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Eudaimonic Well-Being and Physical Health: A Systematic Literature Review

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Abstract:
The aim of this systematic review is to examine the relationship between eudaimonic, well-being and physical health and investigate if eudaimonic well-being both promotes and protects physical health. More specifically, 24 studies were reviewed; measuring Eudaimonic Well-Being (EWB) based on Ryff's measuring scale of Psychological well-being (PWB). Data have been collected using Pubmed and Google scholar database and literature has been searched with the following algorithms: "eudaimonic well-being" or "psychological well-being" and "physical health". Results suggested that eudaimonic well-being can be considered both a protective and a proactive factor for physical health. Also, an eudaimonic way of living might be a preventive factor against the occurance of disease. Furthermore, results mostly highlight the necessity of more clinical interventions, including interventional programs from the early years of life.

Keywords: *Eudaimonia, well being, positive psychology, psychological health, systematic review, physical health*

1. Introduction

Eudaimonic well-being is the concept of human flourishing and it's based on eudaimonia, a Greek word proposed by Aristotle in Nicomachean Ethics, in 350 B.C. (Aristotle, trans.1925). Eudaimonia consists of the word "eu", that means good, and the word "daimon", which means spirit. Aristotle suggests that eudaimonia, and not mere happiness or satisfaction, is one of the highest of all human goods. The highest good is to live according to virtue, consisting of the activities of the soul and trying to be the best that is within you (Ryff, 2014). Virtue refers to the human capacity of thinking and being able to use logic in order to achieve optimal goals. Waterman (1984) translated eudaimonia as: *"the feelings accompanying behaviour in the direction of, and consistent with, one's true potential"* (Waterman, 1984). Thus, what "Daimon" actually stands for is that the ideal state of an excellent goal lies in doing one's best to accomplish it, and gives him the sense of a meaningful and purposeful life (Ryff, 1989 happiness).

In fact, "daimon" refers to the unique talents and capacities of a human being, which he has to find, create and develop, in order to fulfil his unique life goal. The two basics components of eudaimonia are self-knowledge and fulfilling your true potential. Aristotle believed that every living creature has a special goal to fulfil in life and, therefore, everyone needs to find their true purpose and live according to it.

A human being who uses his/her logic and leads his/her life with virtue, teaches himself to always choose the middle way between the dipole of exaggeration and deficiency. Balance and choice are the two most essential components of a truly virtuous human being. All the above is best summarized in Sugarman's description of Aristotelic eudaimonia as a "flourishing state of the soul" (Sugarman, 2007).

1.1. Theories of eudaimonic well-being

In 1989, Carol Ryff, based on the previous theories of Maslow, Rogers, Allport, Jung, Jahoda, Frankl, Erikson, Buhler and Neugarten, suggested a multidimensional model for measuring eudaimonic well-being, in order to create a strong theoretical base that measures eudaimonic well-being as a crucial and basic component of positive human functioning and positive health (Ryff, 1989). This model is consisted of 6 psychological aspects in which humans may thrive and function in the most positive way. The 6 aspects of psychological well-being are: *self-acceptance* (the knowledge and acceptance oneself, including the awareness of one's limitations), *purpose in life* (finding meaning and direction in life despite challenging circumstances), *positive relations with others (deeply* connecting and maintaining this connection with significant others), *environmental mastery* (the skill of efficientlymanaging life situations and shaping the environment according to one's needs), *autonomy* (being self-determined and living according to one's authentic way) and *personal growth* (using one's talents and unique capacities). Eudaimonic or psychological well-being is finally distinguished from hedonic well-being (life satisfaction and pleasure), and despite both of them include positive functioning, eudaimonic well-being and purposeful life can empower the organism, when striving with life adversities. Psychological well-being is highly correlated with the existential challenges of life (Ryff, 2002), such us the human striving for a meaningful and responsible life,

even in difficult conditions. Existential philosophies are deeply connected with the sense of eudaimonic well-being, and especially with purpose in life, as they both try to understand the process of full growth and development of a human being (Ryff, 2004).
Another theory on eudaimonic well-being is the Self-Determination Theory (SDT – developed by Ryan and Deci Ryan & Deci, 1985), which suggests that when the personal needs for autonomy, competence and relatedness are satisfied, motivation and well-being are enhanced. Likewise, if the above needs are not met, there is a significant negative impact on our well-functioning (Ryan & Deci, 1985).
The theory of Csikszentmihalyi about Autotelic Personality is also under the field of eudaimonic well-being. Autotelic people are those who often engage in activities for their own sake, and experience flow states frequently (Csikszentmihalyi, 1999). Another scholar of the topic, Seligman (2002), suggests that both pursuits of engagement/flow and meaning can be considered eudaimonic (Seligman, 2002).

1.2. Eudaimonic well-being and Health
According to the World Health Organization (WHO), human health is more than the absence of illness and can be defined as: *"a complete state of physical, mental and social well-being and not merely the absence of infirmity"* (WHO, 1948). Eudaimonic well-being has been highly correlated with health. This trend has flourished in the last two decades, when research in wellness started to focus on a more positive model of health than the already existing (Kimiecik, 2011). Due to the domination of the biomedical model and the existent separation between the body and the soul, in the past, humans have been viewed only as a mechanical entity, which can be understood only by its psychical components (Kimiecik, 2011). This narrow perspective of health has led us to exclude the meaning in one's life and misinterpret the meaning that one gives to his experience of health or illness, focusing only on the elimination of disease (Kimiecik, 2011).
In addition, the aspect of psychological well-being, and its contribution to positive human functioning, has also been neglected from the theoretical domain and the field of research (Ryff, 1989). The shift, that has been observed in the last two decades, is due to the recognition that psychology had focused mostly on human pain and suffer, and too little on human happiness and positive functioning (Ryff, 1989). Researchers started to point out that eudaimonic well-being can influence quality of life, health behaviours and physical health (Ryff & Singer, 1998).
Ryff et al (2004), in their research with older women, point out the fact that women with higher levels of eudaimonic well being had lower levels of daily salivary cortisol, pro-inflammatory Cytokines, cardiovascular risk and longer duration of REM sleep (Ryff et al. 2004). They also came to the conclusion that when the individual lives in an authentic way towards himself, he focuses on what is "intrinsically worthwhile" and that can lead to vitality and self-determination, which increase intrinsic motivations for new challenges, exploration and learning (Ryan & Deci, 2000). Eudaimonic well-being is the balance between internal motivation (true self) and external circumstances (environment), that leads to an authentic expression of self, vitality and the sense of aliveness (Ryan & Deci, 2001).
In summary, positive health suggests that one has to seek optimal health from inside sources to flourish and go beyond neutral. Eudaimonic well-being might be a way to flourish and achieve optimal health. The purpose of the present study is to review the most recent studies regarding eudaimonic well-being and present the main findings in order to help orientation of future research in the field.

2. Method
Data were collected using Pubmed and Google scholar database and literature was searched with the following algorithm: ("eudaimonic well-being") or ("psychological well-being") and ("physical health"). The concept of eudaimonic well-being (EWB) was based on Ryff's theory and the multidimensional model of psychological well-being (PWB). Studies were first selected on the basis of their title and abstract. For practical reasons, articles had to be available only in English language. The studies selected for this review were those: (1) published between 2012 and 2017 (2) in a peer review journal, and (3) measured "eudaimonic well-being" as a protective or promotive factor for "physical health". This review does not include articles that do not provide original empirical data, such as meta-analyses and systematic reviews and articles assessed as irrelevant to the subject, after reading either the abstract or the whole manuscript. Finally, 24 articles were chosen to be reviewed.

Reference	Study design	Independent variable	Dependent variable	Control variable/issue of study	Number of participants included in analyses	Results
Tomba, Tecuta 2016	Case-study	Well-Being Therapy (WBT): promotion of all 6 dimensions of PWB	outcome in the recovery process of a patient with anorexia nervosa	BMI Binging and purging episodes, CID total score CID-irritability CID-environmental reactivity	1	After the 8th session, altered PWB scores were adjusted to healthy optimal levels Her BMI improved to 17.2 and she reported occasional binging-purging episodes. Symptoms of depression,

						irritability, and environmental reactivity also improved.
Boylan, Ryff 2015	Cross-sectional and Longitudinal	Eudaimonic well-being:6 - item scale (Ryff measure) Hedonic well-being: positive affect and life satisfaction	Risk (high or low) of a metabolic syndrome	Age Gender Education Race Marital status Smoking status Alcohol consumption Physical activity Medication usage	1205	Life satisfaction, positive affect and personal growth predicted fewer metabolic syndrome components Life satisfaction and eudaimonic well-being predicted lower risk of meeting diagnostic criteria Purpose in life, personal growth and self-acceptance were predictors of lower metabolic syndrome risk
Davis Slavich, Thaker, Goodheart, Bender, Dahmoush, Farley, Markon, Penedo, Lubaroff, Cole, Sood, Lutgendorf, 2015	Cross-sectional	Eudaimonic well-being (purpose in life, self-acceptance, personal growth) Positive affect Psychological distress	Level of norepinephrine tumor in ovarian cancer	Age, Race Ethnicity Education Relationship status cancer stage, tumor histology, beta-blockers, physical well-being, history of treatment, caffeine use	365	EWB, positive affect and psychological distress were correlated. EWB was related to lower tumor NE. in contrast, positive affect and psychological distress were unrelated to tumor.
Dehnavi, Heidarian, Shaygannejad 2015	Case-control study	Absence or presence of multiple sclerosis (2 groups: patients with multiple sclerosis and normal individuals)	Level of psychological well-being (PWB): 18-item Ryff's PWB	Gender Education Marital status	138	Reduction in all aspects of PWB of people with MS in comparison to the normal population and only the level of education has significantly positive relationship to PWB in MS group. Individuals with higher level of education scored higher in total PWB, positive relationship with others and purpose in life.
Fredrikson, Grewen, Algoe, Firestine, Arevalo, Ma, Cole (a) 2015	Genomic	Eudaimonic well-being Hedonic well-being Social well-being Psychological well-being Total well-being Flourishing health	CTRA (conserved transcriptional response to adversity) genes expression: increased pro-inflammatory genes expression, decreased antibody genes expression	Age Sex Race BMI Smoking history Alcohol history Illness symptoms Depressive symptoms	122	Sub domains of EWB were the basic carriers of CTRA associations Hedonic well-being showed no consistent CTRA expression
Fredrikson, Grewen, Algoe, Firestine, Arevalo, Ma, Cole (b) 2015	Genomic	Eudaimonic well-being :6 - item scale Total well-being	CTRA (conserved transcriptional response to adversity) genes expression: increased pro-inflammatory genes	Sex Ethnicity BMI Smoking history	107	Purpose in life, environmental mastery, self-acceptance, autonomy and positive relations

			expression, decreased antibody genes expression	Alcohol history Leukocyte markers		showed inverse association with CTRA gene expression. Personal growth when analysed in isolation from the other 5 dimensions showed positive association with CTRA genes expression
Ryff,Radler,Friedman 2015	Longitudinal follow-up / Cross-sectional	Psychological well-being :6 scale measure	Physical health status: self-reported physical health, number of chronic conditions, health symptoms, functional health	Age Education Gender	3900	Stable low profile of PWB had worse cross-time health compared to stable high profile. Stable medium profile had worse cross-time health compared to stable high profile. The maintenance of high PWB contributes to an advantage health profile 9-10 years later.
Zilioli,Slatcher,Ong,Gruenewald, 2015	Longitudinal	Purpose in life: three items from the Ryff Scales of Psychological Well-Being	Level of allostatic load over a 10-year period: seven system-level (cardiovascular, lipid, glucose metabolism, inflammation, SNS, PNS, HPA) risk scores.	age, gender, education Ethnicity Health locus of control, health biomarkers, positive affect, negative affect and positive relations with others	1054	Life purpose predicted lower levels of allostatic load at follow up life purpose was also a strong predictor of individual differences in self-health locus of control
Gates, Valenzuela,Sachdev, Singh (2014)	Cross-sectional	Clinical aspects of MCI: cognitive function, subjective memory concern, evaluations of quality of life Negative affect	Level of Psychological well-being: 84-item scale of 6 domains	Age Sex Education Language background Clinical dementia rating Mini-mental state exam score	100	Quality of life had statistically significant effect on PWB when all variables were entered. Better PWB was associated with lower verbal fluency, better cognitive level, better memory function and lower anxiety and depression. Lower levels of psychological well-being were linked with memory concerns in patients with MCI. Memory concern, cognitive function, evaluations of quality in life and negative affect were predictors of PWB.
Hill, Turiano 2014	Longitudinal follow -up	Purpose in life : The psychological well-being scale (Ryff, 1989; Ryff & Keyes, 1995).	longevity across the adult years (mortality data on participants was obtained through a National Death Index)	age, sex, race, education, work status, positive relations with others Positive and negative affect	6163	Purpose attenuated the risk of mortality relatively proportionally for younger, middle, and older adults across the 14-year follow-up period.

Kim, Strecher, Ryff 2014	Longitudinal	purpose in life (on a six-point scale)	Use (high or low) of preventive health care services (e.g., flu shots, cholesterol tests, colonoscopies, mammograms, pap smears, and prostate examinations)	Age Sex Marital status Education Total wealth Mean no. of chronic illnesses Smoking status Exercise Alcohol frequency Insured Urbanicity	7168	Each unit increase in purpose (on a six-point purpose in-life scale) was associated with a higher likelihood that people would obtain a cholesterol test or colonoscopy. women with higher purpose were more likely to obtain a mammogram/X-ray or pap smear males were more likely to receive a prostate examination Each unit increase in purpose was also associated with 17% fewer nights spent in the hospital
Tomba, Offidani, Tecuta, Schumann, Ballardini 2014	Cross-sectional	Eating disorders: 4 groups (bulimia, anorexia, binge eating disorder, controls)	Psychological well-being: 84 item scale	Gender Marital status Education Age Body mass index General health	245	The greatest effect was reported for environmental mastery and self-acceptance. Patients with BD scored significantly lower in all PWB scales. Patients with BED scored lower in autonomy, environmental mastery and self-acceptance. Patients with AN had similar score with controls, except for positive relationships and self-acceptance
Zaslavsky, Rillamas-Sun, Woods, Cochrane, Stefanick, Tile, Tinker, LaCroix (2014)	Longitudinal follow -up	Personal growth Purpose in life: 7-item measure developed for this study	Patterns of survival in the oldest-old age group: 5 categories: healthy, prevalent, incident, disabled, deceased	Ethnicity Family income Level of education Frequency of alcohol consumption Physical activity Baseline obesity Depressive symptoms Smoking status Living status	8880 (women)	Women with low persona; growth and purpose in life were more likely to have prevalent mobility disability and disease of incident death before the age of 85 years.
Bassi, Falautano, Cilia, Goretti, Grobberio, Pattini, Pietrolongo, Viterbo, Amato, Benin, Lugaresi, Martinelli, Montanari, Patti, Trojano, Fave, 2013	Multi-centered	Eudaimonic well-being: 18 item scale of the PWB Hedonic well-being Depressive symptoms Health -related quality of life Optimal experience Life satisfaction	Absence or presence of illness (3 groups: Patients with multiple sclerosis Caregivers Health-professionals)	Age Gender Education Employment Civil status Disease other than MS	168	Patients with MS reported higher depression, lower HRQOL and lower well-being. Caregivers reported higher depression and lower general well-being. Professionals reported the best ill- and well-being profiles.
Lewis,Kanai,Rees,Bates 2013	Neuroanatomical	Eudaimonic well-being :42-	Brain activity: regional grey and white matter	Gender Age	70	Eudaimonia was positively correlated

		item scale of PWB		Whole-brain GM volume		with the GM volume of right insular cortex. Purpose in life, positive relations and personal growth were positively correlated with right insular cortex. Positive relations and personal growth were also correlated with the left insular cortex. Purpose in life was negatively correlated with middle temporal gyrus.
Heller et al. 2013	Neuroanatomical	Eudaimonic well-being :6 subscales of psychological well-being and the positive and negative affect schedule	Brain activity: sustained striatal activity of reward circuitry Cortisol output	Age Blood pressure Cholesterol Depression Corticosteroid medications Individual differences in days after assessment	64	Increased well-being was associated with sustained engagement of brain activity (striatum and dorsolateral prefrontal cortex) PWB predicted sustained striatal activity and vice versa. Sustained striatal activity predicted lower daily cortisol output
Fredrikson et al 2013	Genomic	Eudaimonic Well-Being (EWB) Hedonic Well-Being (HWB)	Expression or not expression of conserved transcriptional response to adversity (CTRA) genes: high level of pro-inflammatory genes expression, low level of antibody genes	Age Sex Race BMI Smoking history Alcohol history Depression Minor illness symptoms	80	EWB was associated with down-regulated CTRA gene expression and HWB was associated with up-regulated CTRA genes. High levels of EWB linked to up-regulated expression of I IFN genes and antibody synthesis genes. HWB is linked with up-regulated expression of proinflammatory genes and a down-regulated expression of antibody synthesis genes.
Karlson, Gallagher, Olson, Hamilton 2013	Longitudinal	Frequency of insomnia symptoms (never-one night per month-several nights per month-one night per week-several nights per week-almost every night	Eudaimonic well-being: 20 -item scale. Subjective well-being Psychological distress Physical illness	Age Marital status Race	4014	Physical illness severity and insomnia had a positive correlation Frequent insomnia symptoms were associated with decreased EWB and decreased SWB, and they predict decreased well-being and increased psychological distress.
Kim, Sun, Park, Peterson 2013	Longitudinal	purpose in life (validated adaptation of Ryff and Keyes' Scales of Psychological	Possibility of a stroke incidence among older adults	age, gender, race/ethnicity, marital status, education level, total wealth, functional status	6739	Greater baseline purpose in life was associated with a reduced likelihood of stroke during the four-year follow-up

		Well-Being)		smoking, exercise, alcohol use hypertension, diabetes, systolic blood pressure, diastolic blood pressure, BMI, heart disease depression, anxiety, cynical hostility, negative affect optimism, positive affect, and social participation		Each standard deviation increase in purpose was associated with a multivariate-adjusted odds ratio of 0.78 for stroke Purpose remained significantly associated with a reduced likelihood of stroke after adjusting for several additional covariates including
Andrew, Fisk,Rockwood 2012	Cross-sectional	Frailty identity crisis and mortality (33 health deficits including: physical symptoms, illness, impaired functions)	Psychological well-being: 18-items scale (6 domains: autonomy, personal growth, mastery, positive relations, purpose, self-acceptance)	Education Cognition Mental health Age Sex	5703	For each additional frailty deficit, PWB scored worsened by 0.3 points. Purpose in life and autonomy were not associated with frailty. Worse PWB was predictive of five-year mortality independent of age, sex, education, frailty and mental health.
Boyle , Buchman, Wilson, Yu, Schneider, Bennett 2012	Longitudinal, epidemiologic, clinicopathologic	purpose in life: 10-item scale derived from Ryff's Scales of Psychological Well Being,	Effects of Alzheimer disease in pathologic changes on cognition in advanced age. (Logical Memory, Word List Memory, Word List Recall, Word List Recognition, Verbal Fluency, a, Digit Span Forward, Digit Span Backward, Digit Ordering, Symbol Digit Modalities Test, Number Comparison, a modified version of the Stroop Neuropsychological Screening Test)	Age Sex Educational level Depressive symptoms Neuroticism, Social network size, chronic illness Physical activity	246	Participants who reported higher levels of purpose in life exhibited better cognitive function despite the burden of the disease. Purpose in life also reduced the association of tangles with cognition higher levels of purpose in life reduced the effect of AD pathologic changes on cognitive decline
Friedman, Ryff 2012	Cross -sectional	Eudaimonic well-being: purpose in life, positive relations with others. Hedonic well-being: positive and negative affect, life satisfaction.	Advantageous profiles of biological risk factors: high or low expression of inflammatory proteins (serum il-6, C-reactive protein)	Age Sex Marital status Education Race obesity Medications Health behaviour Chronic conditions	998	Higher levels of purpose, positive relations and positive affect predicted lower levels of inflammation compared with those with lower well-being scores.
Garcia, Archer, Moradi, Andersson-Arnten (study 3) 2012	Cross-sectional	Psychological well-being: six-point scale	Frequency of physical exercise	gender Age Education Propensity to perform regular physical exercise	135	Positive affect was positively correlated to PWB. Negative affect was negatively related to PWB. PWB was positively correlated with

				Sleeping problems Psychosomatic problems Positive and negative affect		frequent exercise. The more adolescents scored in the six PWB constructs, the more they reported exercising in a frequent basis, and the less they reported pain in shoulders, head and sleeping problems.
Kim, Sun, Park, Kubzansky, Peterson 2012	Cross-sectional	Purpose in life (7-item questionnaire adapted from Ryff's Psychological Well-Being Scale)	Risk of myocardial infarction among individuals with coronary heart disease.	coronary heart disease severity, self-rated health, and a comprehensive set of possible confounds age, gender, race/ethnicity educational attainment, smoking status, frequency of physical activity, alcohol consumption	1546	each unit increase in purpose was associated with a 27% reduction in odds of a myocardial infarction.

Table 1

3. Results

To begin with, three studies examined the association between eudaimonic well-being and healthy living. More specifically, persistently high well-being correlated to better health status across time, compared to those with persistently low well-being. Also, persistently high well-being was protective of physical health especially among the educationally disadvantaged (Ryff, Radler, Friedman, 2015). In addition to these findings, women with low levels of purpose in life and personal growth were more likely to have prevalent mobility disability and disease or incident death before the age of 85 years (Zaslavsky, Rillamas-Sun, Woods, Cochrane, Stefanick, Tindle, Tinker, LaCroix, 2014). Furthermore, bad psychological well-being was associated with five-year mortality independent of age, sex, education, frailty, and mental health, and for each additional point worsening in psychological well-being, the odds of mortality increased by 1%. Personal growth, environmental mastery, positive relations and self-acceptance have been associated with frailty and this relationship might also be bidirectional, which means that increased frailty leads to worse well-being and vice versa (Andrew, Fisk, Rockwood, 2012).

Two neuroanatomical studies have tried to investigate if eudaimonic well-being is linked with brain structure. Eudaimonic well- being has been positively associated with one's grey matter volume of right insular cortex. Purpose in life, positive relations and personal growth scores showed positive correlations with right insular cortex volume. Positive relations also showed a significant association with left insular volume (Lewis, Kanai, Rees, Bates, 2013). The findings from the second neuroanatomical study suggest that individuals with sustained activity in the striatum and dorsolateral prefrontal cortex to positive stimuli over the course of the scan session reported greater well-being and had lower cortisol output. The findings suggest that this relationship may be bidirectional and that eudaimonia may improve physical health through specific neurobiological mechanisms (Heller, Reekum, Schaefer, Lapate, Radler, Ryff, Davidson, 2013).

The next three studies come from the field of genomics, and specifically examine the relation between eudaimonic well-being and CTRA (Conserved Transcriptional Response to Adversity) genes expression, which consists of increased pro-inflammatory genes expression and decreased antibody genes expression. A significant inverse association between expression of CTRA indicator genes and a summary measure of eudaimonic well-being was found. Analysis of domain-specific coefficients indicated a significant inverse association between eudaimonic scores and gene expression, but no significant association with hedonic scores. Results showed that only the sub domains of eudaimonic well-being are the basic carriers of CTRA genes expression (Fredrickson, Grewen, Algoe, Firestine, Arevalo, Ma, Cole, 2015 [a]). In a parallel study, with independent archival data set, the results showed statistically significant inverse associations between CTRA expression and the dimensions of self-Acceptance, Autonomy, Positive Relations with Others, Purpose in Life and environmental mastery. Personal Growth, which showed no significant CTRA association when analyzed separate from the other 5 dimensions, showed a significant positive CTRA association, when analyzed in their context (Fredrickson, Grewen, Algoe, Firestine, Arevalo, Ma, Cole, 2015 [b]). In addition, the third study suggests that high levels of eudaimonic well-being were associated with CTRA down-regulation and that eudaimonic well-being is correlated with a different set of genes than that of hedonic well-being. Eudaimonic well-being is associated with decreased expression of the previously defined CTRA transcriptome profile, involving elevated expression of proinflammatory genes and reduced expression of genes involved in antibody synthesis and type I IFN antiviral responses (Fredrikson, Grewen, Algoe, Firestine, Arevalo, Ma, Cole, 2013).

The aspect of psychological well-being and purpose in life, was examined in the following six studies. One study examined if purpose in life is associated with reduced stroke incidence, among older adults and concluded that purpose in life is a protective factor against a stroke incidence (Kim, Sun, Park, Peterson, 2013). The next study examined whether purpose in life was associated with myocardial infarction among a sample of older adults with coronary heart disease and findings suggested that purpose in life was associated with lower odds of having a myocardial infarction during the 2-year follow-up period (Kim, Sun, Park, Kubzansky, Peterson, 2012). Another study analyzed if purpose in life promotes longevity. These findings proposed that having a purposeful life appears to widely buffer against mortality risk across the adult years (Hill, Turiano, 2014). The next study explored if higher levels of purpose in life can be associated with a higher likelihood of using preventive health care services. Indeed, the findings suggested that a greater level of purpose in life comes with higher use of preventive health services and fewer nights are spent in the hospital (Kim. Strecher, Ryff, 2014). In addition, the next study investigated the prospective associations between life purpose and allostatic load over a 10-year period, with results showing that greater life purpose predicted lower levels of allostatic load (Zilioli, Slatcher, Ong, Gruenewald, 2015). The last study tested if purpose in life can reduce the deleterious effects of Alzheimer Disease pathologic changes on cognition in advanced age, and the findings suggested that higher levels of purpose could be a protective factor against effects of AD pathologic changes on cognitive decline (Boyle, Buchman, Wilson, Yu, Schneider, Bennett, 2012).

The following four studies analyzed if higher levels of PWB can predict better outcomes in specific diseases and disorders. The first study examined if psychological well-being is a protective factor toward metabolic syndrome that is implicated in multiple disease outcomes. Life satisfaction and the eudaimonic well-being composites predicted a lower risk of metabolic syndrome. Specifically, purpose in life, personal growth and self-acceptance were strongly associated with lower risk of metabolic syndrome (Boylan, Ryff, 2015). The next study examined how the two different aspects of well-being (eudaimonic and positive affect) and psychological distress were associated with tumor NorEpinephrine (NE) in ovarian cancer patients. Results showed that only eudaimonic well-being (3 aspects were concluded: purpose in life, personal growth, self-acceptance) was related to lower tumor NE (Davis, Slavich, Thaker, Goodheart, Bender, Dahmoush, Farley, Markon, Penedo, Lubaroff, Cole, Sood, Lutgendorf, 2015).

Another study examined whether positive psychological functioning predicts advantageous profiles of biological risk factors, in those living with chronic conditions. Respondents with higher levels of purpose in life, positive relations with others, and positive affect had lower levels of inflammation, compared to those with lower well-being scores (Friedman, Ryff, 2012). The Tomba and Tecuta study, tested if well-being therapy, which focused on the promotion of psychological well-being, can improve recovery from anorexia nervosa in a single patient. After the eighth session, altered PWB scores were adjusted to healthy optimal levels, her BMI improved to 17.2 and she reported only occasional binging-purging episodes (Tomba & Tecuta, 2016).

Also, four more studies were conducted controlling the possibility of impairment on psychological well-being, cause to a specific illness or disorder, aiming to better understand their correlation and create a more solid ground for more clinical interventions. On that note, the next study tested psychological well-being in individuals with mild cognitive impairment, in order to inform clinical intervention for the reduction of incident disease and the improvement of PWB. Significant predictors of PWB were subjective memory concern, cognitive function, evaluations of quality of life, and negative affect. Memory concerns in patients with mild cognitive impairment were associated with lower levels of psychological well-being (Gates, Valenzuela, Sachdev, Singh, 2014).

The next study examined the connection between psychological well-being and eating disorders. In particular, it measured the psychological well-being (PWB) in out-patients with Eating Disorders where Patients with EDs reported impairment in PWB. Only patients with anorexia nervosa showed similar scores with control group (Tomba, Offidani, Tecuta, Schumann, Ballardini, 2014). Our following study of focus compared the level of psychological well-being between people with Multiple sclerosis and normal individuals, in an Iranian population, and investigated the connection between demographic factors and PWB in people with MS disorder. The results suggest that people with MS disorder has a risk for lower PWB, but only the level of education has significantly positive relationship to PWB and people with higher educational level reported higher level on PWB (Dehnavi, Heidarian, Shaygannejad, 2015). Another study tested the relationship between the frequency insomnia symptoms and well-being. Clinical insomnia symptoms had a significant negative association with SWB and significant negative association with EWB. Frequent insomnia symptoms were associated with decreased eudaimonic and subjective well-being (Karlson, Gallagher, Olson, Hamilton, 2013).

In another study ill-being and well-being dimensions in persons with Multiple Sclerosis was examined along with their caregivers and health professionals in relation to both health and life in general. Persons with MS reported lower levels of psychological well-being, but also their caregivers rated low on well-being. The professionals reported the best well-being profiles. The findings also suggest that well-being coexists with ill-being, and in fact, well-being can regulate the negative effects of disease or care giving, and its measurement could complement and support medical intervention (Bassi, Falautano, Cilia, Goretti, Grobberio, Pattini, Pietrolongo, Viterbo, Amato, Benin, Lugaresi, Martinelli, Montanari, Patti, Trojano, Fave, 2013).

The last study examined in this review, examined tf higher levels of PWB can promote better health behaviours, such as frequent physical exercise, in a sample of adolescents. The more adolescents scored in the six PWB constructs, the more they reported exercising on a frequent basis and the less they reported shoulder pain, headaches and sleeping problems. The aspect of self-acceptance has been an especially strong predictor of engaging in physical activities (Garcia, Archer, Moradi, Andersson-Arntén, 2012).

4. Discussion

Being able to maintain a higher level of psychological well-being in the face of the changes and losses of later life is generally considered a basic part of "healthy" ageing (Baltes and Baltes, 1990; Rowe and Kahn, 1998). One of the most influential definitions

of successful aging consists of three elements: absence of physical illness or disability, high levels of cognitive function and physical functioning and active engagement with life (Rowe & Kahn, 1998). Our findings confirm that eudaimonic well-being is a basic component of healthy ageing, it can be a protective factor against diseases and disorders, it promotes longevity, prevents better outcomes for specific diseases and enhances healthy behaviours.

More analytically, data showed that individuals with higher levels of eudaimonic well-being had lower risk of mortality or mobility disability (Zaslavsky, Rillamas-Sun, Woods, Cochrane, Stefanick, Tindle, Tinker, LaCroix, 2014), better health status during a period of 10 years (Ryff, Radler, Friedman, 2015) and lower risk of frailty incidence (Andrew, Fisk, Rockwood, 2012). Other data have shown a significant association between psychological well-being and risk of pre-frailty, and also that men and women with higher levels of psychological well-being are less likely to become frail over the 4-year follow-up period (Gale, Cooper, Deary, Sayer, 2014)[1].

Previous literature suggested that there is a link between life expectancy and eudaimonic markers of human flourishing such as sense of purpose in life and personal growth (PG; Vaillant, 2002; Buettner, 2008). Our findings confirm that lower levels of personal growth and purpose in life had higher odds of having a mobility disability or a major chronic morbidity at 85 years of age (Ryff, Radler, Friedman, 2015).

Previous data have also shown that higher levels of psychological well being are associated with lower blood levels of the inflammatory markers, C-reactive protein and fibrinogen, and – in men only – higher blood levels of dehydroepiandrosterone sulphate, which may suggest that there may be a higher sensitivity of inflammatory markers in women too (Steptoe et al. 2012)[2] . In addition, our findings proposed that higher levels of eudaimonic well-being were associated with reduced CTRA gene expression, which is responsible for increased inflammation genes expression and decreased expression of antiviral and antibody genes, but no gender differences were found (Fredrickson, Grewen, Algoe, Firestine, Arevalo, Ma, Cole, 2015 [a]), (Fredrickson, Grewen, Algoe, Firestine, J. Arevalo, Ma, Cole, 2013).

Biology, eudaimonic well-being and health seem to have an important interaction, and eudaimonic well-being offers protective benefits that leads to better biological regulation and more positive disease results (Ryff, 2013). In addition, findings of this review, suggest that eudaimonic well-being is linked with specific neurobiological mechanisms, through which it may improve physical health. Increased levels of eudaimonic well-being were connected with sustained engagement of striatal and dorsolateral prefrontal cortex, which is also responsible for lower levels of cortisol (Heller, Reekum, Schaefer, Lapate, Radler, Ryff, Davidson, 2013). Striatal is linked with the reward system and working memory. Cortisol protects the organism from several diseases such as osteoporosis, and it is responsible for insulin production, wound healing and electrolyte balance. It's important to note that these findings support the concept that eudaimonic well-being may act as a moderator of the physiological and biological systems (Ryff, 2014). On this note, data suggest that eudaimonic well-being is also closely associated with grey matter volume of insular cortex volume (Lewis, Kanai, Rees, Bates, 2013).

Previous studies have shown that insular cortex is a source of agentic control (Lee and Reeve, 2013), where agency-detective systems are responsible for the identification of a threatened situation and pain. The insula has also been linked to facilitation of self-awareness (Craig, 2009), as well as the regulation of bodily states and modulation of decision making, based on interoceptive information about these bodily states (Singer et al., 2009). These results show the important links between eudaimonia and brain structure affecting physical health, and may suggest that insular cortex accommodate eudaimonic well-being by producing the necessary capabilities to successfully managing exterior circumstances. These findings provide evidence of individual differences in the brain structure and link an important psychosocial trait with mental and physical health (Lewis, Kanai, Rees, Bates, 2014). The importance of linking biology and eudaimonic well-being refers to the fact that eudaimonic well-being can gain a solid theoretical base as an internal way to flourish and functioning in optimal levels.

The linking of eudaimonia with neurobiological mechanisms and specific genes expression, increase the concept that eudaimonia is the right way to live and it might also be an alternative way to encounter physical illness and modify the existing medical models (Ryff and Singer, 1998).

Another aspect of psychological well-being which seems to stand out and protect physical health in multiple ways is having greater purpose in life. This might be a strong motivation to learn from negative experiences and reevaluate them in order to gain new capacities and manners and quickly refocus on one's goals and purpose (Schaefer et al, 2013). In addition, data suggests that higher levels of well-being, especially purpose in life, might be a resource, which one can be used to cope with difficult situations, handling of these situations, balancing the effect of adverse experiences, and finally facilitating the learning process, while developing greater emotion regulation skills over time (Schaefer et al, 2013).

Purposeful life engagement has also been increasingly linked to better health outcomes, including assessments of morbidity and mortality. Findings of this review support the previous literature that purpose in life is a protective factor for health, and more specifically higher levels of purpose in life can reduce the risk of a stroke in older adults (Kim ,Sun, Park, Peterson, 2013), reduces the risk of myocardial infarction in heart disease patients (Kim, Sun, Park, Kubzansky, Peterson, 2012), predicts lower levels of allostatic load (Zilioli, Slatcher, Ong, Gruenewald, 2015), provides better cognitive function in patients with Alzheimer (Boyle, Buchman, Wilson, Yu, Schneider, Bennett, 2012), raises the odds of using preventive health services (Kim. Strecher, Ryff, 2014) and promotes longevity in older adults (Hill, Turiano, 2014).

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[1] This study was not included because eudaimonic well-being was not measured as it is examined in this literature review

[2] This study was not included because eudaimonic well-being was not measured as it is examined in this literature review.

Impaired levels of purpose seem to be independent from the presence of psychopathology and these results agree with the existent concept of positive psychology and health that the presence of well-being does not simply correspond to the absence of the disease and vice versa (Tomba et al, 2014). Optimal human functioning does not refer to the absence of disease or infirmity. Instead, it refers to the stage beyond neutral in which the human being functions in an optimal way, biologically, mentally and socially. Findings from this review, point out another basic key point of positive health, and that is the fact that illness and well-being may also coexist (Bassi et al., 2013), and through a more positive model of health we can better understand the unique meaning that one gives to illness or health, emphasizing on how well-being can be an internal source that helps us deal and handle illness and adversity.

Aspects of eudaimonic well-being might also be a component "*of what keeps people healthy, even in the face of challenge"* (Ryff, Singer, 2008). On that note, the key point of positive health is that the experience of well-being helps the human organism to function more effectively and that may protect the organism from getting ill, or when illness appears, the higher levels of well-being promote rapid recovery (Ryff et al. 2004). Experiencing positive health and well-being seems to extend the periods of quality living (Ryff et al. 2004). Results from this review suggest that higher levels of purpose in life, personal growth and self-acceptance, predict lower risk for metabolic syndrome (Boylan, Ryff, 2015) and lower tumor of norepinephrine in patients with ovarian cancer (Davis, Slavich, Thaker, Goodheart, Bender, Dahmoush, Farley, Markon, Penedo, Lubaroff, Cole, Sood, Lutgendorf, 2015). In addition, responders with higher levels of purpose in life and positive relations with others had lower levels of inflammation (Friedman & Ryff, 2012), and the promotion of all aspects of well-being predicted better outcomes in a patient with anorexia nervosa (Tomba & Tecuta, 2016).

It is important to note that people living according to their daimon doesn't mean that they don't experience stressful situations but they use their inner resources of subjective vitality that push them to choose behaviours helpful to revisit their feel of eudaimonia (Neumburg et al, 2002). One of this behaviour is taking care of one's self. Health - promotion behaviours are more likely to be used by those who have higher levels of life purpose and positive relations with others (Ryff & Singer, 1998). Healthy behaviours include an engagement with life and self, and participate in optimal functioning: *"taking good care of yourself presupposes that your life is worth taking care of"* (Ryff & Singer, 1998).

Data from the above review suggest that a strong feeling of purpose in life can increase healthy behaviours, such as the use of preventive health services (Kim. Strecher, Ryff, 2014). Furthermore, higher levels of psychological well-being promote physical exercise on a frequent base and especially the aspect of self-acceptance seems to be a strong predictor of engaging in physical activities (Garcia, Archer, Moradi, Andersson-Arntén, 2012). Based on the existed bibliography for the relationship between physical exercise and psychological well-being, previous results showed that when we enhance physical activity we can improve the general well-being of an individual. That suggests that this relationship might be bidirectional, and physical activity can be an appropriate strategy to increase well-being (Mack, Wilson, Gunnell, Gilchrist, Kowalski, Crocker, 2012). Kagee and Dixon (2000) propose that when someone is choosing a healthy behaviour on a regular basis, he is expressing the concept of self-actualization and maximizes his personal fulfilment (Kagee & Dixon, 2000).

The results of the effective role of purpose in life underline another important fact that we have to take under consideration, and that is the importance of finding and establishing a direction in life starting as early as possible (Hill, Turiano, 2014). According to Ryff (2015), increasing purpose in early life might be a protective factor for better general health outcomes in middle life (Ryff et al. 2015). Results also suggest that the presence of disease or disorder can cause impairment on psychological well-being and patients have a greater risk of lower levels on PWB. Patients with mild cognitive impairment were associated with lower levels of psychological well-being (Gates et al. 2014). Also, patients with eating disorders (Tomba et al. 2014) and clinical insomnia symptoms (Karlson et al. 2013) reported impairments in psychological well-being. People with multiple sclerosis had higher risk for lower PWB (Dehnavi et al. 2015), but also caregivers of persons with multiple sclerosis reported lower levels of PWB (Bassi et al, 2013). As mentioned above, the presence of disease does not necessarily mean the absence of well-being, and vice versa. But, there is a strong chance that disease and illness influence negatively the levels of well-being.

There is a basic goal on the field of eudaimonic well-being, and that is the creation of more interventional programs. Interventional programs aim to enhance all aspects of psychological well-being in a large number of people and societies, in order to better deal with medical adversities and have better outcomes in chronic diseases (Ryff, 2013). If we improve aspects in one's life, such as social support, community activities and personal development, we may increase psychological well-being and reduce the influence that depression and anxiety can cause to PWB (Gates et al., 2014). It is interesting that even a small change in cognitive function can affect negatively the level of PWB, and it is also crucial to create early intervention programs based on "psycho-education" to protect psychological well-being before the presence of a disorder (Gates et al. 2014).

In the concept of intervention for enhancing EWB and its benefits, well-being therapy, developed by Fava (1999) and Fava et al. (1998), seems to be a very promising intervention to increase all the aspects of PWB. Well-being therapy is a psychotherapeutic strategy for increasing psychological well-being and resilience, based on Ryff's multidimensional model of PWB, and it has been developed and tested in a number of randomized controlled trials (Fava, 2012). Well-being therapy has been able to reduce the relapse of clinical depression and generalized anxiety disorder (Fava et al.2004, Fava et al.2005). According to our results, well-being therapy seems to predict a better recovery from anorexia nervosa (Tomba & Tecuta, 2016).

Well-being therapy has emerged in addition to cognitive behavioural therapy and it is mostly based on keeping daily diaries of positive experiences in order to increase them and extend them (Ryff, 2014). Also, findings have shown that a combination of cognitive behavioural therapy and well-being therapy had great outcomes in increasing psychological well-being (Fava et al. 2011, Baldessarini et al. 2011). Additionally, interventions targeting eudaimonic well-being, such as acceptance and commitment therapy, mindfulness interventions, and positive psychology techniques enhancing gratitude and patient strengths, may improve levels of psychological well-being and be more beneficial for enhancing physiological resilience (Ryff, 2014.Davis et al, 2015).

Perhaps the most interesting fact about mindfulness intervention and psychological well-being, is that mindfulness is also positively connected with grey matter volume in right insular cortex (Holzel et al. 2008) and might have similar neural bases with eudaimonia, and especially personal growth, positive relations and purpose in life that were also linked with the right region of the insula cortex (Lewis, Kanai, Rees, Bates, 2014). A flourishing ground in the field of eudaimonia is the focus on prevention of illness, and that is the reason why so many clinicians focus on early intervention programs targeting at school and work environment (Ryff, 2014).

A eudaimonic way of living might also be a way to prevent physical illness and offer a new medical model that will target the improvement of internal vitality sources even before illness appears (Ryff & Singer, 2008; Ryff, 2014). Age and education seem to have a positive association with psychological well-being and predict higher levels of well-being. Younger age was associated with higher psychological well-being and optimal experience. Similarly, university education predicted higher psychological well-being, optimal experience, and hedonic balance (Bassi et al. 2013). Furthermore, data suggests that a persistently high well-being level can be protective for health outcomes of educationally disadvantaged individuals known to have greater risks of subsequent health decline (Ryff, Radler, Friedman, 2015).

4.1. Limitations of this Review

Literature was collected only from Google scholar and Pubmed database, and only the studies of the five last years were included. The concept of eudaimonic well-being was measured based only on the multidimensional model of Ryff for psychological well-being. Not all the aspects of health were included.

4.2. Limitations of these Studies

A basic limitation is the type of studies, a significant number of which were cross-sectional. In addition, the type of measure was limited only in self-reports measures. All the studies used quantitative methods for the data analysis.

Also, a demographic limitation is the fact that the majority of studies were conducted in middle aged and older adults.

5. Conclusion and Future Research

A key point for further study is to use qualitative data analysis and qualitative instruments as well, in order to better understand the experience of eudaimonic well-being and the meaning that someone gives to this lived experience.

Further research is needed to examine how purpose in life may interact with other factors, responsible for health, and finally benefits physical health. Especially the aspect of purpose has been negatively correlated with age, so further research is needed in order to understand how we could increase purpose in older age groups and also maintain the sense of purpose, and psychological well-being in general, during adult life.

Clinical interventions, such as well-being therapy, in older adults could be an important future direction. Furthermore, well-being therapy seems to already be an appropriate intervention for enhancing well-being and have better outcomes on mental health. Another direction might be the examination of how well-being therapy can contribute to physical health and physical illness.

As mentioned above, it is crucial to establish a direction in life as early as possible, and that fact that can lead us to more psycho-educational programs targeting on enhancing purpose and well-being from the age of adolescence.

It is not clear yet whether eudaimonia is a state or a trait, as there is serious evidence that we can increase eudaimonic well-being, in the concept of trait. However, data suggests that the level of eudaimonic well-being can be stable over a long period which might make it a state characteristic. Yet, more research is needed to clarify this area.

In addition, it might be useful to investigate the levels of eudaimonic well-being in younger age groups, and their relation to physical health.

Finally, more research is needed to clarify the causal direction between neural bases and eudaimonia. That is, the present data are unable to establish whether greater insular cortex facilitates eudaimonia, or if greater eudaimonic well-being causes increased insula grey matter volume. It has not yet been defined whether the insula cortex has a unique connection with eudaimonia, as the hedonic aspect has not been tested.

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