Cognition and Diabetes Across the Life Span

Naomi Chaytor, Guest Editor

This *Diabetes Spectrum* From Research to Practice section is focused on cognitive functioning in individuals with diabetes across the life span. My training is in neuropsychology, a subspecialty within clinical psychology focused on understanding brain-behavior relationships through research and clinical practice. When I began my career, my work focused on providing clinical neuropsychological services to patients with a wide variety of neurological and medical diseases affecting the brain. The goal of neuropsychological assessment is typically to determine if a neurological/medical condition is affecting brain function and, if so, the consequences for daily functioning (e.g., driving or returning to work or school). Neuropsychologists are also tasked with identifying the etiology of cognitive impairment and recommending and carrying out interventions to mitigate the impact of cognitive impairments via rehabilitation efforts.

When reviewing the medical histories of patients with neurological disease, type 2 diabetes is common. However, aside from being viewed as a generic "cerebrovascular risk factor," diabetes is infrequently considered as a potential direct influence on brain function, nor is diabetes self-management considered an important set of everyday activities that cognitive impairment may affect. A common recommendation for someone with cerebrovascular risk factors and diabetes is to improve diabetes management to maximize brain health, but very little attention is paid to how a patient with cognitive impairment is supposed to accomplish this complicated task.

This changed for me when I was diagnosed with type 1 diabetes at the age of 36 years. I was struck by the cognitive complexity of daily diabetes self-management and started asking more detailed questions of my patients with diabetes given my newfound knowledge of day-to-day diabetes management. I discovered that patients would often initially say their diabetes was "controlled," but further questioning of their spouse or review of their blood glucose data would show that this in fact was not the case. I also discovered that my patients with cognitive impairment were often described as unmotivated or "noncompliant" with diabetes treatment recommendations, and some even ended up in the hospital due to mismanaging their diabetes care. I started making recommendations for cognitive rehabilitation strategies to reduce the impact of cognitive impairment on diabetes self-management, along with standard recommendations about driving and returning to work. These local efforts were not enough, however, and I have since focused my research efforts on better understanding the cognitive determinants of type 1 diabetes self-management in older adults. (My article on this topic is described below.)

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As readers will see throughout the articles in this research section, the relationship between diabetes and cognitive functioning is complex, is bidirectional, and has both similarities and important differences across age-groups and diabetes type, with some areas having a much stronger empirical foundation than others. We start this collection with a pair of articles on cognitive functioning in children and youth with type 1 diabetes. Allison Cato and Tamara Hershey provide an excellent summary of the impact of glycemic extremes on brain development and cognitive functioning (p. 197). These authors highlight the need for longitudinal studies to better understand the temporal relationships between diabetes-related factors and cognition, as well as research exploring protective factors. They advocate for considering the neurocognitive benefits of tighter glycemic control in children, as well as routine cognitive screening for youth with type 1 diabetes.

Rachel M. Wasserman and her colleagues expand on this with concrete guidelines for assessing cognition in children and youth with type 1 diabetes (p. 202). They emphasize that the goal of cognitive assessment in this population is multifaceted and includes characterizing strengths and weaknesses for academic planning and special-education services, informing decisions regarding when to increase independence with regard to self-management, and identifying other possible causes of cognitive impairment that may affect diabetes management or academic performance (e.g., attention deficit disorder). Pediatric neuropsychologists have expertise in diagnosing cognitive and emotional problems in children with medical conditions, as well as in determining how best to mitigate the impact of cognitive problems on daily functioning, including performing diabetes self-management tasks. Although the gold standard of pediatric neuropsychological evaluation may not be readily accessible in all areas of the country, Wasserman et al. provide alternative approaches that can be used, including consultation with a geographically remote neuropsychologist or other psychologist with relevant training. The articles by Cato and Hershey and Wasserman et al. both highlight the importance of early detection and intervention to prevent adverse cognitive and functional outcomes.

Next, we shift to the other end of the life span with an article by Brenna Cholerton and her colleagues on type 2 diabetes and cognition (p. 210). This excellent article reviews risk factors in midlife, such as insulin resistance, prediabetes, and type 2 diabetes, which increase the risk for mild cognitive impairment and dementia in late life, with a focus on targeted early prevention or intervention to alter these relationships. These authors make the point that it is not recommended to wait until a patient has overt signs of cognitive impairment or dementia to intervene, but rather to double efforts to address risk factors before cognitive decline starts. It is important to note that this article is focused exclusively on type 2 diabetes because there are many important differences between type 1 and type 2 diabetes, particularly with regard to disease etiology and treatment, as well as possible cognitive impairment prevention strategies. However, this work also raises important questions about the role of insulin resistance in cognition in type 1 diabetes, given that high BMI and insulin resistance are becoming more common in those with type 1 diabetes. Identifying the shared and unique risk factors for cognitive impairment in both forms of diabetes will further clarify etiological pathways.

My contribution to this section (p. 219) focuses on cognitive functioning in adults and older adults with type 1 diabetes. I summarize the existing literature in this area, as well as point out several gaps that have yet to be addressed in detail. The most notable gap centers on older adults with type 1 diabetes. As the population of adults with type 1 diabetes who are living into old age grows, there likely will be increased focus on cognitive functioning and its consequences in this relatively small but important population.

Our final article, by Rachel Hopkins and her colleagues (p. 224), addresses the practical implications of cognitive impairment in adults with diabetes by providing an approach to medical management of diabetes in patients who already present with cognitive impairment or dementia, regardless of diabetes type. The inclusion of diabetes technology as a potential cognitive compensatory aid for those with cognitive impairment holds promise, although more research is needed to provide empirical support for this use.

It is my hope that this From Research to Practice section on diabetes and cognition across the life span raises awareness of cognitive impairment as a complication of diabetes that needs to be monitored and treated, as well as the implications of cognitive impairment for independent diabetes self-management. It is acknowledged that many additional factors influence diabetes self-management, including patients' mood, education, self-efficacy, social support, and access to health care resources. With the evidence accumulated here, cognition also should be considered as a possible cause of suboptimal diabetes management in both type 1 and type 2 diabetes.

Duality of Interest

No potential conflicts of interest relevant to this article were reported.