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Chapter 9

Leisure Time Activities as Cognitive Training: Can Cognitive Fitness Improve Well-Being of Older Adults?

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Additional information is available at the end of the chapter

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Abstract

Economic reports show that traditional economic variables are becoming insufficient in indicating nation's progress and that self-reported well-being is emerging as an important indicator of nation's prosperity and quality of life of its inhabitants. Since average life expectancy is consistently increasing all over the world, practitioners and scholars are increasingly confronted with the question of what can be done to improve the well-being of growing elderly population. An often highlighted characteristic of older adults is cognitive decline, and interventions aimed at improving or maintaining cognitive abilities of elderly are being extensively designed. In this chapter we will review studies indicating a link between cognition and well-being in aging and advocate (long-term) involvement in leisure activities as a form of cognitive training. Apart from its availability to a much wider audience than those participating in cognitive interventions, a key argument in favor of leisure activities is its unambiguous positive association with well-being.

Keywords: well-being, cognition, aging, leisure activity, cognitive training

1. Introduction

All over the world the population is aging. Essentially every country in the world is faced with the expanding number and growing portion of its older inhabitants. Within the next 30 years, the number of persons aged 60 years or over is expected to more than double, reaching to more than 2 billion in 2050. Moreover, average life expectancy is consistently increasing, i.e., older population is itself aging—the share of people over 80 (the "oldest old") within the older population was 14% in 2013 and is projected to reach 19% in 2050 [1]. This so-called graying of the population will most certainly be the number one trademark of the twenty-first century's societal changes. Furthermore, due to the specificities of older population,

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worldwide aging will affect probably all sectors of society, from family structure to labor market, as well as goods and services needed. A growing field of gerontology has thus a main aim of providing societal decision-makers with advices on creating retirement and social security policies adequate for the growing size of aging population and on ensuring conditions, which support and promote successful aging, i.e., appropriate housing, family relations, and free time of the elderly. What we usually refer to as successful aging is the set of individual and societal conditions under which older people get a maximum of satisfaction and happiness, while the society maintains balance among satisfaction of all age and gender groups [2].

In psychology, life satisfaction and happiness are studied under the umbrella term of well-being [3]. Other componential constructs include optimal experience and functioning [4]. Although seemingly a complex construct, well-being has been repeatedly associated with a number of health, family, work, and economic benefits, for example, decreased risk of disease [5, 6], better immune functioning [7], better coping and speedier recovery [8], and increased longevity [9]. Well-being is also associated with more job-related success and higher incomes, and individuals with higher well-being are more likely to engage in community projects [10]. Globally speaking, countries with higher average well-being are wealthier and have better civil liberties, more equality, and more governmental stability and political engagement [11]. It is of no surprise that well-being of the population has become almost a societal imperative and public policy makers are getting more and more concerned with this topic. Economic reports show that traditional economic variables, such as gross domestic product, average income, or housing conditions, are becoming insufficient in indicating nation's progress and that self-reported well-being is emerging as a variable that must be taken into account [12].

What certainly comes to mind when mentioning old population is the decline of their cognitive capabilities. Until recently, findings of cognitive decline have been relatively unified and disheartening. Beginning of the 1990s, efforts to improve cognitive functioning of healthy older adult have begun. Evidence is accumulating that cognitive training—a therapeutic intervention aimed at empowering cognition—might actually improve cognitive performance and slow down the inevitable cognitive decline. There are now quite robust findings of variability and trainability of aspects of cognition in the old age [13, 14]. Consequently, the topic of understanding and promoting successful cognitive aging is granted high scholarly and practical importance. Since older adults are usually faced with more spare time in the years following their retirement, an important direction in promoting overall well-being of elderly is to identify activities in which they might participate and that might improve their functional status and overall quality of life.

In sum, well-being of elderly is obviously becoming a major societal concern, and upsurge of interest in interventions and activities that could contribute to the life satisfaction and happiness of older people is of no surprise. In this chapter we will (1) give a theoretical overview of well-being research and recapitulate findings on the sociodemographic correlates of well-being, most specifically age; (2) offer accounts on "successful aging," with a focus on cognitive aging; (3) present evidence linking cognition and well-being of elderly; (4) recapitulate benefits of cognitive training programs for elderly; and, finally, (5) advocate leisure activities as a widely available platform to train cognition.

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2. Well-being in psychological research

National surveys measuring well-being are becoming increasingly popular and are being carried out worldwide [15, 16]. Measurement of well-being is a focus of debate itself, and the issue has raised considerable controversies. This controversy stems partly from how "optimal functioning" and "good life" are defined at the level of an individual and is exponentially gaining complexity as we go beyond individual level toward various, cultures, economies, and personalities. Since the 1960s, when the movement of human potentials has spread throughout the Western countries, in which psychological advancements of the time were mostly nested, research on well-being has generated two distinct philosophies, labeled hedonism and eudaimonism.

Hedonism mirrors the notion of well-being, which is built around subjectively pleasant and positive everyday experiences. Hedonic well-being is measured by self-reports in which respondents rate their experiences of positive and negative affect operationalized through adjectives, such as happy, sad, and worried. It is not reduced to physical pleasure and preferences, but it can also be achieved by realization of valued and imported personal goals and aspirations. Despite numerous ways by which this pleasure/pain continuum can be assessed, most research within the hedonic approach has used the construct subjective well-being (SWB). SWB deals with how and why people experience their lives positively. It includes affect (positive and negative) and cognitive judgments of life satisfaction, and it is considered a valuable indicator of optimal functioning [17, 18]. During the past two and a half decades, SWB has become a primary index of well-being and is often employed as a major outcome variable in public health studies and medical and epidemiological testing of diseases and risk factor prevention [4, 19].

Eudaimonism expresses the belief that well-being requires actualization of one's potential. Being well is about fulfilling one's true nature—daimon [20]—and it is distinct from mere happiness. From eudaimonic standpoint, happiness cannot be equaled with well-being because, although maybe pleasure producing, not all outcomes yield achievement of well-being [4]. Realization of eudemonic happiness, and/or well-being, happens when our values are intertwined with our activities and when one is living an authentic life. In operationalizing eudemonic well-being, researchers focus on judgments about meaning and purpose of one's life, called psychological well-being (PWB), and view it as distinct from SWB. Since factors promoting SWB do not necessarily overlap with does yielding PWB, assessment of PWB is cognitively more engaging and demands considerable reflection about self-actualization, vitality, and mental health. PWB is a more diverse construct, and a multimodal approach to its measurement has been proposed. Ryff and Singer (2000), for example, specify six aspects of human actualization: autonomy, personal growth, self-acceptance, life purpose, mastery, and positive relatedness. Also, they report evidence that eudemonic well-being might influence physiological systems and consequently promote immunological functioning and overall health [21].

Within these two approaches, a number of measurement instruments have been proposed and are widely used. Kobau et al. [19] conducted an extensive study to examine descriptive

and psychometric properties of widely used scales and to examine the level of well-being in a representative sample of community-dwelling adults. The study covered (1) satisfaction with life [22]; (2) meaning in life [23]; (3) basic psychological needs of autonomy, competence, and relatedness [24]; (4) domain-specific life satisfaction [25]; and (5) select positive and negative affect items [26]. The scales demonstrated acceptable psychometric properties, and the results confirmed previous findings of preponderance of mildly positive level of SWB in adults [11, 27]. Except for the autonomy, competence, and relatedness scales, all other scales showed good variability and expected differences across sociodemographic subgroups.

2.1. Sociodemographic correlates of well-being

Sociodemographic picture of well-being, as seen through the lenses of psychological research, is more or less clear. In a stratified sample of almost 5500 respondents, Kobau et al. [19] tested for the well-being differences in gender, race/ethnicity, educational level, and household income. Men and women generally reported similar degree of SWB or PWB, i.e., exhibited similar levels of meaning in life, positive or negative affect, global happiness, autonomy, and competence. Women exhibit higher satisfaction with spiritual, religious, and philosophical beliefs, as well as with housing, family and social life, and their ability to help others. Men, however, reported of being more satisfied with their energy level than women did. Also, only slight differences in well-being domains were found across race/ethnicity. Higher educational level is found related to higher well-being across life domains. Respondents of low-level education experienced similar level of positive affect as those highly educated, yet they reported of experiencing significantly more negative affect and lower levels of happiness. In terms of household income, households with lower incomes are generally associated with lower levels of well-being. It seems that income provides clear advantages, with high-income respondents reporting more satisfaction with life, while lower-income respondents generally report lower levels of satisfaction across all life domains.

What does lifespan perspective say about well-being? The U-shaped association between age and well-being is usually taken as standard finding with the most salient finding being the so-called paradox of aging [4]. Not only does well-being not decline, but it usually increases, despite many challenges and losses experienced in the old age. Still, depending on the approach and instruments used, the findings from various studies reveal a relatively dynamic age-related trajectory of well-being. When a more descriptive approach to lifespan changes in well-being is taken, interesting theoretical and methodological issues arise. Namely, when a multidimensional way of measuring well-being is applied, studies show that age is related to (1) people's conception of well-being and (2) content of life aspects contributing to well-being. Young adults draw their well-being from the perceived self-knowledge and competence and are more involved in gaining new experiences. Older adults draw their satisfaction from experiences of positive coping with change, as well as depth and concentration directed toward tasks at hand. Carstensen et al. [28] proposed a socio-emotional selectivity theory to explain these findings. They argue that age is associated with increasing motivation to extract emotional meaning from life and decreasing motivation to expand one's horizons. As they age, people accumulate emotional wisdom, which leads them to select more emotionally gratifying events, relationship, and experiences. By limiting their

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set of social contacts and experiences, despite of deteriorating health, lowered income, and losses related to deaths and retirement, older people maintain and even increase their self-reported well-being.

3. Aging research: is age just a number?

When speaking of aging, we usually refer to the physiological and behavioral changes leading to senescence. Disciplines dealing with senescence, such as sociology, biology, and psychology, are not consistent in their definitions and criteria of old age, yet ages 60–65 are most often marked as the beginning of the old age. As the population is "graying," suggested phases of aging are being more and more refined. The rule of thumb in categorization of age cohorts is three life stages: the young-old (approximately 65–74), the middle-old (ages 75–84), and the old-old (over age 85). Yet criteria of old age are very broad and subjective—it can be the loss of reproductive ability, attainment of wisdom, or retirement. Although highly correlated with age, at an individual level, these indicators of old age may arrive at very different ages. Such a broad range of interindividual differences in older adults proves that chronological age is not a reliable guide in understanding the aging process.

Therefore, today age is held as one of many variables accounting for interindividual differences among elderly. As people move through the lifespan, adult development is less and less under control of physical ontogeny. In adulthood, the information of one's age tells relatively little besides the fact that one has lived for a certain number of years. Knowing solely one's age is informative neither of one's health condition, cognitive status, physiological state, socioeconomic status, nor their lifestyle. Other contributing variables include various physical factors, such as exercise or nutrition [29], psychological health (e.g., Ref. [30]), social factors [31], and various lifestyle factors [32].

Probably the best-documented changes related to aging come from physiology. Aging heart becomes more vulnerable to disease; vision and hearing undergo qualitative changes and so do the skeletal and endocrine systems. Advancements in medicine, throughout the last century, have cushioned much of age-related changes and bolstered longevity. Psychological aspects of aging have not captured researchers' attention until much later—beginnings of organized research in psychology of aging are set in the mid-1950s. Psychology defines aging as a "result of ecological relationships – a particular genetic background is expressed in particular social and physical environments and modified by the strategic capacities of the individual" [33, pg. 3]. In terms of psychological characteristics of aging, the most studied ones come from the domain of cognition.

3.1. Cognitive aging: cognition in older age

What is known about everyday cognitive abilities along adult lifespan? Over the last decades, the magnitude of cognition-related age differences reported in the literature has shrunk. This is likely due to a more systematic investigation of the influences of other concomitant variables that could account for a significant share of variance that was previously attributed to

chronological age. Human mind, as suggested by lifespan psychology, is viewed as a complex system composed of many intellectual abilities that develop with different rates and trajectories, and lifespan changes in cognitive ability should be considered in a differential manner [34].

The most influential and certainly still the most resilient perspective on cognitive abilities in aging is Cattell-Horn's legacy of fluid and crystallized intelligence [35, 36]. Fluid and crystallized intelligence represent a categorization of numerous discrete abilities into two different sets of abilities with different trajectories over the course of development—while crystallized abilities incrementally improve throughout life, fluid abilities peak at around 20 years of age and start declining after 40, with decline progressing after the age of 65. And indeed, some abilities, mostly those broadly termed fluid, decrease with age, such as processing speed [37], working memory capacity [38], associative memory [39], executive functioning [40, 41], fluid intelligence, and reasoning (e.g., Ref. [42]). On the other hand, abilities associated with experience, cultural and social processes, and measures of crystallized intelligence, for example, vocabulary, remain preserved even in very old age [43].

However, if a more differential approach is taken and age differences in various tasks are decomposed depending on the contribution of content, strategy use, or other more reality-related criteria to the efficacy of executing the task, findings show a slightly different perspective. For example, problem solving is often found to show marked age differences with young excelling the old. Yet when problems are analyzed in terms of strategies used to solve them or social and emotional impact a solution of the problem, performance is stable throughout lifespan and sometimes even improved in late adulthood [44]. It seems that young adults excel older ones in problem solving only when tasks are based on fluency or involve single solution [45]. In other words, human development can be seen as a continuous and dynamic interplay of cognitive gains and losses. To underline this thesis, Baltes et al. [46] showed that older adults can profoundly profit from guided practice in tasks or when they are shown and taught strategies for problem solving. In a sample of healthy older adults, they found improvement in fluid ability of healthy older participants when tutor-guided training was provided. A rearview mirror view would probably reveal this study as the beginning of the end of Cattell-Horn's era of innate abilities and the dawning of utility hypothesis of cognitive abilities which is slowly, but steadily, getting recognition under the auspices of *use-it-or-lose-it* hypothesis (e.g., Ref. [47]).

4. The relatedness of cognition and well-being: hot or not?

In recent years, a body of evidence suggesting that well-being might be a potential resource for healthier aging is growing. Older people with higher well-being are less likely to develop mobility problems or other activities of daily life [48]. High positive affect seems to lower the risk of frailty [49]. However, it is unclear whether positive well-being might act protectively with regard to cognitive aging, another important component of healthy and successful aging [50]. Some recent cross-sectional analyses of several older age cohorts have found small to

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moderate positive association between well-being and cognition [51, 52]. Studies have found links of stronger sense of perceived control, a component of eudaimonic well-being, with higher scores in memory performance [53, 54].

Enkvist et al. [55] tested six cognitive domains (executive function, processing speed, episodic memory, semantic memory, spatial ability, and working memory) in a sample of oldest old (aged 78–98), and after the adjustment conducted for potential confounding factors including depression, processing speed and spatial ability were positively associated with life satisfaction 3 years later. Somewhat stronger evidence that poorer fluid abilities might have a detrimental effect on well-being is found in the study investigating whether fluid cognitive ability predicts exposure and emotional reactivity to daily stressors [56]. Findings showed that higher levels of fluid ability were associated with smaller stressor-related increases in negative mood and smaller stressor-related decreases in positive mood, suggesting that cognitively better-off individuals may be more emotionally resilient in the face of daily stress. Allerhand et al. [42] used multilevel modeling to estimate association between cognitive function and positive well-being in four waves of data, collected on a sample of over 10,000 participants, aged 50–90. They found that, although most variation in cognitive function was explained by age and most variation in well-being was explained by depression, small but significant associations between cognition and well-being remained after variation in age and depression were controlled.

It remains unclear whether these significant cross-sectional associations reflect the effect of well-being on cognition or vice versa. It might also be plausible that the relationship between positive well-being and cognitive function is bidirectional. For example, cognitive success in younger age might lead to higher self-efficacy and feeling of mastery, which in turn leads to an increase in cognitive appraisal of satisfaction with life, i.e., increase in well-being. On the other hand, at older ages impaired cognition may constrain managing of daily activities and hence cause detrimental well-being. Studies suggest that cognitive decline leads to diminished well-being, more in terms of its eudaimonic than hedonic aspects [57]. A more rapid cognitive decline in a 5-year period preceding well-being assessment, as measured by Scales of Psychological Well-being [58], was associated with lower level of nearly all aspects of well-being. The extent of the association varied across well-being dimensions. Also, rate of decline of episodic memory, semantic memory, and perceptual speed was associated with rate of decline in purpose in life, and the association between rates of decline in working memory and purpose in life was of borderline significance. A prospective epidemiological study of community-dwelling elderly has also found that greater purpose in life is associated with a reduced risk of incident Alzheimer's disease and mild cognitive impairment [59].

People's cognitive responses to various life events are also associated with different levels of well-being. Happier and more satisfied individuals are more characterized by optimistic strategies and biases when facing different outcomes. They tend to perceive life's circumstances positively [60], expect favorable future [61], experience more internality in terms of control [62], and are confident about their strengths and skills [63]. Inverse relation to well-being is found in inclination to encode negative aspects of events and ruminate about one's problems [64].

Further elaboration associating cognition and well-being comes from the research on self-efficacy. Significant associations between well-being and self-efficacy have been reported [62], and self-efficacy is referred to as a strong predictor of subjective well-being and a mediator of the relation between personality and SWB [65]. Twin and family studies have found that genetic factors may account for 30–40% of the variance in SWB, leaving a fair share of variance of SWB under environmental influences [66]. Environmental factors can obviously play an important role in individual differences in SWB. Therefore, it is reasonable to assume that, partially at least, interventions aimed at various cognitive correlates of well-being could change the self-reported perception of well-being. In sum, an association between cognition and well-being is a sensible assumption, although it is still escaping firm explanations and mechanisms enabling it. In the following paragraphs, we will review types of cognitive interventions offered to elderly and then offer an account of arguments for leisure time activities as a form of cognitive training.

5. Cognitive training: how can cognition be trained?

Although nowadays research argues that age is one of many variables accounting for individual differences in cognition, it is still often taken as a cause of decline in cognitive abilities. Therefore, it is not surprising that practitioners and scholars are increasingly confronted with the question of what can be done to maintain cognitive abilities by postponing degenerative (yet normative) aging processes, thus improving the quality of life in elderly. Pushing the limits of what is currently known about sustaining cognitive functioning in the old age and about the ways of improving cognitive status of the elderly has become one of the most intriguing endeavors of psychologists, gerontologists, and cognitive scientists alike. Also, it is a pursuit which brings together not only scientists but also clinicians and entrepreneurs. In 2012, the brain-fitness market had total revenues of more than $1 billion, and forecasts for 2020 are settling around $6 billion [67]. The metaphors of the brain gym and workout for the mind have never been more appealing. Although cognitive training programs could be tailored to suit various age cohorts, aging baby boomers seem to be their number one consumers.

Similar to children, adults do not often function at the limits of their capacities; when placed in conditions that support and foster their higher-level functioning, resources are activated, but they are not spontaneously used [68]. In many areas of life, performance of older adults is below their actual competence level. This idea of an unused reserve, which is not activated because the situation is not requiring it, is partly described in the concept of cognitive reserve. Cognitive reserve refers to the brain's capacity to cope actively with neuropathological damage through the implementation of cognitive processes [69]. It is the ability to adapt to neural damage by employing alternative cognitive processes and/or strategies in compensation. In essence cognitive training procedures are based on this idea that the brain, even in old age, can change for the better. Findings of brain's plasticity [70], i.e., brain's ability to change and keep its vitality, suggest that it resembles muscles. As physical training can improve physical abilities and overall physical fitness, cognitive training can improve trained activities and cognitive status. Such training can take many shapes. The use of instruction and guided practice

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on tasks related to specific cognitive abilities or cognitive appraisals of one's own ability has proven to be a key to success of such programs intended for the elderly. In the consecutive order of their development, these types of training are listed: strategy training, multimodal training, cardiovascular exercise, and process training [71].

Strategy training involves training strategies instrumental in increasing performance on trained tasks. These strategies most often used mnemonics and reported memory improvements for different mnemonics taught, ranging from imagery (d = .14), and peg-word (d = .62), to method of loci (d = .80), and organization (d = .85) [72]. Strategy trainings are featured by large and lasting effects on the trained task but are scarce in transfer effects, i.e., acquired mnemonics has limited generalizability to untrained tasks. As a response to these limited transfer abilities of strategy training, *multimodal trainings* were developed. These more complex interventions include cognitive and social component and sometimes even lifestyle changes. Multimodal training, as the name suggests, includes multiple modes of meaningful and joyful activities, for example, learning new skills which is cognitively demanding (e.g., board and card games, Sudoku, quilting). This approach offers wider transfer to different cognitive and other psychological domains (e.g., Ref. [73]), yet from a methodological point of view, it is difficult to determine which mode, or activity, was crucial or most beneficial for the improvement. *Cardiovascular training* features improvement in cognitive function of elderly via designated aerobic exercise. Greatest benefits of cardiovascular training are witnessed in executive function (g = .68 for flanker task) and are moderate for performance in speeded tasks (g = .43 for spatial or g = .27 for reaction time tasks) [74]. These trainings can have large and widespread effects, but are not necessarily accessible to persons with physical disabilities. Finally, *process training* trains specific processes, such as working memory [75] by exposing the participants to a "cognitive drill" on tasks tapping specific process. These trainings are promising, in terms of transfer effects, yet require rigorous task analysis to determine exactly which process is being trained. In applied sense, process trainings are known to be tiring and, consequently, demotivating, which in turn can have adverse effects on adherence.

Cognitive interventions are best delivered in a group format, although individual sessions and even self-help trainings [76] have been successfully implemented. Similar to real-life experiences, adaptive tasks are instrumental for training success, i.e., tasks which grow more challenging as the performance is getting better [72]. There is evidence that even relatively simple cognitive exercises can help to improve aspects of cognition. For example, older people can benefit from cognitive interventions in forms of computerized board games of chance [76]. Authors argue that the reason for this improvement lies in the newly acquired skill (i.e., computer use) and draw attention to higher feelings of mastery and self-efficacy as a potential reason behind the improvement. Other computer-based procedures come to similar conclusions. Whitlock et al. [77] confirm enhancement of well-being and life satisfaction after a multimodal game-based intervention and, in line with other studies on cognitive exercise and well-being, suggest a link between gaming and better emotional functioning and higher well-being. In sum, programs for the elderly which are now needed are those targeting multiple cognitive and physical functions because age-related decline is experienced in both of these areas. This decline is often accompanied by emotional difficulties, which might affect cognition. Thus, interventions which incorporate multiple components, such as

regular physical and cognitive activity and stimulation, and are depression protective, are needed—most likely in midlife and earlier—to maximize their potential of slowing down cognitive decline in later age. Finally, cognitive training procedures may have practical values and benefits even if they do not change the rate of cognitive decline, in terms of statistical significance. Even if the rate of decline returns to normal after temporary improvement in the level of function due to the intervention, it may delay the point at which an individual reaches sufficient degrees of impairment to impact daily life in terms of dependency, housing, or constant medical care [71].

6. Leisure time activities: engagement that counts

Two contrasting, although not mutually exclusive, views have been proposed to account for the contribution of activities in successful aging. According to the *activity theory* [78], maintenance of activities and attitudes of middle age as far and as long as possible, in terms of one's age, is the key to successful aging. On the other hand, *disengagement theory* [79] suggests acceptance and willingness to disengage from active life as factors holding the key to aging successfully.

Ever since the 1960s, both of these theories have been a benchmark for testing various hypotheses explaining why some people age more adaptively, in terms of successfully standing up to the challenges which aging brings. They both hold an interdisciplinary approach on aging, taking into account not just medical/physiological data but also social, psychological, and interpersonal factors. Most importantly, they have both called scholars' attention to the positive and healthy aspects of aging instead of the usual studies on frailty and decline in relation to age. Furthermore, both theories apply a developmental perspective to late adulthood, a standpoint in which aging involves a progression through consecutive stages rather than a decline from middle adulthood toward the end of one's life [2]. Activity and disengagement theories have provided a fruitful theoretical platform for the study of aging and have extensively advanced our knowledge and appreciation of aging.

Studies identify three categories of leisure time activity as valuable constituents of "successful aging"—social engagement, physical exercise, and mental stimulation [50]. Many recent studies have found that social network size (number of people we see or meet in certain periods) is inversely related to the risk of cognitive decrement [80, 81]. Large social networks provide cognitive and physical engagement, which mediates cognitive decline, while preserved cognitive abilities are mostly a condition sine qua non for lasting social network. As for the physical component of leisure time activities, studies show that long-standing aerobic fitness leads to positive cognitive outcomes, even in old age, and cardiovascular trainings can improve cognitive performance in otherwise mostly sedentary older adults (e.g., Refs. [13, 82]). Cognitively demanding leisure activities, such as reading books and high-level journals and visiting plays and exhibitions, intuitively perpetrate higher cognitive abilities [83]. However, there are methodological issues involved in this intuition—it might be that highly functioning individuals seek complex, more cognitively demanding, leisure activities.

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Interestingly, there are three lifestyle factors important in slowing the rate of cognitive decline: social network, regular physical activity, and cognitive leisure activities [84]. The integration of these aspects into neurorehabilitative methods is strongly recommended [71]. Combined interventions are often designed to be enjoyable or socially meaningful for older adults, increasing the chances that they will maintain the activities and skills even after the formal training period has ended. Compared with just physical or cognitive training programs, combined trainings provide significantly greater benefits in various cognitive functions of older adults [85, 86]. Given the similarity of training components contributing to training success and lifestyle factors important in slowing the rate of cognitive decline, it is justified to ask whether leisure activities could serve as a form of cognitive training.

An important aspect to bear in mind, in the discussion of leisure time activities as a "substitute" for cognitive trainings, is their relation to well-being. Overall, training and cognitive aging studies, although not extensively, provide evidence of a positive association between cognitive status and well-being in the old age. Literature on leisure activities almost unambiguously demonstrates that leisure activities can improve well-being. Well-being is positively associated with frequency of participation in enjoyable activities (e.g., different hobbies, reading, socializing) [87, 88]. The level of participation of older adults (age 60+) in leisure activity was found to predict life satisfaction 7 years later. A similar longitudinal finding is the one of older adults (age 72+) who volunteered in community work and other helping behaviors and were found to have greater life satisfaction 3 years later [89], while more hours of volunteering resulted in even greater benefit in well-being in older (age 60+) adults [90]. Overall, both cross-sectional and longitudinal evidences speak in favor of leisure time activities in terms of well-being. Long-term participation in leisure activities is not just protective of cognition in old age but is also regarded as a factor contributing to its improvement.

It seems that leisure time activities have some striking similarities to cognitive training program. These similarities certainly lie in factors proven to slow down the rate of cognitive decline and components of frequent leisure time activities in which elderly are involved are striking, namely, social network, physical activity, and cognitively demanding tasks. Also, just as cognitive trainings provide users with the sense of mastery and self-efficacy, especially if new skills are required through the course of the training, so do leisure time activities. Based on their facial validity, i.e., instantly seen pleasurable purpose of these activities, development of mastery and self-efficacy in leisure time activities is probably even more pronounced. Furthermore, leisure activities circumvent crucial shortcoming of cognitive trainings—they are mostly free and available to almost everyone. Cognitive training procedures are usually not offered to older population on a larger scale. They are usually based in validity studies and are at disposition to volunteers in research institution—university centers, geriatric units, or aging institutes. Web-based programs are becoming an economically available alternative, yet they still require resources and, after all, a home computer with Internet access. Finally, traditional leisure time activities are perceived as much more enjoyable than strategy trainings and extensive practice tasks, and this enjoyment might ensure for higher motivation and adherence of older participants in pursing them.

7. Concluding remarks

A successful example in which an initially leisure time activity, volunteering, was tested as a cognitive protection intervention [91]. Older adults (ages 60–86) worked with elementary school students in supportive interactive roles for 15 hours weekly over the school year. Physical activity, strength, reported social support networks, and cognitive activity significantly increased for these elders. This study is an example of targeting social engagement interventions to enhance cognitive aging for older adults and a further support of the theory that active involvement with society and engagement in meaningful activity are critical to "successful aging." More studies like this are needed to have a sound, psychometrically proven, argument of leisure activity being the No. 1 choice of cognitive training. However, such studies are usually not commercially or grant-wise interesting because the final products—a participation in activity—cannot be sold and there are no financial incentives; it is most often open to community dwellers in forms of various hobby centers, book clubs, or volunteering opportunities.

At the end, which is then the right way to healthy aging and cognitive vitality in the old age? Is it the activities, is it training programs either web-based or offered by research in others, or might it be both? Aging is a dynamic progress in which we win some and we lose some. Losses are mostly there by default; wins mostly require hard work. Studies on cognitive plasticity show that behavioral effects of experience are quite narrow and the effects of participation in activities show because engaged lifestyle pulls attentional resources to support abilities and maintain skills needed to pursue such lifestyle [92]. In other words, abilities are maintained through consistent use of exercising them. Exercise and engagement can be operationalized in various ways, but they usually involve challenging levels of activity situated in real-life contexts. So the question of activity or disengagement as a key to successful aging can best be rephrased by emphasizing choices we make about our activities and involvements in them. Such a claim is advanced in the Dumbledore hypothesis of cognitive aging—suggested by Elizabeth Stine-Morrow and inspired by the wise words of Dumbledore, a kind wizard in the Harry Potter saga—it is not our abilities that define us; it is our choices that show what we truly are [92]. What seems crucial for successful aging and higher well-being of elderly is to find the right balance between one's ability, choice of activities, and the level of engagement in these activities. Choosing to engage in leisure activities and adjusting this engagement to own aging abilities, yet making it inspiring enough to provide a mastery experience, which would lead to higher self-efficacy, seem to be the path to maximize our own potentials and be well.

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