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Editorial

Leveraging the Power of Networks to Support Healthy Aging

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Networks are not only a central organizing principle of biology, but also of cognitive, and social structures (Ellwardt, Aartsen, & van Tilburg, 2017; Gosak et al., 2018; Hu, Thomas, & Brunak, 2016). The theme of the 2019 Gerontological Society of America Conference is, "Strength in Age—Harnessing the Power of Networks." In this special issue, contributing authors highlight many ways in which networks can be leveraged to support healthy aging, ranging from sensory to motor, cognitive, and social networks. The issue opens with a discussion of the important, underappreciated impact of sensory processing on cognitive performance in older adults. A second theme of the issue examines interactions between cognitive and physical networks. Finally, the articles discuss the broader impacts of the ways in which social and community networks shape early-life experiences, and in turn affect late-life cognition. Together these articles provide compelling support for studying network interactions across sensory, physical, cognitive, and social domains in order to develop targeted interventions to support healthy aging.

Oftentimes, age-related cognitive changes are studied in isolation without considering the influence of other networks. Articles in this issue point to the importance of examining how age-related changes to other networks in the body, in particular sensory networks, can contribute to cognitive changes in late life. Davidson, Vidjen, Trincao-Batra, and Collin (2018) investigate the degree to which age-related changes in visual perception versus cognition affect memory networks in older adults. The authors find that individuals with worse visual perception have poorer performance on a pattern separation task, but no relationship is found between pattern separation and long-term memory or executive function. Providing further support for interactions between sensory and cognitive networks, de la Fuente and colleagues (2018) demonstrate that older adults with a visual, auditory, or dual sensory impairment exhibit poorer cognition 8 years later. These articles provide new evidence that supporting sensory functions may boost cognition in late life.

It is well established that older adults generally show poorer short- and long-term memory performance (Park et al., 2002). However, less is known about the degree to which memory performance can be improved by leveraging other cognitive networks. In an article by Strunk, Morgan, Reaves, Verhaeghen, and Duarte (2018), the authors investigate whether recruiting attentional networks in a strategic fashion can improve memory in younger and older adults. Specifically, they examine the utility of retrocues (i.e., drawing attention to the location of items that will be later recalled). The authors find that retrocues improve memory in both younger and older adults, suggesting the relevance of examining interactions between attention and memory networks in aging.

There is a growing body of literature that regularly engaging in physical activity can elicit cognitive improvements in older adults (for review see Erickson et al., 2019), demonstrating an important link between physical and cognitive networks. Yet, it is not known whether the reverse is true; does engaging cognitive networks also improve physical functioning? In this issue, Shu-Han and Hwang, and Huang (2018) examine this question by investigating the role of cognitive networks for physical performance in older versus younger adults. The authors find that older adults' strategy choice during a dual-task affects their postural stability and force matching accuracy, suggesting that cognitive networks may be useful in shaping behavior to achieve better physical outcomes.

Although it is generally established that physical activity is associated with greater performance on higher

level cognitive tasks in aging (Hayes et al., 2015), little is known about the degree to which physical activity affects more basic aspects of cognitive functioning. A second study by Bielak and Brydges (2018) examines whether older individuals who engage in a physical activity intervention have greater cognitive speed, as measured by a reduction in their intraindividual variability. In contrast to previous studies linking physical activity with greater memory function (Erickson et al., 2019; Hayes et al., 2015), the authors do not find that the physical activity intervention increases cognitive speed. This study advances our current understanding of the degree to which physical and cognitive networks interact, and sets the stage for future studies to explore links between different types of cognition and physical activity intensity levels.

On a broader scale, this special issue explores interactions between social networks and cognition. Early-life experiences do not occur in isolation but can be affected by social and societal networks, such as families, neighborhoods, and large-scale communities (Berens, Jensen, & Nelson, 2017; Hargreaves, Pecora, & Williamson, 2017). In an urban sample of African Americans, Chan, Parisi, Moored, and Carlson (2018) investigate the degree to which early-life enrichment is related to education and cognitive performance in late life. The authors find that individuals who self-report greater enrichment activities before age 13 years (e.g., learning a new language, playing team sports) have higher educational attainment and better cognitive performance on processing speed and executive function tasks in older adulthood. Further evidence for the importance of early-life experiences is discussed in an article by Pudas and Rönnlund (2018) that shows that even as early as age 12 years, school grade performance predicts later memory performance in adults 33–54 years later. Jean and colleagues (2018) examine the impact of education on cognitive performance in black and white older Americans, and find that the effect of education on cognition is twice as large in black than in white Americans. Okely and Deary (2018) investigate how late-life cognition affects loneliness, an important socioemotional factor that has been linked to social functioning and health (Beadle, Brown, Keady, Tranel, & Paradiso, 2012; Cacioppo, Capitanio, & Cacioppo, 2014). The study finds that individuals with lower cognition at age 73 years may be at a slightly higher risk of becoming lonely, whereas the reverse was not found (i.e., higher loneliness was not associated with risk for lower levels of cognition). In summary, these studies suggest that interactions between cognitive and social networks in early life may influence late-life cognitive outcomes.

In this editorial, I highlight the important role that networks play in sensory and physical processing, cognition, and social behavior in older adults. Moving forward, how might network-based insights be translated to improve cognition and well-being in older adulthood? The intriguing studies collected in this special issue show that difficulties with sensory processing, whether it is visual or auditory, can result in poorer cognitive performance in older adults. Thus, helping older adults to improve their sensory processing with assistive devices is likely to also increase their cognitive performance. Another key finding in this special issue is that cognitive strategy use is linked to better cognitive and physical performance outcomes in aging. This issue also examines how social and societal networks can enrich early-life experiences and lead to better cognitive performance in late life. These articles make a strong case for a network approach to studying aging that allows for the examination of the interaction of systems ranging from biological to cognitive and social as a useful way to study and improve the aging experience. Future studies examining this issue may use sophisticated network science approaches to assess more fine-grained network interactions (Bassett & Sporns, 2017; Gosak et al., 2018; Grayson & Fair, 2017). From a societal perspective, older adults are a precious resource who can support each other and their communities through important activities such as mentoring, volunteering, and caregiving.

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