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#### What is the psychology of aging?

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#### Abstract

Aging is multidirectional, characterized by numerous changes that follow different developmental trajectories. Some abilities, including speed of information processing, working memory, and sensory functions decline more steeply in later life than in younger years. Other abilities, including vocabulary, life-satisfaction, and emotion regulation are relatively stable across most of adulthood or improve with age. Normal aging, which is the focus of this article and volume, refers to non-disease and non-clinical driven age-related changes. This article also discusses how adults adapt to age-related changes in opportunities and resources and to a shift in balance of gains and losses toward greater losses in later life. This adaptation involves numerous mechanisms, including neurological adaption to functional decline and shifts in goal orientation and priorities. Aging is often thought of in terms of growing old, with an emphasis on age-related losses [1]. Indeed, some abilities, such as sensory functioning and speed of information processing decline more steeply in later life than in younger years. Yet, aging is characterized by a multitude of developmental changes that follow different trajectories (multidirectionality; [2]). Most people seem to associate aging with what biologists call senescence which is defined as cellular and functional decline [3]. In contrast, strictly speaking aging begins at birth. Importantly, different to the concept of senescence many psychological processes and abilities are relatively stable across most of adulthood, such as vocabulary and life-satisfaction, and some even improve with age, such as emotion regulation or resolving motivational conflicts [4]. This article first introduces the topic of normal aging, and addresses the multidirectional nature of developmental trajectories across adulthood and into old age. The article also considers how adults adapt to the age-related changes in social and institutional opportunities, capabilities, and internal or external resources.

#### Normal aging

Normal aging refers to non-disease and non-clinical driven age-related changes [5]. For instance, forgetting a routine medical appointment is a memory error that falls within the normal range of age-related decline in memory performance. Conversely, forgetting one's home address is indicative of disease-related memory impairment that could compromise one's ability to live independently. The term 'healthy aging' is often used in the psychological literature and is defined by the World Health Organisation as "The process of developing and maintaining the functional ability that enables well-being in older age." [6, p. 28] and is used more or less synonymously with 'successful aging' [7]. However, the term 'successful aging' also has roots in the medical literature where it has been used to refer to high levels of functioning as the "Low risk of disease and disease-related disability, high mental and physical

function; and active engagement with life." [8,9]. Other uses of the term relate to psychosocial aspects of aging and imply successful adaptation or compensation in response to age-related losses [10,11].

#### Multifaceted nature of aging

Consistent with the conceptualization of aging as senescence, physical functioning (e.g., strength, mobility) declines with age, and the rate of decline accelerates in older age [12]. Disability and disease (e.g., cardiometabolic, neurological, sensory, musculoskeletal, respiratory) are more prevalent in later life [13].

A more differentiated pattern of developmental changes concerns cognitive functioning. Decline is observed in fluid cognitive functions that are more biological based, whereas more knowledge-based functions, such as crystalized intelligence, are more stable with age or even improve (see Loaiza, this volume). For instance, speed of processing-the timely execution of basic cognitive operations-declines with age, likely due to age-related neurological changes (white matter integrity; [14]), and its decline is associated with age-related performance detriments on a vast array of cognitive tasks [15]. Another prominent cognitive change pertains to memory more generally (see Castel, this volume) and working memory in particular [16], which refers to a limited capacity to keep mental representations available for ongoing cognitive tasks. Working memory is associated with age-related declines in learning, reasoning, and decision making [17]. These cognitive changes occur across adulthood, rather than starting in older adulthood. For instance, performance on speed of processing tasks peaks at around 20 years, and performance on working memory tasks peaks at around 30 years [18]. These losses appear to be very difficult to counteract as the research on interventions (e.g., cognitive training) shows (von Bastian et al., this volume). However, selective focus on information that is most important can off-set memory challenges ([19]; Castel, this

volume). Moreover, crystallized cognitive abilities are relatively stable across most of adulthood or may even improve. For instance, verbal ability is relatively protected from age-related decline [16], and so are higher-order functions such as wisdom (e.g., [20]; Glück, this volume).

Personality traits (e.g., the Big Five) were conceptualized as stable dispositions that do not change much after entering young adulthood [21]. In fact, meta-analytic findings of longitudinal studies suggest high rank-order stability of the Big Five personality traits across adulthood, and only small mean-level changes [22]. Conscientiousness, and to a lesser extent, Openness and Agreeableness slightly increase with age until midlife, but return to their younger adult levels in later life. Emotional stability is one exception that increases across adulthood (Bleidorn & Hopwood, this volume). Taken together, the size of personality changes is small in comparison to stereotypic views of older adults as rigid, stubborn, and lonely [1,23]. Age stereotypes, acquired in younger age, can be internalized as a person grows older, becoming part of the person's self-view in older age ([24]; Rothermund & de Paula Couto, this volume). Negative internalized self-stereotypes can operate as self-fulfilling prophecies, bringing about changes in health and well-being (Rothermund & de Paula Couto, this volume). People's identities can also undergo abrupt changes in the transition to retirement [25], during which their consumer choices can play an important role in shaping their identity (Sung & Yoon, this volume).

Life satisfaction also appears to be relatively stable across adulthood with only small declines in very old age [26]. In contrast to assumptions based on cross-sectional results that emotional well-being increases in old age, recent meta-analytic findings of longitudinal data demonstrate that positive affect increases in the post-retirement years (> 65 years) until entering very old age (around 80 years), while negative affect steadily increases from middleadulthood [26]. However, some authors have argued that one might expect much lower well-

being in older adulthood due to the increasing losses in this phase of life (e.g., health-related losses; retirement, Wang & Huang, this volume; or widowhood, Boerner et al., this volume). One perspective proposes that this is due to older adults being better at regulating their emotion ([27]; Isaacowitz & English, this volume). According to Strength and Vulnerability Integration (SAVI), older adults moderate their emotional experiences by avoiding or withdrawing from stressful situations that elicit high levels of arousal (Charles & Piazza, this volume). Social participation (e.g., in community groups) may also buffer against age-related decline in emotional well-being as it is associated with reduced risk of functional decline and depressive symptoms [28,29]. In Japan, where perceiving that one is valued and understood by others is central to happiness in later life, older adult participation in community social activities has been shown to promote physical health and well-being (Uchida et al., this volume).

As a final example of an area that shows multidirectionality, we turn to prosociality. Antisocial behaviors, such as criminal behavior, decline with age [30], whereas prosocial behaviors, such as charitable giving, volunteering, and contributing to the public good, increase with age ([31-33], which may reflect altruistic motivations in later adulthood (Mayr et al, this volume).

The above snippet of adult developmental research provides but a glimpse of the multifaceted and multidirectional nature of systematic changes across adulthood. It is important also to recognize inter-individual variability in age changes. Heterogeneity increases with age as older adults are more different from each other than are younger adults (Ghisletta, this volume). For instance, while some adults show little to no determent in cognitive functioning over much of their lifetime, others exhibit declines at various rates [34,35], due in part to brain morphology and function ([36]; Ebner et al., this volume). Age changes also differ across cultures ([37]; Fung, this volume). As an example, East Asians have been found to adopt a more intuitive reasoning style in comparison to Americans who are more analytic

[38]. One consequence of this cultural difference is that compared to younger adults, older East Asians differ from older Americans in their performance on some cognitively demanding memory tasks where cognitive resources are required to overcome a disadvantage of an intuitive processing style ([39]; Gutchess & Cho, this volume).

#### Successful aging: Processes of adaption and compensation across adulthood

A person's lifespan comprises both gains and losses, and past middle adulthood the balance shifts towards losses. One perspective is that people manage their lives successfully through three regulation processes: selection, optimization, and compensation (SOC; [10,40,41]). In short, selection refers to setting goals, either electively to achieve a desired state (e.g., career success) or due to loss of means to attain a goal (e.g., coaching a soccer team when no longer physically able to compete as a player). Optimization refers to investing in goal relevant means (namely, striving to achieve a goal), and compensation involves investing in alternative means (e.g., employing aids to support vision or mobility) to maintain functioning when faced with losses. People report more use of SOC behaviors from young to middle adulthood and a decline in late adulthood, likely reflecting the constraints of aging on resources [41].

A different perspective, focusing more on the role of control, is offered by the Motivational Theory of Lifespan Development (MTD) proposed by Heckhausen and colleagues (Wrosch & Heckhausen, this volume). Differentiating between different modes of control, this theory stresses the importance secondary control processes (e.g., adapting aspiration levels, devaluing goals that can no longer be reached) as a way to manage losses in primary control (e.g., being able to persistently invest goal-relevant means into goal-pursuit) for successful development.

Older adults themselves view aging successfully as multidimensional, encompassing a diverse range of attributes, including well-being, coping, physical health, self-care and independence, life satisfaction, and a supportive social network [42]. Living a long time is perceived as among the least important attributes of successful aging [42]. When successful aging is defined as physical or cognitive functioning, few of the oldest old adults meet the criteria of successful aging, but when defined as a process of continuous adaptation close to half older adults are classified as successful [43]. This is because older adults typically report high levels of well-being and are satisfied with their lives, despite their functional limitations and other age-related losses.

Adaptation is central to how the aging brain responds to challenges posed by the environment and by neurological and functional decline. Despite age-related decline in brain structure and associated cognitive functioning (e.g., speed of processing, working memory), the aging brain also exhibits increases in prefrontal activation [43,44]. According to Scaffolding Theory of Aging and Cognition (STAC-R), new neural networks and circuity, afforded by plasticity in prefrontal regions, are forged to maintain levels of cognitive functioning in the aging brain (Reuter-Lorenz & Park, this volume).

In their highly influential model of successful aging, Rowe and Kahn [8,9] defined successful aging as the simultaneous ability to maintain a low risk of disease and disease-related disability, high mental and physical functioning, and active engagement with life. In contrast, while the World Health Organization acknowledges that older adults normatively face healthrelated declines, it also emphasizes the importance of values, goal pursuit, and the self, defining 'healthy aging' as "Attributes that enable people to be and to do what they have reason to value" ([6] p. 28; Freund [7]). Indeed, what people value changes across adulthood: An orientation toward gains in young adulthood shifts increasingly toward maintenance in middle-

adulthood, and loss-avoidance in old age (see Freund, this volume), and this shift is associated with higher well-being in later life [45]. At the higher goal system level, people possess a network of interrelated goals that reduces with age to a smaller network of more similar and mutually facilitative goals [46]. With advancing age, people also increasingly disengage from unattainable goals to the benefit of their physical health and well-being [47]. This age-related goal selectivity is thought to enable older adults to maintain a high level of goal engagement as one's resources decline (Hennecke & Fuths, this volume).

Pointing to the influence of the environment on aging successfully, as people age, they sometimes construct more emotionally gratifying social environments [49,50]. This might be to satisfy emotional goals, such as being closer to important social partners to improve their emotional well-being and counteract loneliness ([27,51]; Huxhold & Fiori, this volume). Social partner selection could be a successful proactive strategy for regulating emotion ([51,52]; Antonucci, this volume), with older adults drawing on their age-acquired ability to anticipate their future emotional states [53]. Connection with grown children can provide various benefits to parents, and the flow of intergenerational support reverses in the direction of grown children to parents in very late life ([54]; Fingerman et al., this volume). Affect-regulation motivation has been shown in some studies to increase with age, either as increased pro-hedonic motivation (desire to maintain or enhance positive affect or diminish negative affect) or decreased contra-hedonic motivation (desire to decrease positive affect or increase negative affect; [55,56]; Riediger & Rauers, this volume). When zooming in on specific emotions, a differentiation between sadness and anger appears to be particularly important for understanding how interacting with one's environment changes across adulthood: While anger seems more prevalent and functional in younger adults who are confronted with obstacles in their pursuit of goals, sadness is more often reported by older adults who experience losses they cannot control ([57]; Kunzmann & Wrosch, this volume). Sadness appears to facilitate

adaptive goal disengagement (e.g., from unattainable goals) in older adults experiencing chronic stress, serving to protect against decline in emotional well-being [58].

Adapting to life changes also requires employing appropriate goals for the current context. Motivations to promote well-being and positive emotional experiences may conflict with other important goals. Goal prioritization at all stages of adulthood requires a cost-benefit analysis of competing goals. In decision-making, a goal-driven focus on emotionally gratifying information in older age shifts to a more balanced consideration of positive and negative information ([59,60]; Horn, this volume). Decreases in risk taking propensity with age ([61-63]; Nolte & Hanoch, this volume) and a shift toward a more balanced consideration of positive and negative information seems to reflect age-acquired sensitivity to the possible negative consequences of risk taking [64].

#### **Concluding remarks**

Normal aging comprises a multitude of multidirectional changes, including both gains and losses. Given the breadth and complexity of age-related changes, one may ask whether an alien from a distant planet could recognize an older adult given only a detailed reading of the psychological literature. We maintain that this is not the case as even aging individuals themselves often do not perceive themselves as 'old' (Diehl & Wahl, this volume). Moreover, there is large interindividual heterogeneity in the aging process. One of the largely neglected areas of variation in aging processes concerns the impact of culture (but see Fung; Rolison; Uchida et al.; Yoon; his volume). Describing the complexity of aging is impossible in one special issue, but we believe that this collection of articles will provide the visiting alien with an insight into how fascinating the psychology of aging is.

### Highlights

- 1/ Aging is multidirectional, characterized by changes with differing trajectories.
- 2/ Some abilities decline with age, whereas others are relatively stable or improve.
- 3/ Normal aging concerns non-disease and non-clinical driven age-related changes.
- 4/ Adaptation to age-related changes involves a variety of mechanisms.

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