectively considered as so. Those who were considered successful agers presented higher values of self-efficacy, hope and purpose in life, as well as few difficulties in covering financial expenses.

Conclusion: As a basis for strengthening the existing model, the value of subjectivity should be explored and psychological resources promoted in interventions to foster positive adaptation in very old age.

Keywords: Successful ageing; Centenarians; Longevity; Subjectivity; Resources.

Introduction

The word “success” has deeply marked the history of gerontology research and the emergence of a positive gerontology. In the last decades gerontologists have been shifting their research emphasis from illness to wellness, focusing on optimal functioning rather than on loss and decline. It was the remarkable first issue of “The Gerontologist” journal that reported for the first time the term “successful aging” which was defined by Havighurst (1961) as getting a maximum of satisfaction out of life though no operational definition was presented. Later in the 80’s, within the MacArthur study led by the researchers Rowe and Kahn, successful aging was assumed as a new paradigm still largely valued and studied nowadays (Martin and Gillen, 2013). Their model stimulated research on physical and psychosocial aging over the past 25 years and as a consequence several advances were made in the definitions of successful aging, particularly in the last decade, with a number of researchers reviewing, comparing, and evaluating successful aging as a core concept. In particular, the notion that the definition should consist of a subjective dimension emerged as a significant theme (e.g., Pruchno, Wilson-Genderson, & Cartwright, 2010), as well as the value of individuals’ personal views of success (e.g., Bowling, 2007), and the integration of biomedical and psychosocial definitions into a biopsychosocial approach (Cosco et al., 2013).

What is successful ageing?

The most influential conceptualization of successful ageing was introduced by Rowe and Kahn, who defined it through a biomedical approach as the avoidance of disease and disability, maintenance of high physical and cognitive function, and sustained engagement in social and productive activities (1997). This model was operationalized through the MacArthur study, and individuals who met the three criteria (avoiding disease and disability, high cognitive and physical functioning and engagement with life) were identified as “successful agers” (Rowe and Kahn, 1997). However, no consensus has been reached on which of these criteria have to be met and on their importance for understanding how individuals manage to age well (Freund *et al.*, 2012).

In order to explore “what is successful ageing” and “how people age successfully” in a more process-oriented approach, other models have emerged (Freund *et al.*, 2012). Baltes and Baltes (1990), for instance, highlighted the importance of psychological and behavioral strategies and presented successful ageing as an adaptive process of selection, optimization and compensation strategies (SOC model), and Bowling and Iliffe (2006) presented a lay-based multidimensional model drawing attention to older persons’ perceptions of successful ageing. As for the measures of successful ageing, there’s an

ongoing debate whether quantitative or qualitative methodologies should be used. Von Faber and collaborators (2001) found that the qualitative approach allows considering the individuals that view success as a process of adaptation, suggesting that an expanded definition including the perspective of older adults in order to complement the researchers' definitions. Also a combinatory approach whereby objective and subjective measures should be used in tandem has been recommended (Young *et al.*, 2009). Strawbridge, Wallhagen and Cohen (2002) found that half (50.3%) of older individuals included in their study agreed strongly with the statement *I am ageing successfully* whereas less than a fifth of participants (18.8%) met objective criteria, suggesting that objective measures do not allow to capture the whole history (Pruchno *et al.*, 2010; Depp and Jeste, 2006).

Successful ageing in the very old

Age, i.e. being younger, has been the most consistent predictor of successful ageing (Depp and Jeste, 2006; Hank, 2011), indicating a dramatic drop of the rate of success with advancing age. However, emergent studies based on a more psychological approach have presented the admirable capacity of very old individuals in overcoming adversities and adapting to the challenges of advanced age (Rott *et al.*, 2006). Indeed, the new directions taken in contemporary successful aging studies have shown to be particularly important to understand the vicissitudes of very advanced age (cf., Cho *et al.* 2015, in a recent special issue of "The Gerontologist"; Nosraty *et al.*, 2012).

Studies that have focused on the objective successful pattern of centenarians found that they may easily fail to be categorized as successful agers when objective criteria are applied. A study with 602 centenarians from the Italian Multicenter Studies on Centenarians revealed that even in the group of participants without any particular disease, they did not preserve any social or productive activities, and therefore could not be considered as prototypes of successful ageing (Motta *et al.*, 2005). In another study with a sample of 234 centenarians from the Georgia Centenarian Study, Cho, Martin and Poon (2012) found that 29.5% had low probability of disease, 4.4% satisfied the physical and cognitive capacity criteria, and 57.5% were engaged with life, but none of the centenarians satisfied all three components of successful ageing. These authors suggested an alternative model focused on psychosocial aspects (i.e., subjective health, perceived economic status, and happiness) leading 47.5% of the centenarians to be considered as successful agers. Such findings suggest the need to consider additional criteria, expanding the concepts and multidimensional aspects of successful ageing among oldest-old adults.

Important resources for being successful at 100 years old

The study of lives and patterns of centenarians reveals great heterogeneity between individuals and some paradoxes have been associated with this special age group. The differences between objective measures (e.g., lack in family and friends, sensory deficits) and the subjective appreciations (e.g., perceived quality of life, happiness) elevate the status of these long-lived individuals to resilient survivors (Martin *et al.*, 2010). The mechanisms and attributes associated with this positive adaptation have been of great interest in centenarians' research over the last years, with emphasis on basic factors (e.g., educational level, job training), psychological attributes (e.g., self-referent beliefs, attitudes toward life), and social and economic resources (e.g., social network, income) as determinants of happiness (Jopp and Rott, 2006) and positive affect (Martin *et al.*, 2010). Cho and colleagues (2012) have addressed an alternative model of successful ageing based on psychosocial aspects (subjective health, perceived economic status, and happiness), but their relation with centenarians' strategies, characteristics and support was not explored.

The present study

Seeking to clarify whether centenarians are able to be successful agers (Rowe and Kahn's model) and what kind of resources (i.e., personal characteristics and external support) may be related with that possibility, the present study had two main purposes: first, to investigate objective and subjective profiles of successful ageing among the three components of successful ageing (physical health, cognitive/physical functioning, and engagement with life) in a sample of Portuguese centenarians. Assuming that very old individuals maintain their psychological resilience, we expected that the percentage of centenarians fulfilling subjective criteria of successful ageing would be higher than the percentage fulfilling objective criteria. Second, the association between objective and subjective profiles of successful ageing with sociodemographic characteristics and individual (psychological) and external (social and economic) resources was explored.

Methods

Participants

The sample (n=70) for this study come from the population-based Oporto Centenarian Study (PT100) and it is constituted by centenarians with cognitive capacity for answering self-report questions. Potential participants to be included in this study were from a defined geographical region of approximately 60 km around Porto in Portugal (comprising 16 municipalities), having 1477440 inhabitants, 18.7% aged 65 and more years old, and with 182 centenarians identified in the last National Census (INE, 2011). All inhabitants

who were aged 100 years and more between December 2012 and December 2013 were identified through voter registration files, churches, nursing home and local media newspapers. This first step of recruitment provided 186 potential participants. Although all these centenarians, and respective families and/or caregivers, were contacted, 140 were effectively face-to-face interviewed. The other 46 centenarians were subsequently excluded because they died in the interim or their relatives refused participation because of obvious dementia, severe health problems, or lack of interest. Information was collected during one or two sequential sessions directly with the centenarian and/or with a proxy respondent. More specifically, information on the centenarians' own perception (health, cognitive and functional capacity, social activities and relationships) was only assessed if the individual was not affected by severe cognitive impairment and was willing to present information on these aspects. Taking into account cut-offs that had been utilized in previous studies with centenarians (e.g., Rott *et al.*, 2006), we determined a score of 4 or higher on the SMMSE to indicate the necessary cognitive capacity for answering self-report questions. Based on this cut-off, from the initial 140 centenarians, 70 were selected for this study. Information on the centenarians' physical conditions was also obtained by the proxies, following the methodology used in previous studies that demonstrated high levels of agreement between participants and proxies' answers (MacDonal *et al.*, 2009). Age validation was accomplished via confirmation with identity card or birth certificate and informed consent for participating in the study was fully considered.

The mean age of the sample was 100.91 (SD 1.37), 87.1% were women and 75.7% were widowed. 27.1% of the sample lived in institutions, 48.6% with children, 4.3% alone, and the remaining with other relatives (20.0%). The mean of school years attended was 2.08 (SD 2.38); 40.0% never attended school and 48.6% had up to 4 years of education (elementary school). In what concerns monthly income, 5.9% received less than 250€, 70.6% between 250€ - 500€ and 23.5% more than 500€ per month. Because dropouts are usually worse off we investigated differences between this group ($n = 70$, i.e. persons unable to contribute with valid self-reports) and full participants ($n = 70$, present sample) in basic sociodemographic variables, cognitive capacity and function. Fisher's exact tests showed significant differences ($p < 0.01$) for living arrangements, with a higher proportion of institutionalized centenarians within the drop-outs, and no differences for gender, marital status and education. With respect to physical and cognitive functioning, dropouts scored significantly lower (ADL: $t = -8.40$, $p < 0.001$; IADL: $t = -5.97$, $p < 0.001$; SMMSE: $t = -17.76$, $p < 0.001$; GDS: $t = 3.87$, $p < 0.001$). Consequently, the sample for this study only represents a selected range of physical and cognitive functioning within centenarians and results cannot be generalized to the entire centenarian population.

Study design and data collection

For classifying centenarians as “successful agers”, objective and subjective criteria were considered and four groups created: (i) centenarians that meet only the objective criteria of successful ageing, (ii) centenarians that meet only the subjective criteria of successful ageing, (iii) centenarians that meet both criteria, and (iv) a final group of centenarians that do not meet any criteria. Guided by Rowe and Kahn’s conceptualization of successful ageing, Depp and Jeste’s (2006) review about the components widely used to assess successful agers, recent publications on the prevalence of successful ageing in both American and European studies (McLaughlin *et al.*, 2010; Hank, 2011) and particularly among centenarians (Cho *et al.*, 2012), the following criteria and cut-offs were used to define the existence of *objective successful ageing*:

(i) No major disease and disability. Only the major causes of death among older adults were included for this analysis. Participants were asked if a doctor had ever told them they had any of the following chronic diseases: chronic lung disease, diabetes and heart disease (presently), stroke and cancer (in the last five years). Disability was examined considering activities of daily living (ADLs), namely bathing, taking care of own appearance, dressing, eating, getting in or out of the bed, walking and using toilet as assessed in OARS (Fillenbaum and Smyer, 1981). All of these 7 items were scaled as 2 = without help, 1= with some help, 0= completely unable. Cronbach’s alpha in this study was 0.90, demonstrating high reliability of the scale within this sample of extremely old individuals. Cut-points were chosen at the 33rd percentile to include the best third of the total score, in order to select 1/3 of the cases with high independence.

(ii) High physical and cognitive functioning. Instrumental activities of daily living (IADLs) that require physical capacity as traveling, shopping and housework were considered (OARS, Fillenbaum and Smyer, 1981). Cronbach’s alpha was 0.67. The best 33rd percentile of the total score was selected, thus considering 1/3 of the individuals who presented better results on this measure. For cognitive functioning we used the Global Deterioration Scale (Reisberg *et al.*, 1982), an interviewer rating of subjective memory complaints, orientation, and functional ability covering seven stages of deterioration (1 = no memory deficit evident from interview, to 7 = very poor cognitive, verbal, and psychomotor functioning). Low scores of this instrument indicate good performance. A cut-off score of 2 or less, including stage 1 (no cognitive decline) and stage 2 (very mild cognitive decline) were considered as indicative of good cognitive functioning.

(iii) Active engagement with life. Taking into account the social connections and the engagement in productive activities included in this dimension, individuals were

defined as “successful” if they reported at least one community engaged activity of a list of three (including volunteering, voting and attending religious celebrations). Social interaction was considered existent if the centenarian had at least three regular visits.

Rowe and Kahn’ model was evaluated by the centenarian through self-reported measures in order to obtain the profiles of *subjective success*. Each of the model’s components included two questions that were answered by those centenarians with response capacity (those who weren’t able to give self-reports due to their cognitive impairment were classified as unsuccessful in any criteria). Selected items were:

- (i) No major disease and disability. A positive general self-rated health (*In general, how would you rate your overall health?* excellent=5, very good=4, good=3, fair=2, bad=1, don’t know (d/k)=9) and the absence of perceived frequent health restrictions (*How often does your health interfere in your daily living?* never=5, seldom=4, sometimes=3, frequently=2, always=1, d/k=9) were considered for the group with subjective successful ageing.
- (ii) High physical and cognitive functioning. The absence of perceived memory problems (*In general, do you think you have memory problems?* no=1, yes=0, d/k=9) and a good perception of physical health (*In general, do you feel physically healthy?* yes=1, no=0, d/k =9) were selected.
- (iii) Active engagement with life. The will to perform activities abroad (*Do you prefer to stay at home rather than going out and do things?* no=1, yes=0 , d/k =9) and the perception of having at least one family or friend as confident (*With how many persons do you can talk with about private matters?* none=0, one or two=1, three or more=2, d/k =9) were considered as representing engagement with life.

In order to evaluate centenarians’ resources, information was also collected on psychological, social and economic functioning. Items indicating self-efficacy (*I feel able to accomplish my goals*), hope (*I feel hopeful right now*), and purpose (*Life as meaning for me*) were drawn from the Valuation of Life Scale (Lawton *et al.*, 2001), with a Cronbach’s alpha of 0.75. For positive emotional status the third item of the Satisfaction with Life Scale (*I am satisfied with my life*) from Diener and colleagues (1985) was used. For all these items the answering format was modified for 1=no, 2=in between, 3=yes due specific difficulties in assessing centenarians (see Jopp and Rott, 2006). For social resources we used the total number of living children and a question retrieved from the social components of frailty (Tilburg Frailty Indicator, Gobbens and van Assen, 2012) was used to assess whether the individual felt satisfied or not with his social support. In

addition, information about monthly income (1= \leq 500€, 2= $>$ 500€) and income adequacy for expenses, i.e., if the monthly income was enough for all the expenses related with centenarian housing, alimentation, medication and other payments (1=doesn't cover expenses, 2= cover expenses) were used as economic resources indicators. Finally, sociodemographic information on gender (1=male, 2=female), marital status (1=widower, 2=not widower), education (1=illiterate, 2=literate) and living arrangements (1=community, 2=institution) was collected by means of a questionnaire.

Data Analyses

The existence of objective or/and subjective conditions of successful ageing were calculated considering four distinct groups: those fulfilling objective successful ageing criteria, those fulfilling subjective successful ageing criteria, those fulfilling both objective and subjective criteria and, finally, those having no successful ageing criteria. Pearson's Chi-squared tests were performed to identify differences between study participants to achieve objective and subjective criteria of the original successful ageing model. For the second aim, the Kruskal-Wallis test were performed with successful ageing profiles and the Valuation of Life items of three core constructs within the scale: self-efficacy, hope and purpose (Lawton *et al.*, 2001) in order to choose one item per construct. Pearson's Chi-squared test and Student-t test were performed to identify differences between participants with objective or subjective successful ageing and participants without successful ageing in relation to sociodemographic characteristics, psychological, social and economic resources. All analyses were conducted using IBM SPSS Statistics Software Version 21.

Results

The centenarians' distribution by objective and subjective successful ageing criteria (Table 1) show that 28.6% of the centenarians rated their health as excellent to good, 65.7% reported no memory problems, and 39.9% reported the existence of at least one family or friend as confident. In what concerns the objective criteria, the mean of diseases was less than 1, the Global Deterioration Scale's mean score was 2.89 (SD 1.78), and the most common outdoor activity was going to the church (20%).

Table 1 – Centenarians distribution by objective and subjective successful aging criteria
(Rowe and Kahn's model)

	<i>Objective criteria</i>		<i>Subjective criteria</i>	
		<i>Mean (SD)</i>		<i>n (%)</i>
No major disease and disability	Chronic diseases	0.50 (0.50)	General health	
			Excellent-Good	20 (28.6)
			Fair	36 (51.4)
			Bad	6 (8.6)
	Activities of Daily Living (ADL)	8.34 (3.95)	D/k	8 (11.4)
			Health restrictions	
			Never-Sometimes	30 (42.9)
			Frequently-Always	14 (20.0)
			D/k	26 (37.1)
		<i>Mean (SD)</i>		<i>n (%)</i>
Mental and physical health	Global Deterioration Scale (GDS)	2.89 (1.78)	Memory problems	
			Yes	15 (21.4)
			No	46 (65.7)
			D/k	9 (12.9)
	Instrumental activities (IADL)	1.41 (1.13)	Physical health	
			Healthy	36 (54.1)
			No healthy	24 (34.3)
			D/k	10 (14.3)
		<i>n (%)</i>		<i>n (%)</i>
Active engagement	Presently practiced activities	2 (2.9)	Will to perform activities abroad	26 (37.1)
	Volunteering	10 (14.3)	Yes	17 (24.3)
	Vote	14 (20.0)	No	27 (38.6)
	Going to church		D/k	
	Nº of regular visits	8 (11.4)	Nº of confidants	19 (27.1)
	None	14 (20.0)	None	15 (21.4)
	One or two	42 (60.0)	One or two	13 (18.5)
	Three or more	6 (8.6)	Three or more	23 (32.9)
	D/k		D/k	

Chronic disease [0 to 5 diagnosis]; ADL [0-14, 0=maximum dependence]; GDS [1-7; 1=no cognitive decline]; IADL [0-6, 0=maximum dependence]; D/k – don't know

Figure 1 contains the distribution of centenarians in the various groups described in the methods section. Only a person met simultaneously both objective and subjective criteria in all three components of successful ageing (1.4%); 2 centenarians (2.8%) met exclusively the objective criteria and 4 centenarians (5.6%) met solely the subjective criteria. When separately considering objective and subjective profiles, the results revealed a higher percentage of centenarians that perceived themselves as successful agers compared to those who were objectively defined as being so. More specifically, 28.6% didn't have any major disease and disability, 38.6% had positive self-perceived outcomes of health and functional capacity; 20.0% had good objective indicators of

physical and cognitive functioning, and 40.0% had a positive perception of their functioning ($p < 0.05$). The only exception was the active engagement component that showed a higher proportion of centenarians fulfilling objective criteria (18.6% had presented productive activities and social connections and only 14.3% perceived themselves as being socially engaged with life) though no statistical differences were found.

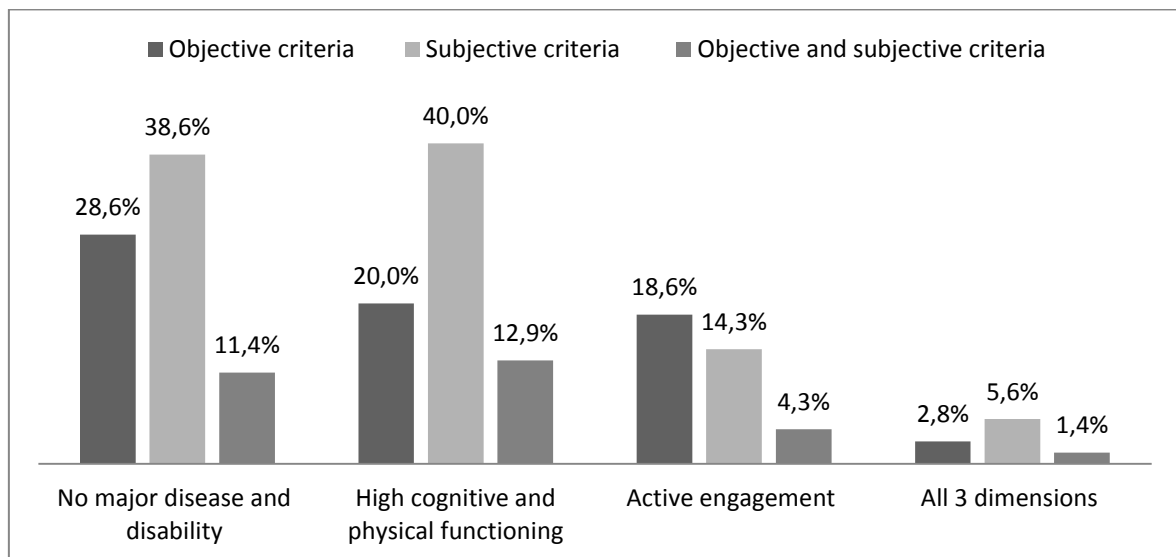


Figure 1 – Profiles of Successful Centenarians (Rowe and Kahn's Model)

Main sociodemographic characteristics of the centenarians that had fulfilled objective criteria for successful ageing are presented in Table 2. When compared with the group of centenarians that did not fulfill objective criteria of successful ageing, the objective successful centenarian group had a lower percentage of women in all the three components of the model but only with statistical significant differences for no major disease and disability ($\chi^2=13.39$ (df=1), $p < 0.1$) and active engagement with life ($\chi^2=5.42$ (df=1), $p < 0.1$). For this last component of the model significant differences were also found according education level ($\chi^2=3.29$ (df=1), $p > 0.1$). In relation to psychological resources, there were higher values of self-efficacy ($t=-1.70$ (df=39), $p < 0.1$) for centenarians with no major disease and disability, higher values of hope and positive emotions in centenarians with high physical and cognitive functioning ($t=-1.75$ (df=48), $p < 0.1$; $t=-2.65$ (df=44), $p < 0.1$), and higher purpose in life in centenarians with active engagement with life ($t=-2.35$ (df=47), $p < 0.1$). Regarding social and economic resources there was a lower mean in the number of living children in centenarians with no major disease and disability ($t=1.72$ (df=44), $p < 0.1$) and less difficulties covering expenses in centenarians with high physical and cognitive functioning ($\chi^2=4.20$ (df=1), $p < 0.1$).

Table 2 – Sociodemographic characteristics, psychological, social and economic resources for Objective Successful Aging (Obj. S.A.)

	No major disease and disability			High physical and cognitive functioning			Active engagement with life		
	Obj. S.A.	No S.A.	sig	Obj. S.A.	No S.A.	Sig	Obj. S.A.	No S.A.	sig
Sociodemographic – n (%)									
Gender (female)	12 (63.2)	49 (96.1)	0.001**	12 (85.7)	49 (87.5)	0.578	8 (66.7)	53 (91.4)	0.041**
Marital status (widower)	14 (73.7)	39 (76.5)	0.518	10 (71.4)	43 (76.8)	0.458	7 (58.3)	46 (79.3)	0.122
Education (literate)	14 (73.7)	28 (54.9)	0.124	10 (71.4)	32 (57.1)	0.254	10 (83.3)	32 (55.2)	0.065*
Living arrangements (community)	13 (68.4)	38 (74.5)	0.410	11 (78.6)	40 (71.4)	0.433	9 (75.0)	42 (72.4)	0.582
Psychological resources – M (SD)									
Self-efficacy	2.25 (0.62)	1.83 (0.76)	0.097*	2.20 (0.79)	1.87 (0.72)	0.226	2.13 (0.83)	1.91 (0.72)	0.466
Optimistic outlook	1.93 (1.03)	1.80 (0.93)	0.656	2.23 (1.01)	1.70 (0.91)	0.086*	1.44 (0.88)	1.93 (0.96)	0.173
Purpose	2.40 (0.83)	2.21 (0.84)	0.479	2.48 (0.87)	2.19 (0.82)	0.289	2.73 (0.65)	2.15 (0.84)	0.031**
Positive emotional status	1.46 (0.88)	1.36 (0.86)	0.731	1.83 (0.58)	1.24 (0.89)	0.013**	1.67 (0.70)	1.32 (0.88)	0.287
Social and economic resources									
Number of children – M (SD)	1.32 (1.25)	2.04 (2.20)	0.091*	1.79 (1.48)	1.86 (2.13)	0.906	1.67 (1.44)	1.88 (2.11)	0.741
Satisfaction with social support – n (%)	8 (53.3)	12 (35.3)	0.192	7 (53.8)	13 (36.1)	0.215	4 (40.0)	16 (41.0)	0.623
Income/month (>500) – n (%)	2 (11.8)	10 (20.8)	0.334	2 (16.7)	10 (18.9)	0.613	2 (18.2)	10 (18.5)	0.673
Income covers expenses – n (%)	10 (55.6)	31 (64.6)	0.346	12 (85.7)	29 (55.8)	0.037**	9 (75.0)	32 (59.3)	0.250

*p < .10; **p < .05

Table 3 – Sociodemographic characteristics, psychological, social and economic resources for Subjective Successful Aging (Subj. S.A.)

	No major disease and disability			High physical and cognitive functioning			Active engagement with life		
	Subj. S.A.	No S.A.	Sig	Subj. S.A.	No S.A.	Sig	Subj. S.A.	No S.A.	Sig
Sociodemographic – n (%)									
Gender (female)	22 (81.5)	39 (90.7)	0.223	24 (85.7)	37 (88.1)	0.521	8 (80.0)	53 (88.3)	0.379
Marital status (widower)	19 (70.4)	34 (19.1)	0.292	21 (75.0)	32 (76.2)	0.564	9 (90.0)	44 (73.3)	0.239
Education (literate)	18 (66.7)	24 (55.8)	0.258	18 (64.3)	24 (57.1)	0.365	4 (40.0)	24 (40.0)	0.630
Living arrangements (community)	21 (77.8)	30 (69.8)	0.327	21 (75.0)	30 (71.4)	0.482	7 (70.0)	44 (73.3)	0.548
Psychological resources – M (SD)									
Self-efficacy	2.10 (0.81)	1.81 (0.66)	0.220	2.24 (0.83)	1.75 (0.61)	0.037**	2.25 (0.70)	1.88 (0.74)	0.207
Optimistic outlook	2.00 (0.98)	1.69 (0.93)	0.259	1.95 (1.02)	1.76 (0.91)	0.485	2.11 (1.05)	1.78 (0.94)	0.352
Purpose	2.48 (0.75)	2.11 (0.88)	0.138	2.52 (0.79)	2.05 (0.83)	0.047**	2.70 (0.67)	2.16 (0.84)	0.068*
Positive emotional status	1.38 (0.86)	1.40 (0.87)	0.941	1.55 (0.76)	1.27 (0.92)	0.275	1.78 (0.67)	1.30 (0.88)	0.089*
Social and economic resources									
Number of children – M (SD)	1.81 (1.94)	1.86 (2.07)	0.927	1.64 (1.81)	1.98 (2.14)	0.333	2.20 (1.75)	1.78 (2.05)	0.547
Satisfaction with social support – n (%)	8 (40.0)	12 (41.4)	0.580	10 (47.6)	10 (35.7)	0.292	3 (30.0)	17 (43.6)	0.343
Income/month (>500) – n (%)	5 (20.8)	7 (17.1)	0.474	5 (20.8)	7 (17.1)	0.474	3 (30.0)	9 (16.4)	0.267
Income covers expenses – n (%)	18 (66.7)	23 (59.0)	0.355	16 (61.5)	25 (62.5)	0.570	8 (80.0)	33 (58.9)	0.183

*p < .10; **p < .05

When analyzing the same factors between centenarians fulfilling subjective ratings of successful ageing and centenarians with no subjective successful ageing it is possible to see that differences were only significant in the components of high physical and cognitive functioning and active engagement (Table 3). More specifically, successful centenarians had higher levels of self-efficacy ($t=-2.16$ ($df=39$), $p<0.1$), purpose in life ($t=-2.04$ ($df=47$), $p<0.1$; $t -1.87$ ($df=47$), $p<0.1$) and positive emotions ($t=-1.81$ ($df=44$), $p<0.1$).

Discussion

This paper examined one of the most controversial and influential concepts in ageing research, successful ageing, among individuals that reached the threshold of 100 years old. The results suggest that the prevalence of “success” in the oldest old, even when considering subjective criteria, is very low, confirming the markedly fewer possibilities of being successful as age increases (McLaughlin *et al.*, 2010).

The results confirm our hypothesis that the percentage of centenarians fulfilling subjective criteria of successful ageing would be higher than the percentage fulfilling objective criteria in Rowe and Kahn’s health related components but not for active engagement with life. A reduced proportion of individuals fulfilling Rowe and Kahn’s objective criteria of successful ageing was also found in previous studies with younger elders, more precisely in European adults aged 50+s (Hank, 2011) and American elders aged 65+ (McLaughlin *et al.*, 2010), confirming that this concept might be too narrow. In fact, in our sample only one centenarian fulfilled all three criteria, which is somewhat expected due to the physical constraints present in nearly all centenarians (Andersen-Ranberg *et al.*, 2001), the highly expected cognitive restrictions (Hagberg *et al.*, 2001), the loss of family and friends that may lead to a reduced social network (Randall *et al.*, 2010) and the high levels of anxiety symptoms (Ribeiro *et al.*, 2014).

The disparity between objective and subjective measures of successful ageing, that had already been reported in previous studies with younger populations (e.g., Strawbridge *et al.*, 2002; Pruchno *et al.*, 2010) and confirmed in a sample with long living individuals (Cho *et al.*, 2012), suggests that a combination of measures should provide a more comprehensive account of how successful ageing might be approached.

Specific attention should be given to the lowest proportion of centenarians considering themselves as successful agers in the component of active engagement. This finding leads us to think that some healthy and autonomous centenarians, with good physical and cognitive capacities, may not have social activities and connections and/or are satisfied with them. Leisure time and productive social activities didn’t feature as important factors in previous studies among centenarians (Motta *et al.*, 2005), which strengthen the tendency of older adults to gradually withdraw from social roles and activities, and to

reduce their social network (e.g., Carstensen *et al.*, 1999). Moreover, it may also suggest the higher importance of transcendence in fulfilling individual needs, as an adaptive mechanism through which the individual can maintain psychological well-being (Tornstam, 2005). With regard to social relationships, these are seen as changing from the wider and shallower relationships with others (characteristic of young people) to few and narrower relationships later in life, and an eventual departure from a social role. Whether this reduced subjective appreciation of social engagement is protective in terms of maintaining positive levels of well-being is an issue that requires further attention, especially as the extent of being “socially engaged” at such a very high age is probably strongly limiting the prototype of (perceived) successful ageing.

The analysis of sociodemographic factors, psychological, social and economic resources across objective and subjective profiles of successful ageing reveal that some psychological resources are significantly different across groups. The association of self-efficacy, purpose and hope with measures of well-being and life quality has been previously presented (e.g., Reker and Woo, 2011), but few studies addressed the specific contribution of these type of resources in centenarians (Jopp and Rott, 2006) and within a successful ageing approach.

In general, multidimensional approaches of successful ageing based on objective and subjective dimensions may contribute to a greater understanding of its correlates and modifiable aspects as defended by Pruchno *et al.* (2010) through the test of successful ageing as a two-factor model including objective and subjective components. Hence, it is crucial to think and investigate about appropriate subjective criteria. Concretely for the group of centenarians, such an approach may help researchers to gain deeper insights on how this special group achieves successful ageing even under conditions of physical health limitations, disabilities, and social constraints. Despite the unquestionable value of Rowe and Kahn’s model of successful aging, a broader definition of successful ageing more process-oriented is therefore warranted, especially when considering the oldest old population. Future studies should address the possibilities of successful ageing at such advanced age, confronting different models and methodological approaches, in order to adapt this concept to the constraints of an older and possible more impaired population.

The impact of the available resources, such as individual strategies and external support, in improving subjective appraisals of successful aging may inform tailored interventions to promote successful aging in old age. As seen on this study, certain internal resources are not overwhelmed by physical deterioration and may even gain power when congruent and meaningful perceptions of oneself and one’s life are maintained in late life. In accordance with previous findings (Jopp and Rott, 2006), certain psychological attributes have shown to be important for centenarian’s adaptation. Hence, interventions should maximize

elder's positive traits, enhancing their competencies so they can effectively use their resources, and address self-appraisals more than objective states. Given the importance of self-efficacy and purpose, activities directed to preserve control over some functions and maintain meaningful goals must be developed.

Some final considerations about the challenges and limitations that had emerged during this study are required. The first ones concern data collection. Since self-reports on extremely long-lived individuals are more difficult to obtain due to multiple sensory and cognitive limitations, and in this particular case due to the low levels of literacy in Portuguese centenarians, the successful ageing profiles were explored in a sample without severe cognitive impairment. In addition, we also recognize as a constrain the provenience of the sample that though coming from a population-based study, refers to a specific geographical area and centenarians of other regions might present different patterns of (un)successful ageing. The results related with psychological resources should be carefully considered, since self-efficacy, hope, purpose in life and positive emotions were evaluated by single items.

Conflict of interest declaration: none

Description of authors' roles: L. Araújo wrote the manuscript and performed the data analysis; L. Teixeira supervised data analysis and contributed in the methodological design; O. Ribeiro was responsible for the study conception and design, and supervised data collection; C. Paúl critically revised the paper for important intellectual content.

Acknowledgements:

The project would not have been possible without the involvement of our centenarians and their family members, as well as the participation of PT100 team in collecting data. The authors would like to thank the guidance of Daniela Jopp and Christoph Rott from the Second Heidelberg Centenarian Study (Germany).

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Chapter IX

A Multidimensional Concept of Successful Aging in Centenarians

A Multidimensional Concept of Successful Aging in Centenarians

Abstract

Background: The multidimensional model of successful aging (Young, Frick, Phelan., 2009) has been serving as a reference in empirical studies of successful aging over the last years (e.g., Pruchno et al., 2010) and a benchmark to assess the health and functioning of very old individuals (Philips Lifeline, 2014). By comprising bio, psycho and social domains, it constitutes a promising approach to the study of the centenarian population who tend to present several age-related losses. **Aims:** The study aims to validate a multidimensional model of successful aging in a sample of Portuguese centenarians. **Methods:** 80 centenarians from the PT100 project (Oporto and Beira Interior Centenarians Studies) were face-to-face interviewed. Indicators of disease and physical impairment (physiological domain), emotional vitality and inner contentment (psychological), and engaging with life and spirituality (sociological) were collected. **Results:** Structural equation modeling analysis to the hypothesized model suggests the separation of the psychological domain into two latent factors (cognitive function and well-being). The alternative model fits well to the observed data, with $X^2(71)=79.634$, $p=0.226$, CFI=0.953, GFI=0.877, RMSEA=0.040, $p=0.622$. **Discussion:** The consideration of multi indicators of successful aging enables considering compensatory mechanisms and synergies between physical, psycho and social domains. **Conclusion:** This conceptual model seems to be particularly helpful in identifying possible avenues for intervening with individuals who experience age-related changes and transitions, which is the case of centenarians.

Key-words: Successful-aging; Multidimensional concept; Centenarians; Confirmatory factor analysis; Measurement model; Structural modeling

Introduction

The most influential construct for distinguishing pathological, normal and successful aging was introduced by Rowe and Kahn, who defined successful aging as the “avoidance of disease and disability, maintenance of high physical and cognitive function, and sustained

engagement in social and productive activities” (p. 439) [1]. This definition was pioneer in considering multiple dimensions, as well as a non-physical domain about active social engagement with life. However, over the last years, disagreement around this model has increased with cross-national studies presenting very low prevalence estimates of “successful aging” among older individuals, suggesting the concept is very restrictive [2]. Also, several studies have questioned the criteria used to assess the concept and the continued focus on physiological aspects which completely enables an older person with some kind of age-related illness and/or disability to be considered as “successful” [3]. This last aspect is particularly true when the evidence shows us that many older individuals perceive themselves as happy and well, even in the presence of disease or disability [4], i.e., they feel “successful” even though they have significant health problems [5]. Older people’s views of successful aging appear to be multidimensional and more complex than the apparent viewpoint of many of early studies, which tended to focus on a single dimension of health - psychological or mental [6].

The multidimensional concept of successful aging

In an attempt to overcome the limitations around successful aging definition, measurement and intervention Young and colleagues proposed a multidimensional concept of successful aging, with operational (measure) information [7]. The authors moved beyond the previous limited perspective that emphasized physiological aspects (e.g., disease and impairment) and presented a concept that also encompasses psychological (e.g., emotional vitality and inner contentment), and sociological (e.g., engaging with life and spirituality) domains [7]. This greater focus on psychosocial domains highlights the person’s capacities of adaptation, resilience, and coping, which have been tremendously advocated in last years in the gerontological literature [8-10]. Additionally, this model follows previous recommendations and includes spirituality as a component of successful aging [11], recognizing, therefore, the importance of nontangible means of support such as giving and receiving prayers [11-12]. The multidimensional model of successful aging [7] has been serving as a reference in empirical studies of successful aging [6, 13] and also as a benchmark to assess the health and functioning of the older population [14]. This new approach emerges as a hallmark of the clinical care of older people [15], allowing medical doctors to consider multidisciplinary and multidimensional assessments of successful aging [4].

Successful aging at one century of life

The progressive aging and longevity of the older population itself has becoming an important issue for successful aging' research and policy. The estimated number of people aged 100 and over has doubled each decade since 1950 in more developed countries. In addition, the global number of centenarians is projected to more than quintuple between 2005 and 2030, making them the fastest growing age segment [16]. But the celebration of the 100th birthday can come with several costs: loss of health, functional capacity and even loss of friends and family [17] and therefore most of them fail to "age successfully" [18, 19]. Considering that Young's et al. multidimensional model [7] overcomes the reductionism of previous health-based models [1], it is assumed to be a promising approach to the study of centenarians' successful aging.

The present study aims to evaluate the validity of Young and colleagues' [7] multidimensional concept of successful aging in very advanced age. This conceptual model has been suggested as helpful in identifying possible avenues for intervening with individuals who experience age-related changes and transitions, which is the case of centenarians that represent the ultimate challenge of aging.

Methods

Sample

Data from two Portuguese studies on centenarians were considered: 43 centenarians from the Oporto Centenarian Study and 37 centenarians from the Beira Interior Centenarian Study. The first one is a population-based study comprising a total of 186 centenarians living in Oporto city and its surrounding geographical area (Oporto Metropolitan Area, which comprises a region of approximately 60 km around Porto, in Portugal) and the second one refers to a convenience sample of 105 centenarians living in the interior part of the country with a similar geographical extension around the city of Guarda). From a total of 291 centenarians, only 241 were effectively face-to-face interviewed. The other 50 centenarians were excluded because they died in the interim or their relatives refused participation because of obvious dementia, severe health problems, or lack of interest. Information was collected during one or two sequential sessions directly with the centenarian and/or with a proxy respondent (families and/or caregivers). Age validation was accomplished via confirmation with identity card or birth certificate and informed consent for participating in the study was fully considered (previously approved by Institute of Biomedical Sciences Ethical Committee).

Since this study requires centenarians' own perceptions about well-being measures, information was only assessed if the individual was not affected by severe cognitive impairment and was willing to inform on these aspects. Taking into account cut-offs that had been used in previous studies with centenarians [20], we determined a score of 4 or higher on a shortened version of the Mini Mental State Examination [21, 22] to indicate the necessary cognitive capacity for answering self-report questions. Following the recommendation by Holtsberg, Poon, Noble, and Martin [23] the selected shorter version items included those that were not biased by sensory impairment often prevalent in very old age, resulting in a maximum score of 21 points instead of 30. Based on this cut-off, from the initial 241 centenarians, 124 were selected. Additionally, since the methodology used in the present study requires the absence of missing information, only centenarians with complete interviews were considered ($n=80$).

The mean age of the final sample ($n=80$) was 101.01 (SD 1.31), 81.3% were women and 81.3% were widowed. 31.3% of the sample lived in institutions, 45.0% with children, 7.5% alone, and the remaining with other relatives (16.2%). The mean of school years attended was 2.16 (SD 2.44); 37.5% never attended school and 49.0% had up to 4 years of education (elementary school). In what concerns monthly income, 15.6% received less than 250€, 63.6% between 250€ - 500€ and 20.8% more than 500€ per month.

Because drop-outs are usually worse off we investigated differences between this group ($n = 161$, i.e. persons unable to contribute with valid and full self-reports) and participants ($n = 80$, present sample) in basic sociodemographic variables, cognitive capacity and function. Results showed significant differences ($p < 0.05$) for gender, with a higher proportion of men in the selected group (18.8% for 8.7% in the drop-out), for living arrangements, with a higher proportion of institutionalized centenarians within the drop-outs (52.5% for 32.5% in the selected group), and for education (45.2% of illiterate in the drop-out and 28.7% in the selected group). No differences for marital status were found. With respect to physical and cognitive functioning, drop-outs scored significantly lower in Activities of Daily Living (ADL: $t(237) = -7.871$, $p < 0.001$), Instrumental Activities of Daily Living (IADL: $t(233) = -6.704$, $p < 0.001$), Mini-Mental Status Examination (MMSE: $t(231) = -13.675$, $p < 0.001$) and Global Deterioration Scale (GDS: $t(234) = 2.736$, $p < 0.001$). Consequently, the sample for this study only represents a selected range of physical and cognitive functioning within centenarians and results cannot be generalized to the entire centenarian population.

Measures

Physiological domain. Health problems and comorbidity were assessed with a list of 18 health problems that includes, for example, hypertension, heart problems, chronic lung disease, diabetes mellitus, frequent urinary infections, arthritis. Functional disability was assessed with items retrieved from the Older Americans Resources and Services (OARS) Multidimensional Functional Assessment Questionnaire [24, 25]. The scale includes 7 items to assess basic daily living activities (ADL; e.g., the ability to talk on the phone, to travel, go shopping, prepare meals) and other 7 items to evaluate instrumental daily living (IADL; e.g., the capacity for walking, bathing, eating, toileting). Respondents were asked how much difficulty they had performing each of these activities by rating them on a three-point scale (2 = no difficulty; 0 = can't do without help).

Psychological domain. Cognition was assessed with a shortened version of the Mini Mental State Examination [21, 22] with a maximum score of 21 points instead of 30. Depression was evaluated through the Geriatric Depression Scale shorter version (GDS-4), a scale that measures affective and motivational/cognitive components of depression in older adults [26, 27]. This smallest subset of questions has been indicated as an adequate substitute for the 30-item version, most desirable to be incorporated into routine care by the general practitioner [27]. For life satisfaction, the Satisfaction with Life Scale (SWLS) was used. The SWLS is a short 5-item instrument designed to measure global cognitive judgments of satisfaction with one's life [28-29]. Due centenarians' multiple sensory, literacy and cognitive limitations, the original answering of SWLS of five categories was changed to three (0=No, 1=In between, 2=Yes).

Social domain. Two questions from the Social Resources subscale of OARS [24, 25] were used to evaluate engagement with life: one about the number of visits the centenarians had on a regular basis, and another on how often time they spent with someone who does not live with them. Centenarians' were also asked about the activities they performed in a regular basis (e.g., volunteering, voting, visiting a familiar or a friend, and attending religious celebrations). For evaluating aspects related with spirituality, the item "My life is guided by strong religious or ethical beliefs" from the Valuation of Life Scale [30] was used. In order to further reduce cognitive load, the original answering format was reduced from 5 to 3 categories: "yes", "in between", "no".

The interview also included information on socio-demographic aspects (age, gender, education, living arrangements, and monthly income). All the variables and respective assessment and coding form are presented in Table 1.

Table 1 – Variables, contents and assessment for each of the multidimensional model of successful aging domains.

Domain	Contents	Assessment	Coding
Physiological	Comorbidity	List of conditions most prevalent among elderly	0 = < 3; 1 = 3-5; 2 = ≥ 5 (diseases)
	Functional impairments	OARS Multidimensional Functional Assessment Questionnaire (ADL and IADL)	0 = < 8; 1 = 8-13; 2 = ≥ 13 (score of ADL) 0 = < 3; 1 = 3-6; 2 = ≥ 6 (score of IADL)
Psychological	Cognitive function	Shortened version of MMSE	
		MMSE 1 – Items 1, 2, 4, 6, 7, 12	[0-10]
		MMSE 2 – Items 3, 5	[0-2]
		MMSE 3 – Items 9, 10	[0-2]
		MMSE 3 – Items 8, 11, 13	[0-7]
	Depression	Geriatric Depression Scale (GDS-4)	[0-4]
	Emotional vitality	Satisfaction with Life (SWL) Scale	
		SWL 1 – Items 1, 3	[0-4]
		SWL 2 – Items 2, 4, 5	[0-6]
Social	Engaging with life	OARS	0 = 0; 1 = 1; 2 = 3-4; 3 = ≥ 5 (n° regular visits) 0 = 0; 1 = 1; 2 = 2-6; 3 = 7 (times spent social relations/week)
		Questionnaire about social activities performed	0 = 0; 1 = 1-2; 2 = ≥ 3 (n° regular activities performed)
	Spirituality	Religious beliefs from the Valuation of Life Scale (Item 4)	0 = No; 2 = In between; 3 = Yes (have religious beliefs)

Analysis

Exploratory factor analyses using principal component method and varimax rotation were conducted on each of the scales to determine their dimensionality. If the scale items' load in only one factor this score was used as indicator of a latent factor and in the case of items loading more than one factor, the subscales were used as indicators of latent factors [31]. These first analyses were conducted using IBM SPSS Statistics Software Version 21.

In order to test the viability of a hypothesized structure of successful aging in centenarians, a confirmatory factor analysis was conducted using AMOS 21 for Windows. An examination of the skewness (sk) and kurtosis (ku) indicated that there were no violations to the normal distribution (sk <3 and ku <10) [32]. Outliers were checked by inspecting the Mahalanobis distance and no single case exceeded the alpha level of .001 suggested by Tabachnick and Fidell [33], indicating that no multivariate outlier existed.

The evaluation of fit of model was based on the following goodness of fit criteria: normed chi-squared (χ^2/df), the comparative fit index (CFI), the goodness of fit index (GFI), the Akaike's information criteria (AIC), and Root Mean Square Error of Approximation (RMSEA). CFI and GFI indices assume values in range from 0 to 1, with higher scores indicating better fit. Models with the lowest values of AIC are most likely to be good fits [34]. Items loading below 0.20 were deleted and a new factor structure was analyzed. Generally, the cut-off criteria for factor loadings is between 0.3 and 0.4 but given the nature of this study and sample, 0.10 was used in order to include a larger number of components in the analysis. We used the chi-square difference statistics to test the significance of the change in the chi-square test for each alternative model over the full model.

Results

Exploratory factor analysis yielded one factor for ADL and one factor for IADL. Also the four items from GDS remained in the same factor. For the Satisfaction with Life Scale a two-factor model was retained. Two items loaded on one factor and three items loaded on another factor and these two subscales were used as indicators of satisfaction with life. From the short-version of MMSE four factors were extracted, with seven items in one factor, three items in other factor and two items in the other two factors. These four subscales were used as indicators of cognitive function. After the definition of indicators for latent factors, maximum likelihood estimation was employed to estimate the structural

equation model. The hypothesized model 1 assuming all error terms and variables are uncorrelated was tested, with $\chi^2(74)=116.140$, $p=0.001$, CFI=0.768, GFI=0.827, RMSEA=0.086, $p=0.034$ indicating that the fit model is poor. Low factor loadings were verified in the psychological domain, especially in the indicators of depression (0.14) and satisfaction with life (0.14 and 0.08). Also high modification indices were suggested to the correlation between the errors of depression indicator (e8) and satisfaction with life (e9). These results may be related to the existence of other latent factors beyond those considered in the model.

The psychological domain was separated in two latent factors (cognitive function and well-being) in the hypothesis model 2, which was tested and supported, with $\chi^2(71)=79.634$, $p=0.226$, CFI=0.953, GFI=0.877, RMSEA=0.040, $p=0.622$. No modification indices were indicated. The model fit indices (such as CFI, AIC, BCC, and RMSEA) on model 2 was slightly improved when compared to model 1, and the analysis of the chi-square difference between the two models suggested a preference for the second model ($\chi^2(3)=36.506$, $p<0.05$) (see table 2).

Table 2 - Goodness-of-fit statistics for confirmatory factor analysis models of multidimensional model of successful aging.

Model	χ^2	df	χ^2/df	CFI	GFI	PCFI	PGFI	χ^2_{dif}	AIC	BCC	RMSEA
1	116.140	71	1.57	0.768	0.827	0.625	0.583	--	178.140	193.140	0.086
2	79.634	74	1.12	0.953	0.877	0.743	0.593	36.506	147.634	164.085	0.040

This simplified model presented better CFI and GFI (>0.90) and lower AIC and BCC than model 1, revealing a good adjustment. Factor loadings were between 0.37 and 0.79 for the first factor, 0.49 and 0.68 for the second, 0.11 and 0.77 for the third and 0.41 and 0.49 for the last one. The final model (model 2) is shown in Figure 1, including standardized coefficients among 14 manifested indicators and the 4 factors.

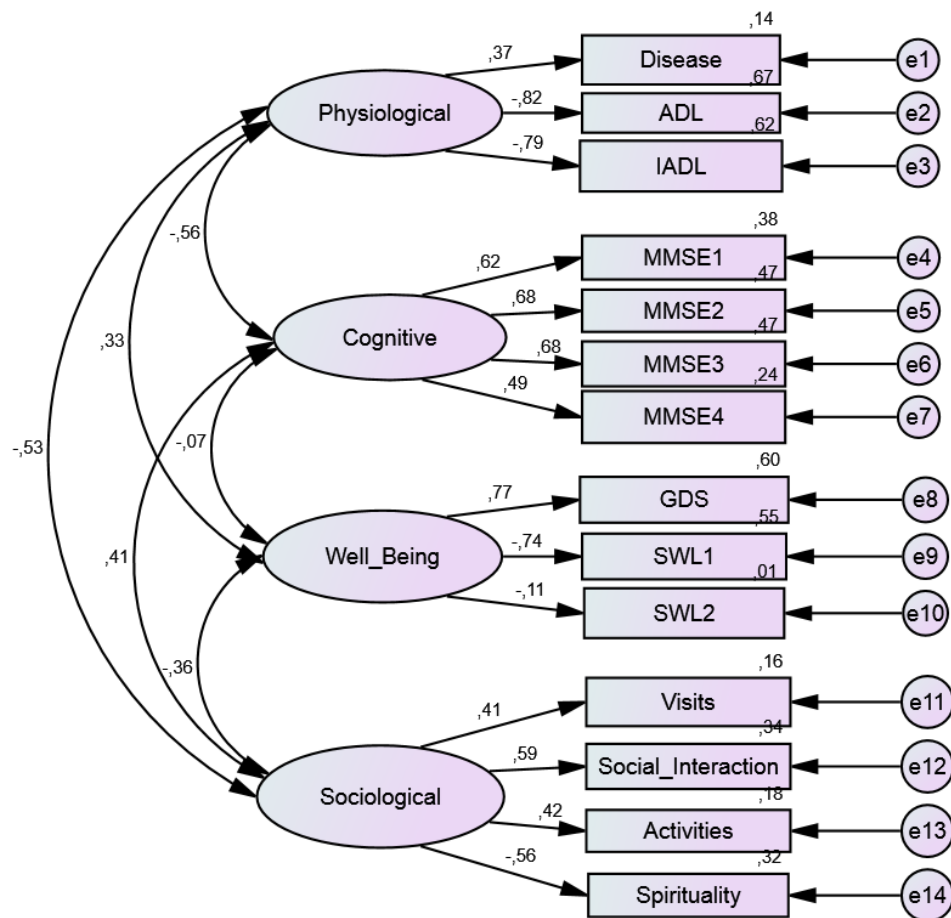


Figure 1 - Factor structure model for multidimensional model of successful aging.

Approximately 67% and 62% of the variance in the indicators ADL and IADL respectively were accounted for the physiological latent factor. Only 14% of the variance in the disease indicator accounted for physiological factor. The indicator of ADL had the strongest link ($B = -.82$, $p < .000$), followed by IADL ($B = -.77$, $p < .001$) and disease ($B = .37$, $p < .001$).

The lower boundary of reliability estimates for the indicators of cognitive function were .38, .47, .47 and .24, with all indicators having a strong link to the latent factor ($B \geq .49$, $p < .001$). In the well-being domain the indicators of depression and satisfaction with life had

stronger links to the latent factor ($B=.77$ and $B=.74$, $p<0.001$), and 50% (depression) and 55% (satisfaction with life) of their variance were accounted for the psychological functioning factor. The second indicator of satisfaction with life had a very lower association with well-being ($B=.11$, $p<0.001$) and only 1% accounted for the latent factor. However, since latent variables with only two indicators tend to create problems with identification (negative degrees of freedom) in the models, it is preferable to maintain the second indicator of life satisfaction.

Approximately 34% of the variance in the time spent in social interactions, 16% in visits, 32% in spirituality and 18% in activities indicators' were accounted for the sociological latent factor. The indicators about time for social interaction ($B=.59$, $p<.001$), spirituality ($B=-.56$, $p<0.001$), activities ($B=.42$, $p<.001$) and number of visits ($B=.41$, $p<.001$) were associated with the sociological domain.

Discussion

This paper examined one of the most prominent concepts in aging research, successful aging, by testing the multidimensional model proposed by Young, Frick and Phelan (2009) in centenarians [7]. These researchers presented a measurement' proposal that comprises 3 domains of successful aging: physiological, psychological and sociological. The relationship among all the variables in the path diagram (model) was acceptable when dividing the psychological domain in cognitive function and well-being. This hypothesized model fits well to the observed data on several commonly accepted fit indices criteria such as chi-square, CFI, GFI, IFI, RMSEA and AIC [34].

There are fourteen indicators representing the four factors of successful aging in this study, with different weights within its corresponding factors. For instance, the indicators of ADL and IADLs linked stronger to the physiological domain indicating that elders with no functional incapacity in ADL and IADL felt they had better physical health when compared to the other objective indicator, i.e., number of diseases. Because of high prevalence of several common diseases and chronic conditions, centenarians are not healthy [17]. However, a minor proportion have been identified as being cognitively intact and functioning well [17].

The model was significantly improved when considering cognitive function and well-being separately, which indicates that these are two different constructs that may assume different pathways in very old age. The differentiation of cognitive function from well-being was also suggested by Cosco and colleagues [3] in a systematic review of operational

definitions of successful aging. The indicators of time spent in social interactions and the number of visits had strong links to the sociological domain, but also was the case of spirituality, which may indicate that both sources of support are important for centenarians [11, 35].

Conclusion

Successful aging is gaining increasing attention owing to its importance to everyone, including elders' family, society, and older persons themselves. The proposed and tested model strongly confirms the suitability of Young, Frick and Phelan's [7] multidimensional model of successful aging in a sample of exceptionally old individuals. This model provides a holistic and multidisciplinary overview of successful aging that includes other domains than the physiological one, which seems particularly important when considering the oldest old. It is important for researchers and practitioners to consider adaptive psychological and social mechanisms in order to promote strategies for enhancing the older person's psychosocial well-being.

Although findings from this study produced several relevant outcomes in understanding successful aging in very late life, limitations that affect the generalization of this study's results have to be considered. Since the tested model requires psychological variables and the structural equation modeling methodology does not allow for the existence of missing data, the present study is based on a selected sample of centenarians with cognitive capacity to provide information (self-report measures). Nevertheless, considering that these are preliminary results, further investigation is needed with other populations and with diversified methodological approaches like using a more widening range of sources of information (e.g. based on observation and interviews, as well as on proxies ratings), in order to include a broader range of individuals.

Conflict of interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Acknowledgment

The project would not have been possible without the involvement of our centenarians, as well as the participation of PT100 team in collecting data. The authors would like to particularly acknowledge the guidance and scientific support of Daniela Jopp and Christoph Rott from the Second Heidelberg Centenarian Study.

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Chapter X

Predicting successful aging at one hundred years of age

Predicting successful aging at one hundred years of age

Abstract

Objective: The present study is based upon a multidimensional model of successful aging, and aims to (i) identify subgroups of centenarians sharing communalities in successful aging profiles, and (ii) determine the role of sociodemographic factors and psychological, social and economic resources on successful aging. **Methods:** 80 centenarians were face-to-face interviewed. A cluster analysis was performed to identify distinct groups of successful aging and logistic regression models were performed considering as dependent covariate the cluster membership. **Results:** Two distinct clusters were grouped, with 40 centenarians in each, one of them presenting better results in all domains. Male sex and better income adequacy from expenses were the best predictors of successful aging. **Conclusion:** Results help to identity different patterns of successful aging and provide greater clarity regarding its correlates, increasing current understanding of its modifiable aspects.

Key words: successful aging; centenarians; predictors; resources.

Introduction

The last years of gerontological research have been characterized by an increased interest in health promotion and on positive features of aging. The focus on older persons who are doing well as opposed to the usual focus on disease, disability, and dementia, was consolidated through the presentation of successful aging conceptual models. Most researchers studying successful aging have followed Rowe and Kahn's model (1997) by selecting older persons who had low probability of disease and disease-related disability, high cognitive and physical functional capacity, and active engagement with life. Nevertheless, several critics to this model argue that it has an excessive focus on superior performances, and that the criterion of little or no age-related decrements in functioning, marginalize the majority of older persons (Strawbridge & Wallhagen, 2009), particularly those of more advanced age (Cho, Martin, & Poon, 2012).

According with a recent review of successful aging operational definitions (Cosco, Prina, Perales, Stephan, & Brayne, 2013), several operationalizations of the concept have allowed for individuals with a chronic disease to be classified as “successfully aged”, and a greater focus on psychosocial domains has highlighted the person’s capacities of adaptation and resilience (Cosco, Brayne, & Stephan, 2014). Within this understanding, Young, Frick and Phelan’s multidimensional approach (2009) considers that successful aging may coexist with diseases and functional limitations if compensatory psychological and/or social mechanisms are used. This model encompasses three domains of successful aging, including physiological (e.g., disease and impairment), psychological (e.g., emotional vitality and inner contentment), and sociological (e.g., engaging with life and spirituality). As a result of its holistic and inclusive definition of successful aging, this model has been serving as an assessment tool within clinical care (Philips Lifetime, 2013).

Centenarian’s studies have contributed to enrich the discussion towards successful aging. Despite the losses and constrains of such an advanced age, centenarians have been presented as phenotypes of successful aging. This association is related with this population’s exceptional capacity to overcome the major aging challenges (e.g., Jopp & Rott, 2006). Thus, centenarian studies have been demonstrating that even in the presence of health and functional declines it is possible to maintain a high quality of life with respect to social and psychological well-being (Poon et al., 2010; Jopp & Rott, 2006).

The study of this long-lived individuals has been contributed to identify a number of factors that positively contribute to successful adaptation. Individual resources (e.g., personality and coping), as well as socioeconomic factors (e.g., social network and income) are ought to play an important influence in centenarians’ functioning and overall health status (Martin, Deshpande-Kamat, Poon, & Johnson, 2011). Jopp and Rott (2006), for instance, demonstrated the role of resources, beliefs and attitudes for centenarians’ happiness and Archer, Brathwaite and Fraiser (2005), verified that religiosity was positively related to their successful adaptation, coping and high levels of life satisfaction. Nevertheless, none of these studies was specifically based on a successful aging model. The present study is based upon a multidimensional model encoring physiological, cognitive, well-being and social aspects (Figure 1) and aims to identify subgroups of centenarians sharing communalities in successful aging profiles. In addition, it aims to determine the role of sociodemographic factors and psychological, social and economic resources on successful aging.

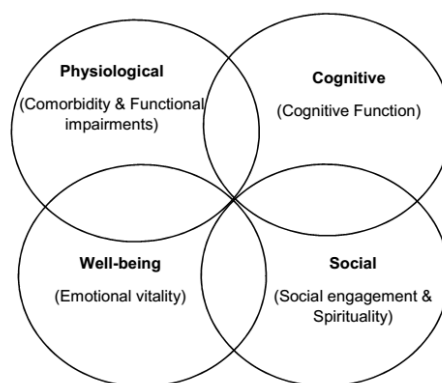


Figure 1 – Multidimensional model of successful aging

Methods

Participants

Data from two Portuguese studies on centenarians were considered: 43 centenarians from the Oporto Centenarian Study and 37 centenarians from the Beira Interior Centenarian Study. The first is a population-based study comprising a total of 186 centenarians living in Oporto city and its surrounding geographical area (Oporto Metropolitan Area, which comprises a region of approximately 60 km around Porto, in Portugal) and the second refers to a convenience sample of 105 centenarians living in the interior part of the country with a similar geographical extension around the city of Guarda (Figure 2). Information was collected during one or two sequential sessions directly with the centenarian and/or with a proxy respondent (families and/or caregivers). Age validation was accomplished via confirmation with identity card or birth certificate and informed consent for participating in the study was fully considered.

Since this study requires centenarians' own perceptions about well-being measures, information was only assessed if the individual was not affected by severe cognitive impairment and was willing to present information on these aspects. Cognitive status was assessed with a shortened version of the Mini Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975; Guerreiro, Silva, Botelho, Leitão, & Garcia, 1994) with a maximum score of 21 points instead of 30. This short version (SMMSE) contained the scales orientation, registration, attention and calculation, and recall (Holtsberg, Poon, Noble, & Martin, 1995). Taking into account cut-offs that had been utilized in previous studies with centenarians (e.g., Jopp & Rott, 2006), we determined a score of 4 or higher on the SMMSE to indicate the necessary cognitive capacity for answering self-report questions. Based on this cut-off, from the initial 241 centenarians, 124 were selected. In addition, considering that the methodology used in the present study requires the absence

of missing information, only the centenarians with complete interviews were considered (n=80).

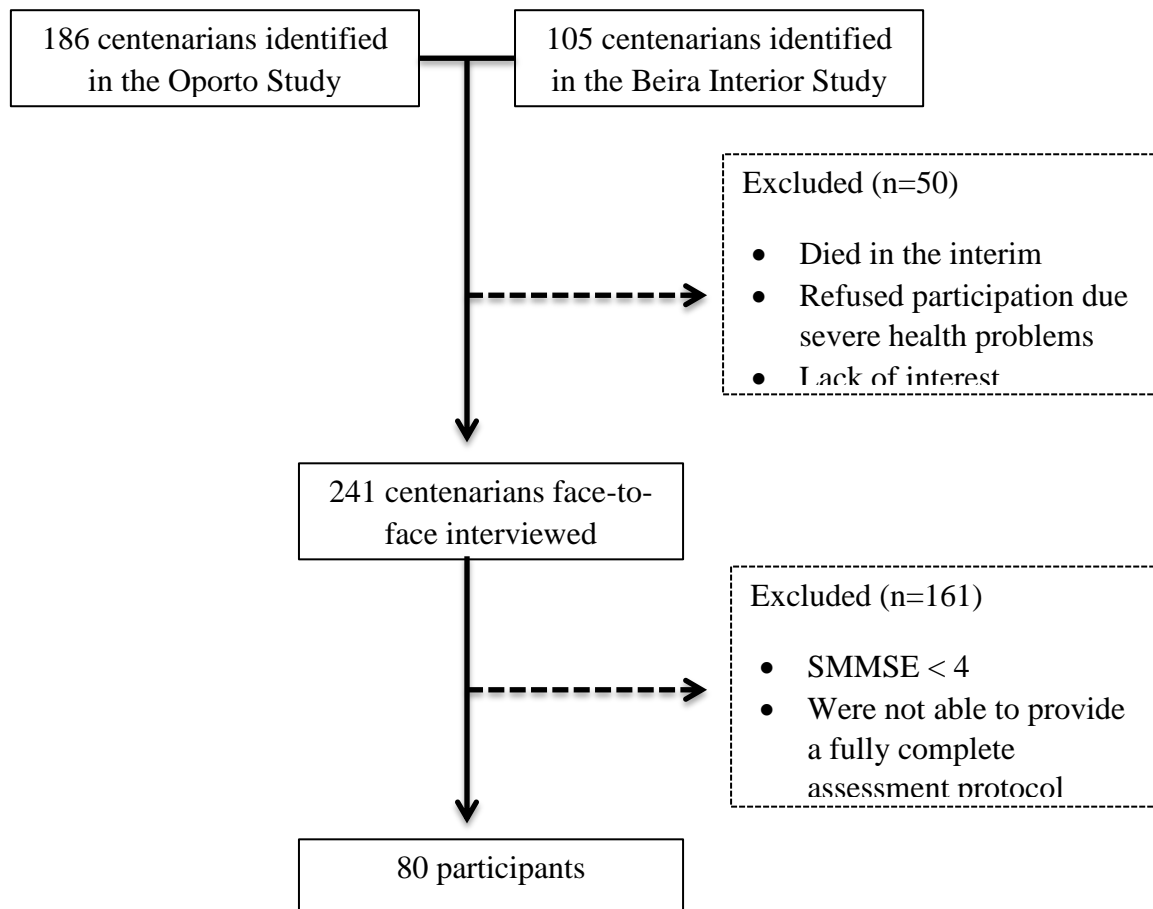


Figure 2 – Participants flow diagram

The mean age of the sample (n=80) was 101.01 (SD 1.31), 81.3% were women and 81.3% were widowed. 31.3% of the sample lived in institutions, 45.0% with children, 7.5% alone, and the remaining with other relatives (16.2%). The mean of school years attended was 2.16 (SD 2.44); 37.5% never attended school and 49.0% had up to 4 years of education (elementary school). In what concerns monthly income, 15.6% received less than 250€, 63.6% between 250€ - 500€ and 20.8% more than 500€ per month.

Because dropouts are usually worse off, we investigated differences between this group (n = 161, i.e. persons unable to contribute with valid and full self-reports) and participants (n = 80, present sample) in elementary sociodemographic variables, and cognitive and

functional capacity. Fisher's exact tests showed significant differences ($p < 0.05$) for gender, with a higher proportion of men in the selected group (18.8% for 8.7% in the drop-out), for living arrangements, with a higher proportion of institutionalized centenarians within the drop-outs (52.5% for 32.5% in the selected group), and for education (45.2% of illiterate in the drop-out and 28.7% in the selected group). No differences for marital status were found. With respect to physical and cognitive functioning, drop-outs scored significantly lower (ADL: $t(237) = -7.871$, $p < 0.001$; IADL: $t(233) = -6.704$, $p < 0.001$; SMMSE: $t(231) = -13.675$, $p < 0.001$; GDS: $t(234) = 2.736$, $p < 0.001$). Consequently, the sample for this study only represents a selected range of physical and cognitive functioning within centenarians and results cannot be generalized to the entire centenarian population.

Measures

For an operational assessment of the successful aging model for centenarians, different measures of the four domains considered were collected through validated and well-known instruments:

Physiological domain. Health problems and comorbidity were assessed with a list of 18 health problems that includes, for example, hypertension, heart problems, chronic lung disease, diabetes mellitus, frequent urinary infections, arthritis. Functional disability was assessed with items retrieved from the Older Americans Resources and Services (OARS) Multidimensional Functional Assessment Questionnaire (Fillenbaum & Smyer, 1981; Rodrigues, 2008). The scale includes 7 items to assess basic daily living activities (ADL; e.g., the ability to talk on the phone, to travel, go shopping, prepare meals) and other 7 items to evaluate instrumental daily living (IADL; e.g., the capacity for walking, bathing, eating, toileting). Respondents were asked how much difficulty they had performing each of these activities by rating on a three-point scale (2 = no difficulty; 0 = can't do without help).

Cognitive domain. Cognition was assessed with a shortened version of the Mini Mental State Examination (MMSE; Folstein et al., 1975; Guerreiro et al., 1994) with a maximum score of 21 points instead of 30. The selected shorter version items included those that were not biased by sensory impairment often prevalent in very old age (Holtsberg et al., 1995).

Well-being domain. Depression was evaluated through the Geriatric Depression Scale shorter version (GDS-15), which was specifically developed to measure affective and motivational/cognitive components of depression in older adults (Yesavage et al., 1983; Apóstolo et al., 2014). The Satisfaction with Life Scale (SWLS), a short 5-item instrument, was also used. This scale was designed to measure global cognitive judgments of

satisfaction with one's life (Diener, Emmons, Larsen, & Griffin, 1985; Sancho, Galiana, Gutierrez, Francisco, & Tomás, 2014). Based on previous experiences about methodological issues in assessing centenarians that had reported centenarians' difficulties in understanding self-referent statements and in using five or six answering categories (Jopp & Rott, 2006), the format of the questionnaire items was changed from statements to questions and the answering format was modified for 0=no, 1=in between, 2=yes.

Social domain. Two questions from the Social Resources subscale of OARS (Fillenbaum & Smyer, 1981; Rodrigues, 2008) about the number of visits the centenarians had on a regular basis and how often they spent time with someone who does not live with were used to evaluate engagement with life. Centenarians were also asked about the number of activities they perform in a regular basis (e.g., volunteering, visiting a familiar or a friend, and attending religious celebrations). In order to evaluate aspects related with spirituality and religion, the item "My life is guided by strong religious or ethical beliefs" from the Valuation of Life Scale (Lawton, Moss, Hoffman, Kleban, Ruckdeschel, & Winter, 2001) was used. The answering format was 0=no, 1=in between, 2=yes.

For the second objective of this study, i.e., to determine possible factors predicting distinct successful aging profiles, information on socio-demographic aspects (gender, marital status, education, living arrangements) and social and economic resources (number of living children, satisfaction with social support, and income adequacy for expenses) was collected with a questionnaire. Specifically for psychological resources, Valuation of Life Scale (Lawton et al., 2001) was used. According with Lawton and colleagues (2001), the different items of the scale represent five core constructs, self-efficacy (Items 7, 10), purpose (Items 3, 4, 6, 13), hope (Items 1, 8), futurity (Items 2, 9), and persistence (Items 5, 11, 12). For all these items the answering format was modified to 1=no, 2=in between, 3=yes due to specific difficulties in assessing centenarians (see Jopp & Rott, 2006).

Data analysis

First, a cluster analysis was performed to identify distinct patterns of successful aging in centenarians. This person-centered classification strategy is useful for grouping respondents into smaller, homogenous subsets based on specific characteristics. Based on Young, Frick and Phelan's (2009) multidimensional model of successful aging, including the physiological, psychological and social domains, subgroups sharing communalities in successful aging profiles were formed. Considering the study aims, the k-means non-hierarchical method was selected. In k-means, before starting the clustering process, it is necessary to establish the number of clusters. Ward's hierarchical clustering method was applied to help to determine the optimal number of clusters. As the variables

were measured in different units before clustering, data was standardized by rescaling each variable to have a mean of zero and a standard deviation of unity.

Second, in order to identify potential predictive factors of successful aging, logistic regression models were performed considering as dependent covariate the cluster membership. Three groups of covariates were considered: socio-demographic factors (gender, marital status, education, living arrangements), psychological resources (self-efficacy, purpose, hope, futurity, persistence) and social and economic resources (number of living children, satisfaction with social support, income per month, income adequacy for expenses). Kruskal-Wallis tests were performed to select one item per construct of the Valuation in Life Scale for representing psychological resources. To decide which variable should be included in the multivariable models, an exploratory analysis was performed by fitting univariable models and considering as candidates for the multivariable model all variables significant at the 0.05 level in these models. All analyses were performed with IBM SPSS Statistics 21.

Results

Identification of successful aging groups: cluster analysis

All the variables considered in the multidimensional model of successful aging were considered in the cluster's classification, with exception of spirituality. Since 93.8% of the sample ($n=73$) reported that their life was guided by strong religious or ethical beliefs, this variable would not contribute to differentiate participants between clusters profiles.

The analysis of Ward's dendrogram and of the agglomeration schedule clearly indicated the eligibility of the two cluster solution as the most adequate for the data. In k-means analysis, clusters are represented by a central vector, the cluster centers, and a case is assigned to the cluster for which its distance mean is the smallest. As it can be observed in Table 1, the final cluster centers had exactly the same number of subjects ($n=40$ in each one), presenting distinct profiles of successful aging in the total sample ($n = 80$). Through ANOVA F-test, two variables of the physiological domain and one from the psychological domain were found to differentiate participants between clusters profiles. They were the capacity to perform activities of daily living (ADL, $F = 110.305$) and instrumental activities of daily living (IADL, $F = 51.531$), and depression ($F = 32.837$).

Table 1 – K-Means final cluster centers, cluster means and standard deviations and ANOVA F-test of the nine variables by cluster

	Final Cluster Center		Cluster values		ANOVA F-test	P
	Cluster 1	Cluster 2	Cluster 1	Cluster 2		
Physiological – m (SD)						
Diseases	0.312	-0.312	4.350 (1.73)	3.150 (1.94)	8.503	<0.001
ADL	-0.761	0.761	6.150 (3.35)	12.425 (1.75)	110.305	<0.001
IADL	-0.627	0.627	2.500 (2.56)	7.325 (3.39)	51.531	0.001
Cognitive – m (SD)						
Cognitive function	-0.400	0.400	10.57 (4.26)	14.392 (4.55)	15.054	<0.001
Well-being – m (SD)						
Depression	0.541	-0.541	7.000 (3.86)	2.700 (2.76)	32.837	<0.001
Satisfaction with life	-0.401	0.401	5.425 (2.99)	7.550 (1.72)	15.127	<0.001
Social – n (%)						
Time for social interactions	-0.360	0.360			11.760	0.001
0-1 (times per week)			18 (45.0)	7 (17.5)		
2-6			17(42.5)	18 (45.0)		
7+			5 (12.5)	15 (37.5)		
Regular visits	-0.2104	0.210			3.646	0.060
0-2			16 (40.0)	12 (30.0)		
3-4			13 (32.5)	7 (17.5)		
5+			11 (27.5)	21 (52.5)		
Regular activities	-0.410	0.410			16.031	<0.001
0			26 (65.0)	17 (42.5)		
1-2			13 (32.5)	12 (30.0)		
3+			1 (2.5)	11 (27.5)		

Table 1 also describes the two distinct profiles generated across successful aging domains. Centenarians from cluster 2 are the ones with better measures of successful aging. At physiological level, they have a lower number of chronic diseases (mean of 3.2), and a higher functional capacity (mean score of 12.4 for ADL and 7.3 for IADL, with 0 score meaning total dependency and 14 total independency). The cluster 1 had a mean number of diseases of 4.4 and lower scores in functional capacity (6.2 for ADL and 2.5 for IADL). In cognitive and well-being domains, the second cluster is clearly better, with higher scores in cognitive functioning (means of 14 for cluster 2 and 11 for cluster 1), and in satisfaction with life (means of 7.6 and 5.4), and a lower value for depression (means of 2.7 and 7.0). Within the social domain, it appears that individuals from cluster 2 spend more time in social interactions and in activities. More precisely, 37.5% of the centenarians from cluster 2 have social interactions more than seven times in a week, whereas only 12.5% in the cluster 1 had such a social interaction frequency; and 27.5%

have at least three regular activities compared to 2.5% (n=2) in the cluster 1. The number of visits was also different between groups, with 52.5% in cluster 2 and 27.5% in the cluster 1 reporting at least 5 visits per week. Despite religious beliefs has not entered in the cluster classification, the number of centenarians who report their life was guided by strong religious or ethical beliefs was similar in both groups (n=36 in cluster 2 and n=37 in cluster 1).

Predictive factors of successful aging: multivariable analysis

Gender and living arrangements were considered as potential predictive socio-demographic factors of successful aging. Although both groups were mainly female and community-dwelling, the probability of belonging to the better group was higher for males (OR=5.286, 95%CI 1.361-20.534), and for community-dwellers (OR=2.957, 95%CI 1.091-8.009). When considering these factors in the multivariable model we found that gender remained statistically significant (see Table 2).

Table 2 - Potential predictive factors of successful aging: characterization of profiles, unadjusted and adjusted OR and respective 95% CI

	Successful aging		Unadjusted		Adjusted	
	Profile 1 Lower S.A.	Profile 2 Higher S.A	OR	95% CI	OR	95% CI
Sociodemographic – n (%)						
Gender						
Female	37 (92.5)	28 (70.0)	1	-	1	-
Male	3 (7.5)	12 (30.0)	5.286	1.361-20.534*	4.367	1.070-17.826*
Marital status						
Widower	36 (90.0)	29 (72.5)	1	-		
No widower	4 (10.0)	11 (27.5)	3.414	0.983-11.850		
Education						
Illiterate	18 (45.0)	28 (70.0)	1	-		
Literate	22 (55.0)	12 (30.0)	1.909	0.761-4.788		
Living arrangements						
Institution	17 (42.5)	8 (20.0)	1	-	1	-
Community	23 (57.5)	32 (80.0)	2.957	1.091-8.009*	2.786	0.970-8.002
Psychological resources – M (SD)						
Self-efficacy	1.93 (0.69)	2.36 (0.79)	2.177	1.130-4.191*	1.059	0.450-2.491
Purpose	1.77 (0.89)	2.39 (0.88)	2.130	1.267-3.583**	1.534	0.763-3.084
Hope	1.76 (0.82)	2.13 (0.92)	1.615	0.959-2.722	1.032	0.528-2.018
Futurity	1.92 (0.81)	2.45 (0.75)	3.060	1.513-6.188**	2.004	0.801-5.011
Persistence	1.99 (0.76)	2.58 (0.66)	2.332	1.287-4.224**	1.299	0.513-3.286
Social and economic resources						

Number of children – M (SD)	1.90 (1.88)	2.21 (1.92)	0.915	0.721-1.163		
Satisfaction w/social support – n (%)						
No	28 (71.8)	18 (48.6)	1	-	1	-
Yes	11 (28.2)	19 (51.4)	2.687	1.039-6.946*	2.291	0.748-7.017
Income/month – n (%)						
< 500 €	30 (78.9)	31 (79.5)	1	-		
> 500 €	8 (21.1)	8 (20.5)	0.968	0.322-2.910		
Income adequacy for expenses – n (%)						
With some/with difficulty	23 (60.5)	4 (10.3)	1	-	1	-
Without/without much difficulty	15 (39.5)	35 (89.7)	13.417	3.953-45.535**	9.836	2.813-34.388**

*p<0.05, **p<0.01

When analyzing the items of Valuation of Life Scale for choosing the variables representative of psychological resources, Kruskal-Wallis test revealed one item of each core construct with significant differences between the two cluster groups ($p<0.05$): *I feel able to accomplish my life goals* (self-efficacy), *My life these days is a useful life* (purpose), *I feel hopeful right now* (hope), *I intend to make the most of my life* (futuraity), and *I have a strong will to live right now* (persistence). Cronbach's alpha was 0.83, demonstrating high reliability. Thus, in the second block of factors (Table 2), the psychological resources were statistically significant predictors of successful aging in univariate logistic regression, except for hope. The probability of being in the high successful group was higher for centenarians with higher scores of futurity (OR=3.060, 95%CI 1.513-6.188), persistence (OR=2.332, 95%CI 1.287-4.224), self-efficacy (OR=2.177, 95%CI 1.130-4.191), and purpose (OR=2.130, 95%CI 1.267-3.583). But when multivariate model is performed, all the variables lost their predictive value.

In relation to social and economic resources, Table 2 shows that satisfaction with social support and income adequacy for expenses are the only predictive factors of successful aging. The odds of being in cluster 2 is 2.7 times higher (95%CI 1.039-6.946) for centenarians that are satisfied with their social support and 13.4 times higher (95%CI 3.953-45.535) for centenarians without much difficulties in paying their expenses.

Discussion

This study examined the profiles of successful aging and its predictors in centenarians from two distinct Portuguese regions. The analysis based on the multidimensional model of successful aging yielded two distinct clusters of physiological, cognitive, well-being and social characteristics. The first cluster corresponds to the group of centenarians with a

lower level of successful aging, characterized by a worse health condition, cognitive and emotional status, as well as lower social engagement. The second cluster represents the more successful group, characterized by a better health status, with lower comorbidity and functional impairment (few diseases and higher scores in ADL and IADL); better cognitive status (higher score in MMSE) and emotional functioning (higher score in SWLS and a lower score in GDS); and a better social engagement (more time spent with social interactions, more visits and more activities). The high proportion of participants reported that their life was guided by strong religious is in agreement with other international studies, that presented the importance of religion in centenarian's lives, both in terms of their affiliation to the church and also on a more personal, spiritual level (Archert et al., 2005; Bishop, 2011). In the Portuguese context, this cultural trend assumes even more importance, since the present generation of elderly population has been very religious (Mónico, 2013). Both groups had exactly the same representativeness, 50% of the sample for each one. Nevertheless, we should note that this analysis had relied only on centenarians with cognitive capacity to give answer on self-perception measures, therefore this two selected groups are different from the remaining centenarians of the original studies.

The present analysis is based on a multidimensional model of successful aging, which seems to be suitable for exploring the pathways for successful aging in very advanced age. It is important to consider different and age sensitive profiles of successful in order to a better understanding of the potential of successful aging among centenarians. This distinct network of variables is based on a conceptual model presented by Young and colleagues (2009). The goal of staying healthy, autonomous and productively engaged advocated in other models (e.g., Rowe & Kahn, 1997) is not a realistic one for oldest old. Even in the first cluster, centenarians are experiencing diseases and report some difficulties in daily living activities. However, covering alternatives domains allows us to consider important features for classifying different levels of successful aging, namely aspects related with psychosocial functioning that may act as adaptive mechanisms.

The second aim of this study was to identify potential predictors of successful aging based upon a pool of sociodemographic factors and psychological, social and economic resources. In general, our findings from the unadjusted regression analysis indicate that different factors and resources are related to successful aging in centenarians. The odds of showing higher successful aging varies with gender, and living arrangements (women and institutionalized centenarians were found to be less likely to age successfully) but education and marital status were not found to be predictors. Nosraty, Sarkeala, Hervonen and Jylha (2012), in a study conducted with a nonagenarian sample, found that

the prevalence of successful aging was clearly lower for those living in institutions. Marital status has been reported as a significant variable in younger samples, with married respondents having higher successful aging scores than those who were not married (e.g., Bowling & Iliffe, 2006), but also in the study of Pruchno, Wilson-Genderson, Rose and Cartwright (2010) there were no significant statistical differences according to this variable. In relation to education, most of the studies reviewed by Depp and Jeste (2006) found no differences according to educational level.

When taking a look at the psychological factors, our study revealed that, with exception of hope, all the psychological resources considered in our analysis act as predictive factors through unadjusted analysis. These results support previous reports about the importance of personal resources to maintain successful aging, in particular self-efficacy, meaning and purpose in life (Wong, 2000; Jopp & Rott, 2006; Fry & Debats, 2010; Tovel & Carmel, 2013). This kind of beliefs and attitudes may represent the contribution of adaptation process to positive developmental adaptation outcomes, which seem to be critical to successful aging in old and very old age (Wozniak & Jopp, 2012). The fact that hope didn't act as a predictor is unclear across studies. Jopp & Rott (2006) demonstrated the importance of optimistic outlook to happiness, but Temple-Scheetz, Martin and Poon (2012) warned to the high values of hopelessness centenarians had comparing with sexagenarians and octogenarians.

Along with the more individual-level variables, also interpersonal variables (satisfaction with social support) and macro-social or environmental factors (income adequacy) were found to be associated with the odds of being successful aged. Centenarians who positively evaluated their social support, and had no/few difficulties in facing their expenses, were more likely to belong to the better cluster, i.e., it seems that social and economic resources contribute to explain why some adults continue to do well and others do not, since these resources may provide older adults with support and help that is necessary when physical, functional and mental health decline (Bishop, Martin, MacDonald, & Poon, 2010). Taken together, the analysis of unadjusted predictors reinforces the pivotal role of subjective appraisals for successful aging, since these psychological, social and economic resources with predictive value are variables of self-perception, not objective states.

The adjusted regression analysis of all the significant variables demonstrated the importance of centenarians' structural circumstances since only gender and income adequacy for expenses were the final predictors for successful aging. Previous works on gender issues and longevity have reported the importance of analyzing aging differences

between men and women, recognizing gender as a cross-cutting determinant for personal aging (Ribeiro, 2012). Although the reported effects of gender on successful aging are inconsistent (Pruchno et al., 2010; Franceschi & Bonafe, 2003), Depp and Jeste (2006) revealed that in 50% of the longitudinal studies reviewed women were more likely to experience successful aging than men. However, when looking to studies with very old samples, the results show to be the opposite, with men being significantly more successful in aging than women (e.g., Nosraty et al., 2012). In spite of the fact that women seem to be hardier and to have a better survival rate than do men, the prevalence of disability is greater in older women (Newman & Brach, 2001). One of the factors contributing for this disability gap is that women have more comorbidity or chronic health problems than do men (Franceschi & Bonafe, 2003), but also psychological factors have been identified in centenarian's research, namely that men had higher scores on optimism, which could reflect higher confidence and vigorous optimistic efforts, offering them a certain advantage in terms of adaptability to diversity and uncertainty (Tigani, Artemiadis, Alexopoulos, Chrousos, & Darviri, 2011). This result call to the recognition of gender as a crosscutting determinant for successful aging trajectories and to the need of gender specific and gender sensitive interventions.

Also economic resources were found to be an important determinant of successful aging. Although it is true that "money can't buy happiness," it can purchase medical services and medications, formal services, utilities, food, and other vital things (Yang, 2012). Economic resources were found to be a component of adaptation (cf. The Model of Developmental Adaptation), since centenarians with better economic status were more likely to have lower negative affect (Martin et al., 2011). Also in the Porto Centenarian Study, economic resources were important to centenarian overall well-being; more specifically, income inadequacy related to medical expenses was found to be a predictor of anxiety (Ribeiro, Teixeira, Araújo, Afonso, & Pachana, 2015). When interpreting this finding, we must remember that most centenarians have poor income and their assets are frequently below the poverty level (Martin et al., 2011). Many centenarians had no expectations to live so long, thus they might be less likely to have enough savings to ensure their expenses (Serra, Watson, Sinclair, & Kneale, 2011), which may be particularly true for the Portuguese context (Araújo et al., 2013). In Portugal, low incomes characterize the daily circumstances of a large number of older people who lived in dictatorship period with several economic and social repercussions and whose main source of income is the state pension (Ribeiro et al., 2015).

Conclusion

This work explored one of the most important research outcomes of the last decades within gerontological research, successful aging, in an increasingly representative group, centenarians individuals. We assume that circumstances of successful aging change over the life course and may include the following: (i) health and functional capacity, (ii) cognitive functioning, (iii) emotional vitality, and (iv) social engagement (both interactions, and activities). This study identified multiple non disease-related factors that influence successful aging in centenarians, and strengthens the assumptions from the developmental adaptation model previously tested with centenarians (Martin et al., 2011). Individual, social and economic resources, as well as structural characteristics, seem to optimize adaptation in very advanced age, explaining why some centenarians continue to do well and others do not (Fry & Debats, 2010). The resources that were found to predict the odds of successful aging at such an advanced age are likely to be promoted in the experiences of daily living. These include the sense of purpose or self-efficacy, which could be promoted through the maintenance of life goals and the preservation of control over some functions, for example, caring for a plant or having a choice of clothes to wear. The value of gender and income difficulties reinforce that the disparities of successful aging may reflect differential survival and lifelong differences in health, economic and social conditions.

Several policy implications become important from a multidimensional perspective and assessment of successful aging and related predictive factors. The ability to adapt to old age, maximizing gains and mitigating losses over time, is highly associated with intra-personal variables but also with more distal social structural factors. These results recognize the importance of historical and cultural context, social relationships, and structural forces in influencing later-life functioning (Stowe & Cooney, 2015).

When interpreting our findings, two points must be considered. The first refers to the fact that the conclusions do not necessarily refer to all centenarians. Selectivity analyses showed that the participants of the present study have a better cognitive and physical functioning compared with the full sample. Consequently, findings should not be generalized to centenarians with strongly restricted cognitive functioning who could not contribute to this study. Secondly, since this is a cross-sectional study, the nature of our data limits the extent of the predictive value of the variables considered since we were unable to infer causality.

Acknowledgements

The authors would like to thank the contribution of Rosa Marina Afonso from the Beira Interior Study and the guidance of Daniela Jopp and Christoph Rott from the Second Heidelberg Centenarian Study (Germany).

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Chapter XI

The role of existential beliefs within the relation of
centenarians' health and well-being

The role of existential beliefs within the relation of centenarians' health and well-being

Abstract

The purpose of this study was to explore the role of existential beliefs in mediating the influence of health on centenarians' well-being. A total of 80 centenarians (mean age 101.1; SD = 1.3; 81.3% women) with no/minor cognitive impairment were included. The OARS questionnaire for diseases and functional capacity (ADL, IADL), the Satisfaction with Life Scale (SWLS) and the Existential Beliefs Subscale were used for data collection. The findings suggest that existential resources are a crucial element for mitigating the impact of health constraints in subjective well-being in this population. Appropriate models of intervention for very old age that recognize the importance of existential beliefs are to be considered.

Key-words: existential beliefs; functional capacity; satisfaction with life; centenarians.

Introduction

The oldest generation is becoming more representative (EC, 2014), and a greater effort is now being made to unravel what very older adults feel about their lives and the strategies they use to sustain a sense of well-being (Poon & Cohen-Mansfield, 2011). This new dynamic is notorious in the way aging has been approached in very recent years, with a clear impetus to consider what is known and conjectured about the sources of human life strengths and how they contribute to positive developmental adaptation outcomes (Fry & Debats, 2010).

Within the gerontological literature, the 90s were marked by Rowe and Kahn's work (1997) on successful aging which draw attention to the potential of a healthy and engaged old age. The model of successful aging had such a tremendous effect in how the experience of aging was viewed and investigated that nowadays there is still an active debate towards its improvement (Katz & Calasanti, 2014). Two of the most considerable critical responses are the absence of spirituality as a domain of successful aging (Crowther, Parker, Achenbaum, Larimore, & Koenig, 2002) and the excessive focus on

overvalued levels of functioning, health and social engagement, which automatically exclude individuals with chronic disease, limited function, or socioeconomic disadvantages (Young, Frick, & Phelan, 2009).

According to several reviews and empirical studies, a more holistic and multidimensional way of looking at successful aging is needed (Cosco, Prina, Perales, Stephan, & Brayne, 2013; Jopp et al., 2014) – one that values the individual's capacity of continuing development and adaptation. New expanded definitions that include psychological domains show to be more comprehensive in including older adults that may subjectively report aging successfully even in the objective presence of chronic illness and functional limitations (Young et al., 2009).

Transcendence has been referred as a good candidate for explaining the adaptive mechanism through which older adults can maintain psychological well-being despite the different losses they may be experiencing, and therefore has been associated with successful aging (Flood, 2006; McCarthy & Bockweg, 2013; Gondo, 2012). The value of transcendence for well-being, even in the face of adverse circumstances was deeper explored by Tornstam (2005) in his Gerotranscendence Theory. According to this author, gerotranscendence can be defined as a late life shift in metaperspective from a materialistic and rational view of the world to a more mystical or cosmic one, leading to a redefinition of time, space, life, death, and the self. Reed (2009) in the Theory of Self-Transcendence stated that individuals who face human vulnerability have an increased awareness of dimensions greater than the self, and expansions of personal boundaries within intrapersonal, interpersonal, transpersonal, and temporal domains. Both theories recognize spirituality as an essential attribute of transcendence, which is closely related to God and religion (McCarthy & Bockweg, 2013).

There has been an abundance of discourse and philosophical treatises on religion, spirituality and existential beliefs as contributing to human adaptation for many centuries, but only recently are emerging as contenders for serious scientific consideration (Bishop, 2011). The meaning of religion and spirituality has taken on newer and more distinct conceptualizations in research, anchoring beliefs, commitments, behaviors and subjective experiences related with the sacred (Hill & Pargament, 2008). In addition, they have been cited for their benefit in areas of mental and physical health (Ai, Peterson, Bolling, & Koenig, 2002) and for being closely related to successful aging outcomes, such as satisfaction, and coping with stress (Pargament, 1997).

The studies of centenarians have contributed to an interesting debate about successful aging definitions and its operationalization, since this survival population represents

exceptional cases of longevity. But the fact that centenarians are survivors does not mean that they are still healthy (Jeune & Andersen-Ranberg, 2000). In what regards health outcomes, the evidence is heterogeneous with some studies reporting centenarians as being in relatively good health conditions (e.g., New England Centenarian Study; Hitt, Young-Xu, Silver, & Perls, 1999) whereas others present high levels of frailty and morbidity (e.g., Danish Centenarian Study; Andersen-Ranberg, Schroll, & Jeune, 2001). Most studies found several functional limitations in long-lives individuals, with centenarians having lower levels of functional capacity in daily living activities than sexagenarians and octogenarians (Randall, Martin, Bishop, Poon, & Johnson, 2011). Indeed, most centenarians seem to be in a frail and pre-frailty condition, particularly when considering their low physical activity, slowness and weakness (Duarte, Teixeira, Ribeiro, & Paul, 2014).

In addition to the pronounced health limitations, centenarians have to face other challenges of such an advanced age, as the loss of their spouses, children and most of their contemporaries, the move to a long-term care facility and perhaps the decrease of economic resources (Martin, da Rosa, & Poon, 2011). In tandem, they have accumulated a century of life events, such as economic depression, world wars and other historical events of each country (Martin, MacDonald, Margrett, & Poon, 2010). For all these risks and threats we could expect to find a very sad and blue group of individuals. However, also here the picture is of diversity. On the subjective well-being level, some centenarians showed lower levels of positive emotions (Poon, Martin, & Margret, 2009) and evaluated their life satisfaction as fair more often than younger adults; but the largest proportion of them still indicated a good life satisfaction (Martin, Poon, Kim, & Johnson, 1996). The fact that most centenarians were satisfied with their lives was a consistent within the studies from Sweden (Samuelsson et al., 1997), Australia (Richmond, Law, & Kay-Lambkin, 2011), as well as from the Heidelberg Centenarian Study, in which the participants felt happy although they were clearly experiencing substantial constraints in central domains of functioning (Jopp & Rott, 2006). Also qualitative studies about what it feels like to be 100 raised important issues about well-being at such an advanced age (Archer, Brathwaite, & Fraser, 2005; Hutnik, Smith, & Koch, 2012) highlighting that centenarians tend to report having had a good and happy life that such feeling is also extended to their present life, as it was transmitted by one participant who said that "I'm perfectly happy to go on as I am, I'm not wishing for anything and I'm glad I've got good health. That's an enormous thing" (Hutnik et al., 2012, p.5). These findings reinforce the importance of considering the existence of paradoxical dynamics between objective health measures and well-being as previously noted in younger individuals (e.g., Araújo & Ribeiro, 2011).

Also until very old age individuals show a tremendous capacity of adaptation (Jopp & Rott, 2006), denoting the existence of internal and external resources that contribute to a person's ability to meet and handle adversities, and keep or regain positive perceptions regarding own life (Martin et al., 2010).

Existential resources such as personal meaning, purpose in life and spirituality (Jopp & Rott, 2006; Wong, 2000) appear to gain increasing importance with advancing age, as in later life persons demonstrate a greater preference for deriving meaning from their faith as well as problems of everyday life (Krause, 2005). In the face of adversity, losses and illness, people need to develop a positive attitude towards life in order to maintain life satisfaction (Wong, 2000). Many of the researches who have focused on the meaning in life construct consider that purpose and meaning in life need to be complemented with a more universal source of life-strengths emanating from a higher power outside the individual (Krok, 2014; Fry & Debats, 2010). Existential beliefs, related with spirituality, religiosity, faith, and devotion were mentioned in differing ways by centenarians (Archer et al., 2005; Manning, Leek, & Radina, 2012; Freeman, Garcia, & Marston, 2013). These long-lived individuals demonstrate a greater preference for deriving meaning from religion and spirituality, representing energy resources that aid adaptation and allow persons to improve their well-being (Bishop, 2010; Manning et al., 2012).

This study aims to explore the role of existential beliefs in mediating the influence of health on centenarians' well-being. We began by examining centenarians' health status and satisfaction with life. We then explored the specific role of existential beliefs for centenarians' well-being and it is predicted that existential beliefs will mediate the association between health and well-being.

Methods

Participants

Data from two Portuguese studies on centenarians were considered. One is a population-based study comprising a total of 186 centenarians living in Oporto city and its surrounding geographical area (Oporto Metropolitan Area, which comprises a region of approximately 60 km around Porto, in Portugal) and the second refers to a convenience sample of 105 centenarians living in the interior part of the country with a similar geographical extension around the city of Guarda). From a total of 291 only 241 were effectively face-to-face interviewed. The other 50 centenarians were excluded because

they died in the interim or their relatives refused participation because of obvious dementia, severe health problems, or lack of interest. Information was collected during one or two sequential sessions directly with the centenarian and/or with a proxy respondent (families and/or caregivers). Age validation was accomplished via confirmation with identity card or birth certificate and informed consent for participating in the study was fully considered.

Since this study requires centenarians' own perceptions about well-being and existential resources, information was only assessed if the individual was not affected by severe cognitive impairment and was willing to present information on these aspects. Cognitive status was assessed with a shortened version of the Mini Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975; Guerreiro, Silva, Botelho, Leitão, & Garcia, 1994) with a maximum score of 21 points instead of 30. This short version (SMMSE) contained the orientation, registration, attention and calculation, and recall assessment scales (Holtsberg, Poon, Noble, & Martin, 1995). Taking into account cut-offs that had been used in previous studies with centenarians (e.g., Jopp & Rott, 2006), we determined a score of 4 or higher on the SMMSE to indicate the necessary cognitive capacity for answering self-report questions. Based on this cut-off, from the initial 241 centenarians, 124 were selected. Additionally, since the methodology used in the present study requires the absence of missing information, only those centenarians with complete interviews were considered (n=80).

The mean age of the sample (n=80) was 101.01 (SD 1.31), 81.3% were women and 81.3% were widowed. 31.3% of the sample lived in institutions, 45.0% with children, 7.5% alone, and the remaining with other relatives (16.2%). The mean of school years attended was 2.16 (SD 2.44); 37.5% never attended school and 49.0% had up to 4 years of education (elementary school). In what concerns monthly income, 15.6% received less than 250€, 63.6% between 250€ - 500€ and 20.8% more than 500€ per month.

Because drop-outs are usually worse off we investigated differences between this group (n = 161, i.e. persons unable to contribute with valid and full self-reports) and participants (n = 80, present sample) in basic sociodemographic variables, cognitive and functional capacity. Fisher's exact tests showed significant differences ($p < 0.05$) for gender, with a higher proportion of men in the selected group (18.8% for 8.7 in the drop-out), for living arrangements, with a higher proportion of institutionalized centenarians within the drop-outs (52.5% for 32.5% in the selected group), and for education (45.2% of illiterate in the drop-out and 28.7% in the selected group). No differences for marital status were found. With respect to physical and cognitive functioning, drop-outs scored significantly lower

(ADL: $t(237) = -7.871$, $p < 0.001$; IADL: $t(233) = -6.704$, $p < 0.001$; SMMSE: $t(231) = -13.675$, $p < 0.001$; GDS: $t(234) = 2.736$, $p < 0.001$). Consequently, the sample for this study only represents a selected range of physical and cognitive functioning within centenarians and results cannot be generalized to the entire centenarian population.

Measures

Physical and Functional Health. Diseases were assessed with a list of 18 health problems that includes, for example, hypertension, heart problems, chronic lung disease, diabetes mellitus, frequent urinary infections, arthritis. Functional disability was assessed through the Older Americans Resources and Services (OARS) Multidimensional Functional Assessment Questionnaire (Fillenbaum & Smyer, 1981; Rodrigues, 2008). The scale includes 7 items to assess basic daily living activities (ADL; e.g., the ability to talk on the phone, to travel, go shopping, prepare meals) and other 7 items to evaluate instrumental activities of daily living (IADL; e.g., the capacity for walking, bathing, eating, toileting). Respondents were asked how much difficulty they had performing each of these activities by rating them on a three-point scale (2 = no difficulty; 0 = can't do without help). Cronbach's α was 0.909 for ADL scale and 0.879 for IADL.

Well-being. Satisfaction with life was assessed through the Satisfaction With Life Scale (SWLS), which is a short 5-item instrument designed to measure global cognitive judgments of satisfaction with one's life was used (Pavot & Diener, 1997; Sancho, Galiana, Gutierrez, Francisco, & Tomás, 2014). Based on previous experiences about methodological issues in assessing centenarians, that had reported centenarians' difficulties in understanding self-referent statements and in using five or six answering categories (Jopp & Rott, 2006), the format of the questionnaire items was changed from statements to questions and the answering format was modified for 0=no, 1=in between, 2=yes. Cronbach's α was 0.634.

Existential beliefs. A subscale of Valuation of Life Scale (Lawton, Moss, Hoffman, Kleban, Ruckdeschel, & Winter, 2001; Araújo et al., submitted) appraising existential beliefs was used. This subscale is constituted by seven items that include aspects of hope (e.g., item 1, *I feel hopeful right now*), meaning (e.g., item 6, *Life has meaning for me*) and religious/ethical beliefs (e.g., item 4, *My life is guided by strong religious or ethical beliefs*). The answering format items was 1= no, 2=in between, and 3=yes. The Cronbach's α was 0.786.

Data Analysis

All data analyses were performed using IBM SPSS Statistics Software Version 21. First, descriptive statistics were computed regarding sample demographics and correlations between variables, using Pearson or Spearman according with the variable's distribution. The health variables showing significant associations with outcome variables ($p < 0.05$) were included in the multivariate analysis. The mediation pathway from health to well-being through existential beliefs was tested following MacKinnon's assumptions (2008). MacKinnon's model is an extension of the three-step model proposed by Baron and Kenny (1986) from social sciences and Judd and Kenny (1981) from health sciences (cit. in MacKinnon, 2008). This multistage linear regression model of testing mediation includes four steps (see Figure 1): 1. Health is associated with well-being (path c); 2. Health is associated with existential beliefs (path a); 3. When controlling for health, existential beliefs is associated with well-being (path b), and the association between health and well-being is either no longer statistically significant (full mediation) or reduced significantly (partial mediation); 4. A statistically significant indirect path exists between health and well-being through existential beliefs. The significance of the mediation effect is calculated using the product of path coefficients, and is tested with the Sobel test (Sobel, 1982 cit. in Preacher & Leonardelli, 2001). This test is used to determine whether the drop in the total effect is significant when the mediator enters the model. All analyzes considered $\alpha = 0.05$ as significance level.

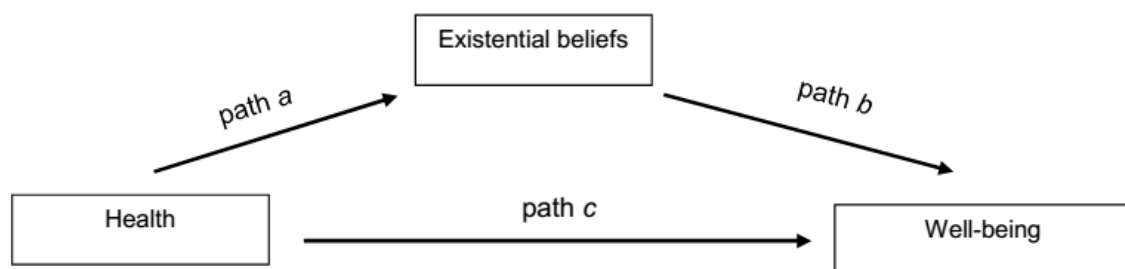


Figure 1. Mediation model

Results

Descriptive analyses of each independent and dependent variable used in the study were conducted. Centenarians had a mean number of 3.75 diagnoses (SD 1.93), with a

minimum of 0 and maximum of 9. More specifically, the majority of the sample (57.6%) had 3 to 5 diseases, 25% had 1 or 2, 1.3% had no diseases and 16.4 had between 6 to 9 diseases. In relation to functional capacity, the mean of ADL score (0 is total dependent and 14 is total independent) was 9.29 (SD 4.13) and 4.91 (SD 3.85) for IADL, indicating higher difficulties in instrumental activities of daily living. The mean value for satisfaction with life (ranging from 0 to 10) was 5.66 (SD 2.76) and for existential beliefs (ranging from 7 to 21) was 16.14 (SD 3.57), with higher values indicating higher level of satisfaction with life and existential beliefs respectively.

Table 1. Correlation coefficients between measures

	ADL	IADL	Diagnosis	Satisfaction w/life	Existential beliefs
ADL	--				
IADL	0.633**	--			
Diagnosis	-0.336**	-0.288**	--		
Satisfaction w/life	0.340**	0.245*	-0.216	--	
Existential beliefs	0.323**	0.245*	-0.069	0.467**	--

* Significant at the $p < 0.05$ level, ** Significant at the $p < 0.01$

Table 1 displays the correlation coefficients between study measures, as a basis for subsequent analyses. As there was not a significant correlation between the number of diseases and the satisfaction with life ($r = -0.216$, $p > 0.05$), the following analysis were based only on functional capacity (ADL and IADL) as a measure representing health function. The correlations between the other variables indicated a statistically significant association between the predictor variables (ADL and IADL) and the outcome variable (SWLS). The results also support the positive and significant association between the predictor variables and the hypothesized mediating variable (existential beliefs) as well as a significant association between the mediator and the outcome variable. What remains to be determined is whether existential beliefs mediate the relationship between functional capacity and satisfaction with life, as hypothesized.

Table 2. Summary of regression models predicting and satisfaction with life through existential beliefs

	B	SE	p	R ²
<i>(i) Activities of daily living</i>				
(Unadjusted)				0.116
ADL	0.227	0.071	0.002	
(Adjusted)				0.252
ADL	0.130	0.074	0.082	
Existential beliefs	0.310	0.084	0.001	
<i>(ii) Instrumental activities of daily living</i>				
(Unadjusted)				0.060
IADL	0.176	0.079	0.028	
(Adjusted)				0.226
IADL	0.065	0.079	0.413	
	0.334	0.086	0.001	

Results on the proposed mediation chain (Figure 1) are presented in Table 2, displaying the multiple linear regression results for mediation analysis, with unstandardized regression coefficients, standard errors and p-values. The results of activities of daily living as predictors showed a significant and positive relationship with satisfaction with life ($b=0.227$, $p<0.01$), revealing that centenarians with higher score in ADL (more independent) feel more satisfied with their life. After controlling for existential beliefs, ADL was no longer associated with SWLS ($b=0.130$, $p>0.05$). The addition of the mediator in the prediction of satisfaction with life resulted in a R^2 value of 0.252. Further, Sobel test ($z=-2.357$, $p<0.05$) indicated that there is a significant decrease in the magnitude of the regression coefficient for the predictor variable upon controlling for the mediator.

In relation to instrumental activity of daily living, the results from the regression tests revealed the association of IADL and SWLS ($b=0.176$, $p<0.05$), since centenarians with higher IADL score (more independent) have better scores of satisfaction with life. This relationship was significantly mediated by existential beliefs: after controlling for existential

beliefs the initial association between IADL and SWLS was no longer statistically significant ($b=0.065$, $p>0.05$). By adding existential beliefs in the regression model, the initial R^2 value of 0.060 increased to a value of 0.226. Results from Sobel test confirmed the value of existential beliefs as a strong mediator ($z=-2.403$, $p>0.05$).

Discussion

The purpose of this investigation was to explore if existential beliefs mediate the health – well-being association in a sample of centenarians. Results indicate a positive association between independence and satisfaction with life. However, this association loses its predictive value once existential beliefs were introduced as a mediator.

Results on centenarian's health indicate that reaching the age of 100 doesn't mean escaping to the main diseases associated with aging. Instead, the majority experiences medical conditions (3 to 5 diseases), as it was found in Danish and Fordham Centenarian Studies (Andersen-Ranberg et al., 2001; Cimarolli & Jopp, 2014), where most of the sample had several common diseases. In relation to functional capacity, our participants faced physical limitations and losses in multiple domains of functioning, with scores very similar to the ones verified in Heidelberg and Georgia Centenarian Studies (Rott, Jopp, D'Heureuse, & Becker, 2006; Randall et al., 2011). When considering the values of satisfaction with life, in the original version (7 point scale) there is a possible score range of 5 to 35, with a score of 20 representing the neutral point of the scale the point at which the respondent is about equally satisfied and dissatisfied (Pavot & Diener, 1993). In our study, the point scale had to be transformed to a 3 point scale (due to centenarians' difficulties in understanding complex answering categories; see Jopp & Rott, 2006), with a possible range of 0 to 10. Thus, the mean score of 5.66 can be interpreted as a slight satisfaction with life (Pavot & Diener, 1993). The existence of existential beliefs is verified through the mean score of 16.14 (higher than the neutral point of 14) in the respective subscale.

The assumption that functional capacity is associated with well-being is well supported by our findings. First, ADL and IADL were significantly correlated with satisfaction with life ($r=0.340$, $r=0.245$, $p<0.05$). Second, in the unadjusted analysis they were considered predictors ($b=0.227$, $b=0.176$, $p<0.05$). But the most interesting result came from mediation analyses, which revealed that existential beliefs can be a mediator of the relation between functional capacity and satisfaction with life. The importance of existential resources to resilience, mental health and well-being seems to be particularly

credible and appealing in very advanced age, as it has been presented in previous research exploring these issues in samples with very old individuals (e.g. Manning et al., 2009; Knight & Ricciardelli, 2003). Despite several adverse circumstances, mostly related with health and functional deterioration, centenarians can maintain a slightly level of perceived well-being (Jopp & Rott, 2006; Poon et al., 2009). Existential resources, including aspects related with meaning, purpose in life, religious and spiritual beliefs, may have a privileged contribution on this adaptive capacity, helping provide a sense of stability when challenges abound (Bishop, 2011), which reinforce the importance of gerotranscendence as an integrative theory in the adaptation to extreme longevity (Gondo, 2012). The valuation of religious and spiritual issues together with the disengagement from social activities and group that centenarians manifest (Willcox, Willcox, Sokolovsky, & Sakihara, 2007; Manning et al., 2012) reinforce the importance of gradual and natural changes in behavior and thought within social relationships, sense of self, and the way the universe is perceived as adaptive mechanism through which they can maintain well-being (Tornstam, 2005). Indeed, we can assume a shift perspective of successful aging, from biomedical models, in young old age, to non-logical models becoming more meaningful and reasonable when function and cognitive capacity have declined considerably (Gondo, 2012).

Some reflections about the limitations of this study are required: firstly, the fact that our sample is positively selected as shown by the selectivity analyses. Thus, when evaluating the results, one has to keep in mind that the findings should be cautiously generalized to very old individuals who are still able to give valid information about themselves. Secondly, this study is limited by the cross-sectional nature of its design. Longitudinal research with attention to understanding the temporal relationships among these dynamics is indicated. Future studies should deeper explore the influence of existential beliefs in mitigation the consequences of other frequent adverse circumstances (e.g., sensorial deficits, loss of family members). Centenarians are likely to become more common and it can be assumed that the demand for health and social care will increase considerably. As a consequence, future effective intervention strategies directed to long-lived individuals' specificities are extremely relevant for care providing professionals and families. It is then crucial not to ignore that existential issues may represent energy resources that aid adaptation and allow persons in advanced old age to confront stressors in everyday life, and therefore should be included in new practical ideas to develop models of intervention that are appropriate for very older people.

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GENERAL CONCLUSIONS

The overarching goal of the empirical work presented herein was to investigate Portuguese successful centenarians. We start our analysis from the most recognized conceptual framework of successful aging (Rowe & Kahn, 1997) and went further by covering new directions and possibilities about what successful aging is and how to measure it. The exceptional capacity of some centenarians to deal and overcome constraints of such an advanced age and the absence of data about Portuguese centenarians has motivated choosing this age group. The approach developed within the process of our work has sought to respect the long history that successful aging has enjoyed, as well as the specific characteristics of the study population. The subjects for this research work come from the PT100 Centenarian Study, both population-based Oporto centenarian study and Beira Interior satellite study. We set out to explore different definitions and operationalization of successful aging and to identify the importance of several internal and external resources for being a successful centenarian. To that end, we conducted a series of review and empirical studies using different approaches and methodologies. These studies relate to how individuals can experience successful aging regardless of the social or health conditions imposed for the privilege of having more than one century of life. The main findings are outlined below. Future research directions are also delineated.

9.1. SUMMARIZING

The first outputs presented in this thesis derived from three literature reviews that have contributed to gather a deeper understanding on several issues related with well-being and centenarian's research. The scope review on the look of Positive Psychology towards older age (Chapter IV) demonstrated that the majority of studies have been focusing on happiness and life satisfaction; issues about the meaning and hope at this life stage were also found to be present, but clearly in a less representative manner. The other two reviews were about centenarians' characteristics, more specifically on their social functioning and quality of life. These studies were critical for further conducting and

interpreting the empirical studies. Results from the international studies reviewed demonstrate that the reduction of social network does not lead inexorably to loneliness and melancholy (Chapter V). On the contrary, the reduction of social relationships is suggested to be as a strategy to deal with the losses and increase well-being. The review on centenarians' quality of life (Chapter VI) has added evidence of their stupendous capacity to cope with adverse situations. The analysis of the quality of life domains showed that the various losses and impairments centenarians face do not necessarily lead to demoralization, to the extent that most of those evaluated in the subsequent empirical studies maintained a sense of satisfaction and well-being.

The first empirical output presented in this thesis was related to the development and psychometric analysis of the Portuguese version of Positive Valuation of Life Scale (PosVOL). Valuation of life's construct was presented by Lawton and coworkers (2001) in an attempt to overcome the tendency to search for symptoms, constraints and diseases for old age. The study presented on chapter VII showed that The Portuguese version of Positive VOL Scale represents a reliable and valid measure to capture the subjective experience of attachment to one's life. This step was fundamental for the following research since there was no appropriated instrument to assess valuation of life for Portuguese elders. The two factors that have emerged, existential beliefs and perceived control, have been extensively studied in the health psychology literature, since they are related with how individuals cope. Both are considered important internal resources that, together with external resources (e.g., social support and material resources), help to determine how individuals overcome and adapt to adverse situations and, therefore, to age successfully.

The first picture of Portuguese centenarians was presented on the second study (Chapter VIII; Do the centenarians fulfill the requirements for a successful aging). Main findings reveal that centenarians do not meet Rowe and Kahn's (1997) successful aging criteria, which was very associated with the physical constraints, cognitive restrictions and social losses they were experiencing. But when considering centenarians' self-evaluations of the same criteria, the percentage of successful aging was higher, with exception in the social engagement domain. The discrepancy between objective and subjective ratings of successful aging, previously found in other studies (e.g., Strawbridge, Wallhagen, & Cohen, 2002; Pruchno, Wilson-Genderson, & Cartwright, 2010a; Cho, Martin, & Poon, 2012) not only reflects the importance of incorporating the opinions of older adults, but also the complexity of obtaining a unified phenotype of successful aging that can be operationalized and studied (Pruchno, 2015). In a second step, the analysis of sociodemographic factors, psychological, social and economic resources across objective

and subjective profiles of successful aging revealed that some psychological resources are significantly different across groups. Thus, this study goes further by investigating individual's strengths, such as psychological factors that enable centenarians to handle everyday challenges, which seem to be particularly frequent at this very old age. The higher values of self-efficacy, hope and purpose verified in the successful group reinforced Bandura (1997), Reker and Woo's (2011) works about the importance of these types of resources to well-being and life quality.

In the next study (Chapter IX. What is the best model for considering successful aging centenarians) the application of Young, Frick, and Phelan's (2009) multidimensional model of successful aging in centenarians was explored. The choice of this model was related to the fact that it comprises bio, psycho and social domains, with spirituality ("the forgotten factor of successful aging", cf. Crowther, Parker, Achenbaum, Larimore, & Koenig, 2002) being considered in the social domain. This study also encompassed participants from the Beira Interior Centenarian Study, allowing not only a larger sample but also a deeper and global view of Portuguese centenarians. Based on the results obtained through the structural equation modeling analysis, a final model of four domains (biological, cognitive function, well-being and sociological) with good fit indices was achieved. This model seems to be particularly profitable for the oldest old since it considers multiple domains, allowing an important proportion of centenarians to be included, namely those who would be automatically excluded in physiological and one-dimensional models. In other words, although physiological change or functional deterioration is closely associated with increasing age, well-being and social aspects of aging may not have positive relationships with physiological changes (Young et al., 2009) and can even be compensating physiological decline, allowing some older adults to age successfully (Cho et al., 2012). Therefore, this approach permits the inference to psychological and social adaptive mechanisms, which have been already identified as relevant in centenarian research (Jopp & Rott, 2006; Martin et al., 2011).

The multidimensional model of successful aging tested in the previous study (Chapter X. What are the predictors for being successful at 100 years old) was deeper explored in the same selected sample of centenarians (as presented in Chapter IX). The main focus was the formation of subgroups of centenarians sharing communalities in successful aging profiles and the identification of related sociodemographic, psychological, social and economic factors. One interesting result was the fact that spirituality (one of the variables of the sociological domain) didn't contribute to differentiate participants between clusters profiles. Almost 94% of the sample reported that their life was guided by strong religious or ethical beliefs, which goes in line with international (Krause, 2005; Manning, Leek, &

Radina, 2012) and national (Mónico, 2013) studies that confirm the importance of religion and spirituality for the elderly. Two distinct clusters were grouped, one of them with superior results in all domains, i.e., better health and cognitive status, emotional functioning, and social engagement. Subsequently, gender and income difficulties (from adjusted analysis) and psychological resources, such as purpose or self-efficacy (from unadjusted regression models) were found to predict the odds of successful aging. These results reinforce that the disparities of successful aging may reflect differential survival and lifelong differences in health, economic and social conditions (Martin et al., 2011). Concomitantly, psychological strengths, including beliefs, seem to optimize adaptation in very advanced age, explaining why some centenarians continue to do well and others don't (Jopp & Rott, 2006).

The final paper of this thesis (Chapter XI. What is the role of existential beliefs in the association of health and well-being in centenarians) sought to explore the role of existential beliefs in mediating the influence of health on centenarians' well-being. It integrates an eudaimonic perspective of well-being, in which individuals have beliefs that give purpose to their existence (Cohen-Mansfield & Poon, 2011), and assumptions from the Gerotranscendence Theory, namely the personal power and driving forces of individuals in advancing age (Tornstam, 2005). Existential resources (including aspects related with personal meaning, purpose in life and spirituality) were found to mediate the association between functional capacity and satisfaction with life. These resources may have a privileged contribution on centenarians' adaptive capacity, helping to provide a sense of stability when challenges abound (Bishop, 2011). The positive mediation effect of existential beliefs goes in line with the focus on the positive aspects of existential beliefs within the context of a conceptual model related to successful aging, which seems to be an emerging issue when considering the trials and tribulations of very old age (Crowther et al., 2002; Young et al., 2009; Nosraty, Sarkeala, Hervonen, & Jylha, 2012).

The present work focuses on a very specific generation that has never been studied previously in Portugal. The macro or historical events as well as the micro influences of the last century make this cohort group different between countries, different within the same country from other age groups, and even distinct from the future centenarians' generations. Culture and history therefore play an important role in determining the kinds of resources intervening in adaptation (Fry & Debats, 2010). Both material and psychosocial resources, such as competencies and social support, may be differently valued within several contexts, circumstances or conditions. The experiences from the studies with Portuguese aging samples have been noticing some particularities of our elderly population, namely their low levels of formal education. In a recent population

study of the Portuguese aging profile, 30.5% of the 1492 interviewees had a school level of 3 or least years and 50.9% between 4 and 6 years. The number of school years attended decrease across age groups, with a mean of 4.8 years in the group of 65 – 74 years old and of 4.2 in the group of 75+ years old (Oliveira et al., 2008). Also, the level of income is especially lower among elderly people, with 30% of poverty within the elderly aged 75 and more years old and living alone (Rodrigues & Andrade, 2013). Another cohort effect that has been reported is the frequency of religious beliefs and practices, which was found to be associated with a better overall health status (Mónico, 2013). Taken together or even independently, these characteristics may be even more pronounced in centenarians, as it has been verified in international studies (Poon et al., 1992). Life for centenarians in Portugal may be particularly difficult due to social isolation and economic hardship. Women of this age group lived through a period of fewer opportunities of education and workplaces for them. For these reasons they were protected from several causes of accidental deaths and are now living longer, but also have lower earning power and a greater likelihood of living alone.

Although the findings from these studies contributed to a better understanding of successful aging in very late life, some limitations have to be considered. First, all the five research papers used cross-sectional data sets, and consequently we are not able to test for causal relationships. In addition, the studies were based on a selected sample of individuals with no/minor cognitive impairment that had participated in the full interview. This procedure was warranted since all studies require self-appraisal measures and the absence of missing information. Thus, some concerns with findings' generalization are required.

9.2. FUTURE DIRECTIONS

The belief that an enhanced understanding of what successful aging is can contribute to develop interventions that will enable more people to age successfully always accompanied this study. The available knowledge about very old age is growing as the population (and its related interest) increase each year. The capacity of survival and adaptation of the ones who reach 100 and beyond made the several efforts necessary to study this specific population worth it. Understanding what we can learn from these expert survivors and what do workers need to know to provide meaningful and relevant interventions was our mainstream.

A general conclusion of the present thesis, which is in agreement with what other scholars have been reporting, is that centenarians present special features and constitute a very heterogeneous group. Thus, we believe that for intervening with long-lived individuals something different is required, i.e. practice with centenarians should be target for their specificities. A significant learning from the interviews we conducted was the importance, when we interact with very old individuals, of being aware of the historical worlds in which their life journeys had taken place. Particularly in Portugal, the last 100 years were of profound political, economic and social changes, and centenarians born in a period where there was no electricity, potable water, automobiles, among many other banal things. Inquiring about this will help professionals to better understand resilience, responses to personal challenges and personal goals. Furthermore, above and beyond distal influences, the present characteristics of these individuals make all the difference. For many of them, even those considered successful agers in our study longevity comes with several losses at physical, cognitive and social levels, associated with an increased risk of sensorial deficits, mobility restrictions, cognitive constraints, and smaller social ties. This may lead to a constricted access to social, occupational, recreational, and religious activities, thus the relationships with the wider world peak. The preservation of personal behaviors and characteristics, as well as established habits, routines, and rituals of centenarians is important in practice. Intervention should address the preservation of function, providing opportunities for meaningful engagement and sense of autonomy.

Family consideration and ties are vital aspects of practice with the centenarian population, which led the PT100 team to develop a new study about centenarians' offspring⁸. Caregiving to a centenarian involves some different issues than caregiving to an older person of younger age, this because they have experienced many losses during their life, possibly including their adult children who often serve as caregivers to their parents. In those situations of less/no availability of informal care, organizations become more important. As verified in our study, many centenarians had to move into institutional care, which is expensive for many of them. The current cohort of centenarians receives very low pensions and many have arrived at 100 years old without any expectation that they would live so long or any preparation for such a prolonged life. Thus, institutions (at a local level) and also policies (global level) must take potential economic problems of long-lives individuals into consideration.

⁸ The Project Centenarians' offspring: intergenerational ambivalences and demands of care (EXPL/MHC-PAP/1064/2013) is an ongoing study anchored in the PT100 - Oporto Centenarian Study. This exploratory project is specifically interested in analyzing the caregiving demands of these centenarians' offspring and unravel the associated psychological and familial challenges and adaptations they face.

Recently, the literature has emphasized the importance of focusing the characteristics of vulnerable individuals to gain an understanding of their operating standards, capacities and resources. This study have followed this positive trend, leading to the identification of several resources that must be considered by researchers who study very older adults or practitioners who work with them in various settings. For instance, some internal resources are not overwhelmed by physical deterioration and may even gain power when congruent and meaningful perceptions of oneself and one's life are maintained in late life. In accordance with previous findings, certain psychological attributes have shown to be important for centenarian's adaptation. Hence, interventions should maximize elder's positive traits, enhancing their competencies so they can effectively use their resources, and address self-appraisals more than objective states. Given the importance of self-efficacy and purpose within different outputs presented in this thesis, activities directed to preserve control over some functions and maintain meaningful goals must be developed. Considering the role of existential beliefs, professionals should understand the role, if any, of religion and spirituality and, given possible barriers (e.g., mobility, vision, hearing) the access to religious institutions and activities should be facilitated.

Summarizing, professionals must be aware of centenarians' specific characteristics and should consider the need to develop interventions that specifically target this population and the best potential candidates, i.e., near-centenarians (aged 95+). Personalized interventions, coordination between medical, psychological, social and gerontological professionals and care providers, and articulation with family and community members are of crucial relevance. As for further studies, three directions are suggested. First, future research on very old adults should use longitudinal designs, applying, for example, successful aging model to different cohort groups for several years. Only within this methodology investigators will be able to explore the predictive effects of several factors and the effective influence of age for successful aging. Second, a further investment in diversified methodological approaches like using a more widening range of sources of information (e.g. based on observation and interviews, as well as on proxies' ratings) would permit to include a broader range of individuals. Third, future research should focus on cross-cultural perspectives, comparing centenarian from different regions and cultures.

9.3. CONCLUDING REMARKS

The studies conducted throughout the work presented in this thesis allowed to identify and investigate Portuguese successful centenarians. We validated a reliable Portuguese version of the Positive Valuation of Life Scale, which was then very useful to analyze important aspects related to centenarians' attachment to life. The depth study of successful aging concept in very advancing age culminated in the following findings, (i) successful aging shouldn't be defined merely through objectively criteria, (ii) a multidimensional model comprising biological and sociological aspects, cognitive functioning and well-being seems to be suitable for evaluating successful aging, and (iii) certain structural variables, as well as psychosocial resources, especially existential beliefs, contribute to centenarians' adaptive capacity and, therefore, should be considered concomitant to successful aging. Believing that studying centenarians allows learning something about these expert survivors, but also about aging processes that apply to other adults as well, we hope that this work can contribute for further basic and applied research in the gerontological field.

In the end of this thesis – as in the beginning – the conversation between Socrates and Cephalus (360 B.C.) makes perfect sense.

Socrates: this is a question which I should like to ask of you who have arrived at that time which the poets call the "threshold of old age". Is life harder towards the end, or what report do you give of it?

Cephalus: The truth is (Socrates) that these regrets, and also the complaints about relations, are to be attributed to the same cause, which is not old age, but men's characters and tempers; for he who is of a calm and happy nature will hardly feel the pressure of age, but to him who is of an opposite disposition youth and age are equally a burden.

— Socrates, in Plato's Republic

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APPENDICE

APPENDICE A - Abstracts from other publications

List of Articles (published/in press)⁹:

Ribeiro, O., Araújo, L., Teixeira, L., Duarte, N., Brandão, D., Martin, I., & Paúl, C. (in press). Health status, living arrangements and service use at 100: Findings from the Oporto Centenarian Study. *Applied Developmental Science*.

This paper describes the socio-demographic characteristics, health status and service use of community dwelling and institutionalized centenarians and examines their main differences. Participants were 140 centenarians from the population-based Oporto Centenarian Study (mean age 101.2; SD 1.6). Main findings revealed that the majority of the centenarians lived at home with their family members (57.9%). Increased health care needs, living alone and family caregiving constraints were the most common reasons for entering a nursing home. Community-dwelling centenarians were cared mostly by their children and were less dependent and in better cognitive status than those who were institutionalized. Differences were found in the pattern of health service use according to the centenarians' residence, ability to pay medical expenses and dependency level. Findings highlight the need for an accurate assessment of caregiving support systems, particularly family intergenerational duties, and of the factors constraining the access and use of both health/social services.

Ribeiro, O., Teixeira, L., Araújo, L., Afonso, R.M., & Pachana, N. (2014). Predictors of anxiety in centenarians: health, economic and social factors. *International Psychogeriatrics*. doi: <http://dx.doi.org/10.1017/S1041610214001628>.

Background: Centenarians' psychological well-being is presently of great interest in psychogeriatric research but little is known about factors that specifically account for the presence of clinically relevant anxiety symptoms in this age group. This study examined the presence of anxiety and its predictors in a sample of centenarians and aims to contribute to a better understanding of anxiety determinants in extreme old age. Methods: We examined how socio-demographic, health, functional, and social factors contribute to the presence of clinically significant anxiety symptoms in centenarians recruited from two Portuguese centenarian studies. The Geriatric Anxiety Inventory – Short Form (GAI-SF) was used to assess anxiety symptoms. Results: A total of 97 centenarians (mean age 101.1 years; SD = 1.5 years; range = 100–108) with no/minor cognitive impairment were included. Clinically significant anxiety symptoms (GAI-SF ≥ 3) were present in 45.4% (n = 44) of the sample. Main predictive factors included worse health perception, higher number of medical conditions, financial concerns related to medical expenses (income inadequacy) and loneliness. Conclusions: Results suggest that along with health status (subjective and objective), income inadequacy related to medical expenses and feeling lonely may predispose centenarians to clinically significant anxiety and be important to their overall well-being. Further research is needed on the repercussions of clinical anxiety in centenarians' quality of life and on co-morbid conditions (e.g. depression) at such advanced ages.

Ribeiro, O., Teixeira, L., Duarte, N., Azevedo, M., Araújo, L., Barbosa, S., & Paúl, C. (2012). Versão Portuguesa da Escala Breve de Redes Sociais de Lubben (LSNS-6). *Revista Kairós*, 15, 217-234.

A avaliação das redes sociais na investigação e prática gerontológica requer o uso de instrumentos válidos e eficazes que sejam simples, concisos e de fácil aplicação na população idosa. A Escala de Redes Sociais de Lubben (LSNS) é um dos instrumentos mais utilizados para avaliar a integração social e o risco de isolamento social em idosos residentes na comunidade. Este artigo debruça-se sobre a tradução e validação

⁹ Publications that were not considered as outputs of this thesis

da versão abreviada da escala (LSNS-6) para o Português Europeu e expõe as suas principais características psicométricas.

Ribeiro, O., & Araújo, L. (2012). Centenários e os Desafios da longevidade. *Rediteia - Revista de Política Social – Envelhecimento Ativo*, 45, 117-128.

O presente artigo, debruçando-se sobre alguns resultados dos principais estudos sobre centenários, provê uma breve incursão sobre a heterogeneidade que caracteriza esta população, dando conta, a título de exemplo, dos distintos perfis de longevidade identificados e da importância de melhor compreender os recursos psicológicos que lhe estão associados. Ao enunciar a crescente representatividade numérica deste grupo etário no nosso país, dá conta, também, da necessidade de providenciar dados científicos sobre os centenários portugueses.

List of Abstracts (published in peer-review journals):

Araújo, L., Ribeiro, O., Teixeira, L., Duarte, D., Brandão, D., Azevedo, M.J., & Paúl, C. (2014). Successful Aging in Centenarians: The Relevance of Social Engagement for Psychological Well-being. *The Gerontologist*, 54, 84.

Rowe and Kahn's (1997) version of successful aging defines avoidance of disease and disability, maintenance of high physical and cognitive function, and sustained engagement in social and productive activities as essential components of aging successfully. The applicability of this model in very advanced age has been questioned and the relative importance of these aspects to well-being is not properly established. In order to analyze the effect of Rowe and Kahn' criteria on both subjective (hedonic) and psychological (eudaimonic) well-being, 140 individuals with 100 and more years old from the Oporto Centenarian Study (PT100) were interviewed. The mean age of the sample was 101.18 (SD 1.59); 89.3% women, 76.4% widowed and 57.9% living in the community. The Positive Valuation of Life Scale (Lawton et al., 2001), the Satisfaction with Life Scale (Diener et al., 1985) and a questionnaire of health and social information were used for data collection. Descriptive and inferential analyses were conducted. Mean scores of well-being were 27.81 (SD=5.21) for VOL and 6.51 (SD=1.97) for SWLS. Of the successful aging criteria only social engagement, i.e. participation in social activities, had a significant association with psychological well-being ($p<0.01$). These results stress out the influence of activity and social engagement participation in the adaptation to the challenges of very old age. The characteristics, sort and distribution of activities practiced at this age should be further investigated in order to promote and/or adjust available social engagement opportunities.

Araújo, L., Ribeiro, O., & Paúl, C. (2014). Positive Psychology and Aging through Hedonic and Eudaimonic perspectives: A Scoping Review. *The Gerontologist*, 54, 84.

The phenomenon of ageing population has been primarily presented in terms of individual and social challenges and rarely is referred as an opportunity with benefits to older people and to the community. The study of aging from the lens of Positive Psychology allows this emphasis, looking beyond the decline normally associated with advancing of age and aiming to promote fulfilled and happy years in later life. In order to analyze the investment and statement of Positive Psychology research in the study of aging, a scoping review of the scientific literature published in the last 10 years was conducted. Our goal is to gather evidence on the key conceptual and empirical advancements that illustrate the commitment of Positive Psychology with aging issues. The literature search was conducted across the databases SCOPUS, Web of Science and INFOPsy, looking for papers having "Positive Psychology" and "Aging" (or similar words to aging) on their title, abstract or key-words. Simultaneously, aging related terms were searched in well-known journals of Positive Psychology. This strategy yielded 48 articles, 33 original scientific papers and 15 reviews for analysis. Main themes and study designs are presented and endpoints are discussed according to the hedonic and eudaimonic perspectives of the studies. In spite of the highest number of studies about happiness and life satisfaction (hedonic well-being), it is clear a growing interest on eudaimonic components of well-being in the last years, highlighting the human potential in advancing age and the importance of growth, self-actualization and meaning to a positive aging.

Teixeira, L., Araújo, L., Duarte, D., Brandão, N., Azevedo, M., Paúl, C., & Ribeiro, O. (2014). Cognition and functionality: how do they relate to time lived after 100 years of age? *The Gerontologist*, 54(S2), 520.

Introduction: The number of centenarians has greatly increased in Portugal in the last decades. Therefore, the analysis of survival time after becoming a centenarian and related factors constitute an important issue for the quality of care provision. The objective of this study is to identify health related factors associated with the time lived after being 100 years of age. Methods: Data come from the population-based study PT100 (Oporto Centenarian Study) and considers information gathered through face-to-face interviews with centenarians and their proxies during 2013. Study eligibility criteria included being 100 and more years old and living in the Oporto Metropolitan Area. Survival analyses were performed in order to identify factors associated with survival after the 100. Functional status (e.g., walking, being bedridden) and specific health conditions (e.g. presence/absence of cognitive impairment) were considered as potential factors. Results: The sample comprises 140 centenarians with approximately 14.5 months as median survival time after their 100th anniversary. Centenarians who were bedridden presented a higher probability to live after 100 years when compared with functionally independent centenarians. Presence of cognitive impairment was not associated with the time lived after 100 years old. Conclusions: Given the increasing number of centenarians in Portugal, different studies based on this population need to be considered. The present study, focused on the life after 100 years old, provides new information about this topic contributing to the formulation of new scientific questions for this population.

Ribeiro, O., Teixeira, L., Araújo, L., Duarte, N., Brandão, D., Martin, I., & Paúl, C. (2014). Intergenerational ambivalence: care challenges facing Portuguese centenarians. *The Gerontologist*, 54(S2), 605.

Intergenerational ambivalence in later life is not a new theme in gerontology but it has rarely been studied within the context of centenarians' family ties, which are often characterized by internalized social norms of filial responsibilities. This paper presents findings from the Oporto Centenarian Study and considers informal caregivers who provided continuous care to a centenarian living in the same household. A total of 60 dyads were assessed on the overall caregiving experience with direct and indirect measures of intergenerational ambivalence and of psychological well-being. Caregivers were then clustered in three distinct groups: "extremely burdened", "mostly satisfied with the role" and "ambivalent". Main findings revealed that the demands of care tend to be surpassed by the existence of an overall rewarding experience, and that both ambivalence and satisfaction with the role were related to higher levels of well-being of the caregiver and the centenarian.

Araújo, L., Teixeira, L., Ribeiro, O., Brandão, D., Duarte, N., & Paúl, C. (2014). Multi-indicators of successful aging in centenarians. *Atencion Primaria*, 46 (Espec Cong 1), 41.

Introduction: The multidimensional model of successful aging (Young, Frick & Phelan., 2009) has been serving as a reference in empirical studies of successful aging over the last years (e.g., Pruchno et al., 2010) and a benchmark to assess the health and functioning of very old individuals (Philips Lifeline, 2014). By comprising bio, psycho and social domains, it constitutes a promising approach to the study of the centenarian population who tend to present several age-related losses. Objectives: The study aims to validate a multidimensional model of successful aging in a sample of Portuguese centenarians. Methods: 80 centenarians from the PT100 project (Oporto and Beira Interior Centenarians Studies) were face-to-face interviewed. Indicators of disease and physical impairment (physiological domain), emotional vitality and inner contentment (psychological), and engaging with life and spirituality (sociological) were collected. Results: Structural equation modeling analysis to the hypothesized model suggests removing the social activities indicator (factor loading of 0.07). The alternative model fits well to the observed data, with $\chi^2(24)=29.058$, $p=0.218$, CFI=0.949, GFI=0.925, RMSEA=0.052, $p=0.048$. Conclusion: The consideration of multi indicators of successful aging enables considering compensatory mechanisms and synergies between physical, psycho and social domains. A greater focus on psychosocial domains values the individual capacities' of adaptation, resilience, and coping, which have been tremendously advocated in the gerontological literature (Baltes & Baltes, 1990; Jeste, Depp, & Vahia, 2010).

Brandão, D., Duarte, N., Araújo, L., Alves, S., Teixeira, L., & Ribeiro, O. (2014). Centenarians' quality of life and the role of health and living context: first findings From the Oporto centenarian study. *Atención Primaria*, 46 (Espec Cong 1), 45.

Introduction: The interest of the scientific community to study the centenarian population has been growing due to the significant expansion of life expectancy and human longevity. Evidences about their quality of life (QoL) are, nevertheless, still limited. Different conceptualizations of QoL, the overvaluation of the negative aspects of advanced age and the heterogeneity of the oldest old are some issues that could explain the difficulties in this assessment. Objectives: This study aims to analyze the perceived QoL in a sample of centenarians and analyze if there are significant life context (community vs institutional) and health (objective and subjective perception) differences. Methods: A subsample of 59 Portuguese centenarians who participated in the PT100_Oporto Centenarian Study, conducted in 2013 was considered. Descriptive and chi-square analysis were conducted. Results: Most centenarians perceived their QoL in a very positive manner (50.8% rated it as "good", 6.8% as "very good" and 3.4% as "excellent"); 28.8% perceived it as "acceptable" and 10.2% as "bad". No significant statistical differences were found for the considered variables. Conclusions: Centenarians seem to present high levels of perceived QoL, which can be associated with a great ability to adapt to adverse situations that occur through their lives. Neither contextual and health aspects seem to influence the perception of QoL in this particular sample study. Nonetheless, more research is needed to understand the specificities of the QoL in the centenarian population, namely the role of psychological and social variables.

Araújo, L., Ribeiro, O., Brandão, D., Duarte, N., Alves, S., Teixeira, L., Paul, M.C., & Azevedo, M.J. (2014). Well-being in very old age: valuation of life and health at one century of life. *Revista de Saúde Pública*, 48, 238.

Introduction: Centenarians due to their very advanced age have to face with demanding accumulative conditions, which may constitute a serious challenge to their well-being and valuation of life (VOL), which includes judgments with regard to one's desired length of life (Lawton et al., 1999). Objectives: To assess levels of VOL in centenarians and to identify VOL's association with objective and subjective health measures. Methods: 35 individuals with 100 and more years old from the Oporto Centenarian Study (PT100) who were able to respond to a complete assessment protocol were considered for this analysis. The mean age of the sample was 101.23 (SD 1.57); 80% women, 77% widowed and 71% living in the community. The Positive Valuation of Life Scale (Lawton et al., 2001; Araújo et al., submitted), the OARS (Fillenbaum & Smyer, 1981; Rodrigues, 2007) and a socio-demographic questionnaire were used for data collection. Descriptive and inferential analyses were conducted. Results: Mean VOL score was 27.30 (SD=6.45) with higher scores in items related with hope and purpose. There were statistically significant differences only for subjective health: centenarians with a positive self-perception of health had higher valuation of life (28.3±5.8) than those with negative (19.7±6.6). Conclusions: Since VOL excluded physical health content, it was expected to exhibit no correlation, confirming the capacity of centenarians to minimize life circumstances on their subjective states (Rott et al., 2006). Further investigation should look for factors that may determine whether centenarians see life as being worthwhile or not.

Alves, S., Ribeiro, O., Brandão, D., Duarte, N., Araújo, L., Teixeira, L., Azevedo, M.J., & Paul, M.C. (2014). Informal caregivers of Portuguese centenarian: a first glance from the Oporto centenarian study. *Revista de Saúde Pública*, 48, 253.

Introduction: The increasing number of centenarians has enhanced the attention to this age group and to their specific care needs. Informal care represents an important support for centenarians but the available knowledge on this topic is quite scarce in the national context. Objective: To provide a first overview of caregiving aspects (burden and positive aspects) in a sample of informal caregivers of centenarians. Methods: A sample of 46 informal caregivers of centenarians from the Oporto Centenarian Study was considered. Information on sociodemographic aspects and on the caregiving experience (e.g. length of care, relationship with centenarian), presence of positive aspects of caregiving (from the Positive Aspects of Caring scale) and caregiver strain (from the Caregiver Strain Index-modified) were obtained. Results: Informal caregivers have a mean age of 63.9 years, are mostly women (87%), married (63%) and children of the centenarian (63%). Time spent on caregiving tasks is on average 19.6 hrs/day (SD=8.22) and the length of care is around 11 years (SD=10.80). Caregiving revealed to be an experience that provided meaning to most caregivers' life but with

several strains associated, namely physical strain and sleep disturbance. Conclusions: This is a first and preliminary approach to informal caregivers of centenarians and further information on their specificities will be obtained and made available in the near future from the ongoing project Centenarians' offspring: intergenerational ambivalence and demands of care.

Araújo, L., Ribeiro, O., Duarte, N., Brandão, D., Azevedo, MJ, Teixeira, L., & Paul, C. (2013). Centenarians own perceptions about their extreme longevity. *The Gerontologist*, 53(S1), 60.

Centenarians exhibit extreme longevity and a remarkable compression of morbidity and investigations about their special ability to avoid and/or overcome major constraints of life are being conducted all over the world. A special emphasis has been paid on the influence of biological and genetic factors (Poon & Cheung, 2012), but less attention has been given to life as a centenarian (Serra et al., 2011). With the main purpose of identifying how centenarians perceive their longevity and justify having reached 100 years old, a sample of 50 persons with 100+ years from the Oporto Centenarian Study (PT100) was selected considering their ability to provide extended in-depth face-to-face interviews. Main aspects pointed out as reasons to have reached extreme longevity included the value of hard work, good lifestyle choices (internal locus of control) and God's will (external locus of control). Even in a more transcendent justification, centenarians highlight their own responsibility in engaging in religious practices, such as praying and attend to mass. These results are analyzed according to the Portuguese cultural context, the major assumptions of spirituality and self-transcendence theories and the relation between locus of control and longevity. Gerotranscendence may provide a theoretical basis for the development of interventions that can foster a sense of meaning in life, well-being and life satisfaction as nearly as possible to the end of life.

Araújo, L., Ribeiro, O., Brandão, D., Duarte, N., Teixeira, L., Azevedo, MJ, & Paul, C. (2013). Exploring Successful Aging through Long Lived Individuals. *The Gerontologist*, 53(S1), 168-169.

The presentation of the first successful aging model (Rowe & Kahn, 1997) started a path of discussion between psychologists, physiologists and sociologists still present nowadays. Centenarian individuals are frequently referred as "successful agers" due to their exceptional capacity of overcoming and adapting major individual and social life constraints. This study is based on the preliminary findings of the Oporto Centenarian Study (PT100) and aims to analyze the appropriateness of main successful aging approaches on a selected sample of 25 centenarians. Participants were interviewed face-to-face, using a biopsychosocial approach, and were asked to fulfill an assessment protocol including questions on social resources, health, functionality and psychological aspects. They were also questioned about their past life events, present challenges and future expectations. Most participants were female, illiterate or had reduced educational levels (four years education) and were widows. Main results demonstrate multiple routes for achieving perceived successful ageing in exceptional longevity and that these do not necessarily include the absence of disabilities and chronic disease. This finding highlights the importance of the subjective perception of what it is to age successfully and the contribution of personality and spirituality factors. A clear understanding of how very old persons report successful aging even in the presence of chronic illness and function limitations is necessary to explore the concept's usefulness as a potential basis for the maintenance of full function and quality as nearly as possible to the end of life.

Duarte, N., Paúl, C., Araújo, L., Brandão, D., Teixeira, L., Azevedo, MJ. & Ribeiro, O. (2014). Frailty Phenotype Criteria in Portuguese Centenarian - Exploratory Findings from the Oporto Centenarian Study. *The Journal of Frailty & Aging*, 3(1), 47.

Background: The most acceptable definition of frailty in medical literature is Fried et al.'s frailty phenotype (2001) which includes at least 3 clinical states: shrinking, weakness, self-reported exhaustion, slowness, and low physical activity level. Methods: This study is based on the preliminary findings of the Oporto Centenarian Study and the aims to determine the prevalence of frailty (phenotype) and bring to discussion the appropriateness of the available assessment instruments in this population. The sample comprises 35 centenarians (mean age=101.34, SD=1.88; 78.1% female). Shrinking was assessed using the question "Have you lost a lot of weight recently without wishing to do so?" (≥ 6 kg during last 6 months, or ≥ 3 kg during last month); weakness was measured using a dynamometer (grip strength); endurance and energy were obtained with the question "do you feel full of energy?"; slowness was evaluated considering the time taken to walk 3 meters; physical activity was assessed by the question "do you practice any of the follow activities (dancing,

walking, farmer work or gardening)?". Finally, we used the last quartile to classify centenarians according to their weakness (<14.45) and slowness (<14.73). Results: Participants with 0/5 criteria were considered as nonfrail, 1-2/5 as prefrail and $\geq 3/5$ as frail. Most centenarians in this study were found to be frail (28, 80.1%) and prefrail (6, 17.1%); only one case (2.9%) was considered nonfrail. Conclusions: This population is very heterogeneous and some centenarians stand out due to their good health, functionality and/or cognition. Instruments used to assess frailty have to be sensitive enough for this population.

Ribeiro, O., Araújo, L., Teixeira, L., Duarte, N., Brandão, D., & Paul, C. (2013). Health Profiles From the Oporto Centenarian Study: Preliminary Results. *The Gerontologist*, 53(S1), 557.

An increase in the number of centenarians is currently seen in all European countries and Portugal is no exception with approximately 1500 centenarians according to last 2011's Census. The purpose of this study is to present preliminary data from the first Portuguese study on centenarians – the Oporto Centenarian Study (PT100) regarding health, cognition and functionality. Main findings reveal a great variability in the presence of major age-related pathologies, cognitive status and overall physical condition. Obtained profiles are compared with those presented in other international centenarian's studies, considering the survivors, delayers and escaper's categorization (Evert et al., 2003) and the typology presented by Gondo et al. (2006) on the centenarian's functional status: exceptional, normal, frail and fragile. The multiplicity of health related profiles found in our sample accounts for the heterogeneity of this population and provides important knowledge for health care and social services and for further international study comparisons.

Araújo, L., Ribeiro, O., Teixeira, L., & Paul, C. (2013). Valuation of Life and Health in Later Life: Findings from a study with community-dwelling older people. *Atención Primaria*, 45, 111.

Introduction: Valuation of Life (VOL) represents a complex of judgments, emotions and projections into the future that reflects the active attachment to one's present life. As a construct, it comprises five core dimensions: hope, futurity, purpose, self-efficacy and persistence (Lawton et al., 1999). Objectives: To assess differences in VOL between community-dwelling individuals according to main socio-demographic characteristics and to identify VOL's association with objective and subjective health measures. Methods: A sample of 207 community-dwelling seniors aged between 65 and 96 years (mean = 77.2, SD = 7.5) were face-to-face interviewed. For data collection the Positive Valuation of Life Scale (Lawton et al., 2001), the Geriatric Depression Scale (Yesavage, 1983) and the OARS (Fillenbaum & Smyer, 1981) were used. Socio-demographic information was also collected. Results: Mean VOL score was 43.87 (SD= 9.55), with higher values for men (49.87 \pm 7.95) and for younger seniors (<80 years old) (50.57 \pm 6.74). Health measures revealed significant and negative relationships with VOL (<0.01). Physical health showed the weaker correlation (R²=-.223), followed by functionality (ADL -.422; IADL -.453) and mental health (-.630). There was also found a significant correlation between VOL and subjective health (-.351) with a better self-perception of health being associated with higher valuation of life. Conclusion: The relationship between health, particularly mental health and subjective health, and the way people evaluate their lives must be recognized in future directions of research since it has the potential to predict why, how and how long people wish to live even under the adverse health circumstances of later life (Rott et al., 2006).

Ribeiro, O., Araújo, L., Teixeira, L. & Paúl, C. (2012). Positive Valuation in Life: PosVOL Specificities and Predictors for a Portuguese Sample of Older Adults. *The Gerontologist*, 52(S1), 22-23.

Assessing the way old people think about the value of their lives and feel attached to life is receiving an increasing scientific attention worldwide. The purpose of this study is to examine the factor structure of the Portuguese version of Lawton's positive Valuation of Life measure (VOL) and to determine the predictive role of personality, meaning in life, social resources, depression and demographic factors on VOL. A sample of 207 community-dwelling seniors aged between 65 and 96 years (mean = 77.2, SD = 7.5) were interviewed. Factor analysis on the VOL scale yielded two factors accounting for 49% of the variance, suggesting that the construct may be more complex. Regression analysis predicting the overall valuation of life score indicated that extraversion, conscientiousness, meaning of life and depression explained 57% (R²=0.565). Findings highlight the complexity of the construct and the importance of intrapersonal factors regarding the way people appraise their life.

Araújo, L., Ribeiro, O., Paul, C., Duarte, N., Brandão, D. (2013). Centenarians: Successful Agers or just Survivors? 13th European Congress of Psychology, Stockholm, July 9-12. Available in https://abstracts.congrex.com/scripts/JMEvent/EmptySessionSchedule_Post.asp?Client_Id='CXST'&Project_Id='13078006'

The presentation of the first successful aging model (Rowe & Kahn, 1997) started a path of discussion between psychologists, physiologists and sociologists still present in nowadays, that has been a question of high interest in gerontology studies and interventions. However, there is limited information about the applicability of this concept in the oldest old, who are more physically frail and functionally dependent. The aim of this research is to understand if centenarians can be successful agers and to define which approach of success can be more appropriate for them. Twenty Portuguese centenarians were recruited and interviewed face-to-face, using a mixed method approach. They were asked to fulfill an assessment protocol including questions on social resources, health and psychological aspects (e.g., OARS, Fillenbaum & Smyer, 1981; Lawton et al., 2001) and to answer open questions about their past life events, present challenges and future expectations. Different interpretations and experiences related to ageing and the life course are discussed, noting the immense heterogeneity of profiles that can be found at a century of life. Centenarians don't fit in the criteria of the Rowe & Kahn model but demonstrate themes and characteristics considered in alternative theoretical conceptions (e.g., SOC model, Socio-emotional Selectivity Theory, Gerotranscendence), which emphasize the need of a different approach, possibly with a greater valuation of psychological aspects.

Araújo, L., Ribeiro, O., & Paúl, C. (2012). Valuation of Life in old age and the role of intrapersonal factors. *Abstract Book of the 21st Nordic Congress of Gerontology: Dilemmas in Ageing Societies*, 115.

Valuation Of Life (VOL) is understood as a set of judgments, emotions and projections into the future, representing the "dynamic accommodation and assimilation process by which people meet the threat of illness and decline" (Lawton et al., 1998: 23). In order to analyze the differences of VOL in young-old, old-old and very-old people and identify the factors that explain its variance, a study with a sample of 207 community-dwelling participants aged between 65 and 96 years (mean age 77.2, SD 7.5) was conducted. Data collection included a multidimensional protocol comprising validated and recognized instruments as the Positive Valuation of Life Scale (Lawton, 1999), the Meaning of Life Questionnaire (Steger et al., 2006), the Geriatric Depression Scale (Yesavage, 1983), the NEO-FFI (Costa & McCrae, 1992) and the OARS (Fillenbaum & Smyer, 1981), as well as socio-demographic information. Results demonstrated differences on life evaluations between the three age groups ($p < 0.05$), with better results in the youngest. After testing the individual contribution of each variable with unadjusted linear regressions for the Positive Valuation of Life (Pos-VOL), we conducted an adjusted linear regression model using the significant ones, namely gender and age. In the final model, extraversion, conscientiousness, meaning of life and depression explained 57% of the dependent variable variance ($R^2 = 0.565$). The results for extraversion, as one of the contributors of Pos-VOL is in line with previous work (e.g., Lawton et al., 1999, 2001; Rott, Jopp, D'Heuresse & Becker, 2006), which could be related with the tendency of extroverted persons to positive mood, sociability, and activity (in the sense of an active, busy, or engaged lifestyle). Conscientiousness appears as a dimension to be further investigated due its association with VOL and with greater longevity and lower all-cause mortality risk (e.g., Chapman, Roberts, & Duberstein, 2011). Together, these results reinforce the importance of intrapersonal factors in the way people judge their present and anticipate their future life.