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How to cite

IHLE, Andreas et al. Ageing and Reserves. In: Withstanding Vulnerability Throughout Adult Life: Dynamics of Stressors, Resources, and Reserves. Spini, D. & Widmer, E.D. (Ed.). Singapore : Palgrave Macmillan, 2023. p. 239–252. doi: 10.1007/978-981-19-4567-0_15

This publication URL: https://archive-ouverte.unige.ch/unige:170852
Publication DOI: 10.1007/978-981-19-4567-0_15

CHAPTER 15

Ageing and Reserves

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Introduction

With regard to the unfolding of vulnerable life trajectories, reserves play a key role. Specifically, based on the overarching framework of vulnerability understood as dynamics of stress and resources within context across the life course (Spini et al., 2017; see also in this volume the introductory

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D. Spini, E. Widmer (eds.), *Withstanding Vulnerability throughout Adult Life*, https://doi.org/10.1007/978-981-19-4567-0_15

chapter by Spini & Widmer), we have studied multidomain reserve accumulation and activation as key mechanisms of the development of vulnerability and resilience in older age (Cullati et al., 2018). In this regard, in contrast to situation-dependent momentary levels of resources, reserves are seen as latent capacity that is built up across the life course. Reserves are needed for protection against damage and stress to delay or change the processes of decline in well-being, mental and physical health, economic status, or social participation throughout old age, thereby enabling the individual to maintain performance above a functional threshold. Reserves must, of course, be activated when the individual is in stress, e.g., following shocks and adversity (Cullati et al., 2018).

Vulnerability is thus proposed to be the result of (a) insufficient reserve accumulation across the life course in various domains (e.g., cognitive, relational, economic, affective), linked with (b) inefficient reserve activation in situations of stress, in the context of (c) insufficient or entirely absent systemic (e.g., welfare state) measures to offset or prevent negative outcomes. Specifically, certain individuals are more vulnerable than others to impairments in human functioning because of insufficient reserves accumulated over their life course, which consequently exposes those individuals to greater difficulty dealing with threatening situations in old age to offset or prevent negative outcomes following shocks and adversity. In

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general, our life course view on reserves is inspired by the use of the reserve concept in cognitive neurology, in which cognitive and brain reserves determine the level of protection against clinical manifestations of neurological damage (Stern, 2009). Building on this reasoning and establishing a broader perspective extended to new research areas beyond cognitive impairment, we emphasised the multidimensionality of reserves with a wider application in, e.g., social sciences. To illustrate our research perspective in this regard with empirical examples, we focused on cognitive and relational reserve domains and their role in cognitive health and well-being as ageing outcomes.

The cognitive reserve concept (Stern, 2009) aims to account for individual differences in the course of ageing and neurodegenerative development. Cognitive reserve is built up during life through cognitive stimulation and serve later on as a buffer for coping with brain alterations to preserve cognitive functioning in ageing (Stern, 2009). Frequently used proxies of accumulated cognitive reserve across the life course are education, cognitively demanding jobs, and engagement in cognitive, social, and physical leisure activities (Opdebeeck et al., 2016; Stern, 2009). Empirically, cross-sectional evidence has demonstrated that these cognitive reserve proxies are associated with better cognitive functioning in healthy older adults (see Opdebeeck et al., 2016, for an overview).

With respect to relational reserve, the literature has stressed that social support and social capital contribute to the individual's resilience (Furstenberg & Kaplan, 2004). Accordingly, we define relational reserve as constituted by pools of significant network members (including family, close friends, neighbours, and colleagues) who, because of a history of supportive relationships with the individual, are able to be providers for that individual, e.g., emotional support, to help him or her recover from life shocks and adversity or demanding life transitions (Cullati et al., 2018). Importantly, while, e.g., the social convoy model (Antonucci et al., 2014) perceives the pool of significant network members (e.g., family) as a stable and homogenous component of the personal network, it neglects the dynamic aspect of network configurations. In contrast, the relational reserve approach accounts for those dynamic changes in the degree of importance of certain social relationships (Widmer, 2016).

To investigate these important topics, we analysed data from large interdisciplinary datasets such as the CIGEV-LIVES Vivre-Leben-Vivere (VLV) survey. The VLV project has an interdisciplinary life course focus and aims to explore cognitive and physical health, well-being, activity

engagement, social relationships, etc., of the population aged 65+ living in Switzerland (for a more detailed description, see Ludwig et al., 2014; Oris et al., 2016; see also, e.g., Ihle, Jopp, Oris, Fagot, & Kliegel, 2016a; Ihle, Oris, Fagot, & Kliegel, 2017a; Ihle et al., 2015; Ihle, Gouveia, et al., 2021a; Ihle, Ghisletta, et al., 2021b).

Accumulation of Reserves Over the Life Course

With respect to the cumulative nature of cognitive reserve accumulation during life, the contributions of education (in early life) and an active lifestyle (throughout adulthood) to cognitive reserve and thereby cognitive functioning in old age are interactive (i.e., dependent on each other). In this regard, individuals with lower (compared to those with higher) educational levels show greater potential for increasing their cognitive reserve during adulthood by engaging in activities in midlife and old age (Ihle et al., 2015). Leisure activity engagement is especially relevant for cognitive reserve accumulation after the transition from working life to old age (Ihle, Grotz, Adam, Oris, et al., 2016b). In addition to these contributions of adulthood leisure activity engagement, speaking different languages on a regular basis contributes to the accumulation of cognitive reserve during the life course (Ihle, Oris, Fagot, & Kliegel, 2016c).

Regarding the direction of effects, associations between stimulating leisure activities and cognitive functioning in old age may be reciprocal. However, prior results regarding these issues have remained rather inconclusive, especially with respect to the factors that may moderate such reciprocal patterns. Disentangling the different possible longitudinal mechanisms, Ihle, Fagot, Vallet, Ballhausen, et al. (2019a) showed that the association of leisure activity engagement in the first wave of data collection (i.e., a marker of cognitive reserve) predicting cognitive performance six years later in the second wave was significantly larger than the reciprocal association of initial cognitive performance predicting later activity engagement (Fig. 15.1). Notably, these cognitive reserve effects emerge, for example, particularly in individuals with low-skilled jobs in midlife and thereby demonstrate the additional contribution of late-life activity engagement to the accumulation of cognitive reserve. Interestingly, vulnerable individuals, such as those at a highly advanced age and with low initial overall cognitive ability levels, seem less able to benefit from such late-life activity engagement (Ihle, Fagot, Vallet, Ballhausen, et al., 2019a).

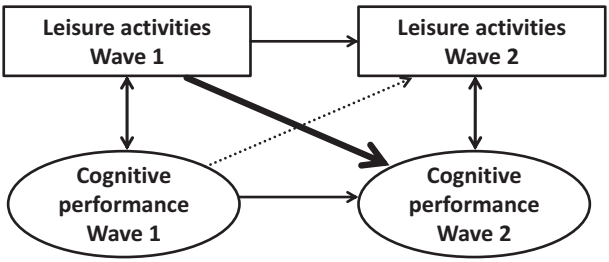

Fig. 15.1 Cross-lagged model. The association of leisure activity engagement in the first wave (i.e., a marker of cognitive reserve) predicting cognitive performance in the second wave was significantly stronger than the reciprocal association of initial cognitive performance predicting later activity engagement

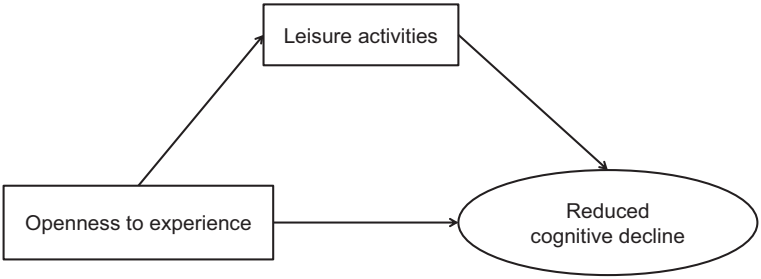

Fig. 15.2 Personality mediation model. The association of openness to experience predicting reduced cognitive decline was mediated via leisure activities (i.e., a marker of cognitive reserve)

Such cognitively engaged lifestyle-cognition associations are influenced by individual characteristics, such as certain personality dimensions. For example, the personality dimension openness to experience reflects an individual's degree of intellectual curiosity, creativity, and preference for variety. Notably, cognitive reserve accumulated in late life mediates the association between openness to experience, on the one hand, and reduced cognitive decline, on the other hand (Ihle, Zuber, Gouveia, Gouveia, et al., 2019b). As illustrated in Fig. 15.2, this mechanism suggests that individuals with higher openness to experience show greater activity engagement in old age. This activity engagement enhances their cognitive reserve and may, in turn, result in smaller subsequent cognitive decline (see also Ihle, Oris, Fagot, Maggiori, & Kliegel, 2016d, for discussions).

Likewise, the accumulation of relational reserve over the life course also shows a dynamic dimension. Individuals have several opportunities to increase their relational reserve that accompany life transitions and the accumulation of social roles across the life course (child, student, citizen, worker, spouse, parent, etc.) that are the basis for relational reserve accumulation (Cullati et al., 2018; Sauter, 2020). Other life transitions, such as retirement, divorce, or widowhood, diminish or alter the pool of significant others. However, individuals can still actively react to those life transitions by adjusting their personal networks, reactivating prior relationships, and establishing new ties, which will contribute to their relational reserve over the long term (Sauter, 2020; Sauter et al., 2019, 2021).

Role of Reserves for Overcoming Cognitive Vulnerability in Old Age

It is crucial to understand the detailed mechanisms through which reserves help to overcome cognitive vulnerability in old age. Our main conclusion was that in several groups of individuals in vulnerabilising situations—for example, individuals suffering from major physiological stressors, such as obesity, unfavourable blood fat levels, chronic diseases, and psychological stress—cognitive and relational reserves accumulated over the life course can reduce the detrimental effects of these stressors on cognitive health in old age (Ihle, Gouveia, Gouveia, et al., 2018c; Ihle, Gouveia, Gouveia, Freitas, et al., 2017b; Ihle, Mons, Perna, Oris, et al., 2016e; Ihle, Oris, Fagot, et al., 2018b; Ihle, Oris, Sauter, et al., 2018a). Importantly, reserves show long-term preserving effects on cognitive changes over time, as demonstrated in individuals suffering from chronic diseases, stroke, obesity, and psychological stress (Ihle, Ghisletta, Ballhausen, et al., 2018d; Ihle, Gouveia, et al., 2021a; Ihle, Gouveia, Gouveia, Cheval, et al., 2019d; Ihle, Gouveia, Gouveia, Haas, et al., 2020c; Ihle, Gouveia, Gouveia, & Kliegel, 2020b; Ihle, Gouveia, Gouveia, Zuber, & Kliegel, 2019c; Ihle, Rimmele, Oris, Maurer, & Kliegel, 2020a).

Interplay of Reserve Effects with Gender

Another challenge is to better understand gender-specific reserve effects. Stimulating internet activities have been investigated to examine gender-specific cognitive reserve outcomes (Ihle, Bavelier, Maurer, Oris, & Kliegel, 2020d). In this regard, internet use may represent a cognitively

challenging leisure activity and thus provide cognitive stimulation, thereby contributing to the accumulation of cognitive reserve. Notably, the benefits of internet use on reduced cognitive decline in old age differ between women and men. In this regard, social norms related to gender (e.g., Levy & Widmer, 2013) seem to determine the specific internet activities in which women and men engage. Older men usually use the internet for a broader range of activities than women. For example, older men mainly use the internet for information and research purposes, while older women mostly use it for communicating with family and friends. Potential differences in the cognitive complexity and demand of these internet use activities between women and men could be explanations for gender differences regarding cognitive reserve accumulation and cognitive outcomes (Ihle, Bavelier, Maurer, Oris, & Kliegel, 2020d). With respect to relational reserve, gender effects can also be observed within the social network. For example, men tend to provide support to fewer family members than women (Sauter, 2020). Such patterns may be linked to social norms related to gender and the distinct life experiences of men and women (McDonald & Mair, 2010). Thus, gender potentially plays an important role in the accumulation of relational reserve over the life course (Sauter, 2020).

Interplay of Different Reserve Domains

Understanding the detailed interdependencies of the different types of reserves, such as cognitive and relational reserves, is a key issue in research on multidomain reserves. Interestingly, relational reserve (e.g., the family network size, i.e., the number of family members whom an individual considers significant; and the given emotional support within the family network) mediates the association between cognitive reserve (e.g., activity engagement during middle adulthood) and better cognitive functioning in old age (Sauter et al., 2019). As illustrated in Fig. 15.3, this mechanism suggests that the interdependencies of cognitive and relational reserves over the life course are crucial for cognitive health in old age. Specifically, individuals who pursue an active lifestyle in middle adulthood accumulate cognitive reserve. They may have greater chances to preserve a stronger continuity of their personal ties throughout adulthood by maintaining sociability and support exchanges with significant others, thereby strengthening their relational reserve. Finally, this enhanced relational reserve results in better cognitive functioning in old age (Sauter et al., 2019). A

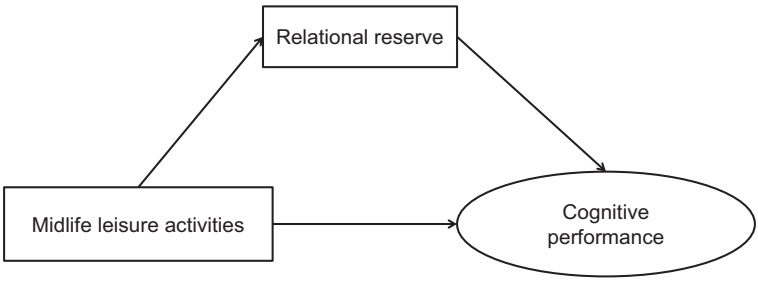

Fig. 15.3 Reserves mediation model. The association of midlife leisure activities (i.e., a marker of cognitive reserve) with cognitive performance was mediated via relational reserve

complementary mechanism suggests that relational reserve helps promote activity engagement in old age. This activity engagement enhances cognitive reserve and may, in turn, result in smaller subsequent cognitive decline (Ihle, Oris, et al., 2021c; see Ihle, Oris, Baeriswyl, & Kliegel, 2018e, for further discussions). Moreover, there is innovative evidence for the detailed interaction between cognitive and relational reserves (Sauter et al., 2021). Such evidence confirms the hypothesis that reserves from different domains are intertwined and that their combined effects contribute to less cognitive decline in old age.

Role of Reserves in Associated Aspects of Everyday Functioning

Maintaining good cognitive functioning is crucial for associated aspects of everyday relevance, such as well-being (Ihle, Ghisletta, et al., 2021b; Ihle, Oris, Sauter, Spini, et al., 2020e). Notably, with respect to the aftereffects of maintaining cognitive health through multidomain reserves, a key mechanism suggests that the association of low cognitive abilities with low well-being in old age is mitigated in individuals with greater cognitive and relational reserves accumulated over the life course (Ihle, Oris, Sauter, Spini, et al., 2020e). Moreover, good cognitive functioning predicts a smaller subsequent decline in well-being in young-old adults but not in old-old adults (we used a median-split approach to divide these two age groups: < 73 years vs. ≥ 73 years, respectively; Ihle, Ghisletta, et al., 2021b). We concluded that as soon as individuals' functional abilities

break down and fall below a critical threshold, decline can no longer be compensated for, not even with the help of reserves (Ihle, Gouveia, Gouveia, Orsholits, et al., 2020f). This deficit makes highly advanced age a particularly vulnerable life phase (Ihle, Gouveia, Gouveia, van der Linden, et al., 2017c).

Conclusions

With regard to conceptual implications, our empirical research achieved in LIVES confirmed the key features of multidomain reserves. Specifically, reserves exist in different domains (e.g., cognitive, relational, etc.) that are accumulated over the life course from childhood to old age through different sources (e.g., education, work, activities, social relationships, etc.). These different contributions to the accumulation of reserves across the life course depend on each other, e.g., the accumulation in earlier life phases influences the accumulation in later life phases. Moreover, these life course dynamics of reserve accumulation are influenced by several individual characteristics, such as age, abilities, personality dimensions, and social norms related to gender, which shape individuals' reserve accumulation pathways. The reserves accumulated establish a latent potential that can be activated when the individual is in stress following shocks and adversity, such as strong physiological and psychological stressors, which initiate reserve effects in old age. To be able to deal properly with stressors and avoid negative outcomes, reserves must be sufficiently accumulated, available at the right moment, and successfully activated. In this way, reserves allow individuals to overcome stressors and face vulnerability in old age by maintaining performance above a functional threshold (Cullati et al., 2018). Moreover, in the context of using one's reserves, the plasticity and maintenance of reserves is an important issue. Since vulnerability further emerges in cases of reduced capacity to restore reserves, to ensure resilience in older people's functioning in the long term, individual reserves must be reconstituted after the initial shocks (e.g., diseases) or transitions (e.g., retirement) to be ready for subsequent adverse events in later life (Cullati et al., 2018). Notably, the multiple reserve domains show dynamics and a strong interconnectedness across the life course, with different mechanisms emerging, such as mediation and joint effects between the reserve domains involved. We emphasise the investigation of the detailed interplay of multiple reserve domains and their life course dynamics as an innovative and fruitful field in life course and ageing research.

Thus, the concept of reserves is a powerful construct to explain processes of vulnerabilisation across the lifespan into old age. In this regard, the empirical evidence gained from our research presented above reinforces our central proposition that vulnerability is the result of insufficient reserves accumulated over the life course in multiple reserve domains that are crucial for maintaining cognitive health, well-being, and everyday functioning in old age. With regard to practical implications, social policies and intervention programs targeting the promotion of lifelong activity engagement and social participation are required to help people accumulate, maintain, and restore reserves to overcome vulnerability and preserve functioning in the long term in old age.

Outlook

This chapter focused on empirical examples of cognitive and relational reserves. However, importantly, the conceptual proposition of reserves and their role in overcoming vulnerability potentially also applies to other reserve domains (e.g., economic, biological, physiological, health-associated, motivational, affective) that comprise various aspects of human functioning (Cullati et al., 2018). Future research should thus focus on the interplay of multiple reserve domains, with a special emphasis on gender-specific effects. Another important angle could be to consider in more detail the interplay of reserves accumulated over the life course with individuals' normative and nonnormative (idiosyncratic) life events as well as contextual factors, such as demographic, economic, and societal characteristics of the surrounding environments in which an individual grew up and spent his or her adulthood, and systemic (e.g., welfare state) measures to offset or prevent negative outcomes.

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