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The Adolescent Brain: Implications for Vocational Evaluation and Assessment

Bridget Green, Cliff Oliech, and Pamela J. Leconte

Abstract

Adolescence is a pivotal time in life. During this period, individuals' brains are experiencing a second sensitive, highly developmental, period due to intense neurological rewiring. Neuroscience has provided insight about barriers that adolescents may experience during this period relatingto emotional control, decision making skills, and behavior regulation. Vocational evaluators will benefit from understanding basic neuroscience to answer the "why" behind certain behaviors observed during the assessment process. The purpose of this article is to outline the implications of adolescent neuroscience for vocational evaluators to inform their practices and assist their promotion of appropriate learning pathways for adolescents, including those with disabilities.

Keywords

adolescent brain, disability, vocational evaluation

Introduction

"The word 'adolescence' originates from the Proto-Indo-European roots 'ad' meaning 'to, toward' and 'al' meaning 'nourish, ripen.' From Latin, *al à alere (*to nourish) à alescere (inchoate form indicating 'in the process of becoming'). Therefore, from an etymologic perspective 'adolescence' means 'in the process of becoming ripe.'" (Giedd, 2015a, p. 158).

Adolescence is a pivotal period for individuals to understand who they are and how they can relate to the world. It is a time between childhood and adulthood when individuals learn about themselves, develop skills, and identify as members of the community (Giedd, 2015a; Kanwal et al., 2016). Adolescents experience intense reconstruction

within their brains. The brain begins its second sensitive period around puberty, which is referred to in research as the adolescence period (Armstrong, 2016; Giedd, 2004; Giedd, 2015a; Meltzer, 2007; Wiebe & Karbach, 2017), and it does not stop refining connections and developing until approximately the age of 25 (Geidd, 2015a; Jensen & Nutt, 2015; Meltzer, 2007). Throughout this brain development period, teenagers' and young adults' actions and decisions are driven by hormones that release a reward-like feeling after they participate in risks (Banich et al., 2013; Giedd, 2012; Jensen & Nutt, 2015). This is but one example of the changes their brains are making. These changes present challenging times for many teens, their families, educators, and others, such as vocational evaluators and career assessment and development personnel. The purpose of this article is to review aspects of adolescent brain development as it relates to learning and behaviors in order to enhance vocational evaluator practices. The article begins with basic but essential information about adolescents' developing brains. Following brief information about specific aspects of brain development, implications for vocational evaluation are discussed.

Personnel who work in career and vocational assessment, as part of career development, will benefit from learning foundational knowledge needed to effectively assess adolescents' behaviors. Many career assessment professionals and vocational evaluators have not had education regarding current research about adolescent neuroscience or how to interpret adolescent behaviors in relation to cognitive development. Vocational evaluators work with adolescents in education, rehabilitation, and other settings. Since the passage of the Individuals with Disabilities Education Improvement Act (IDEIA) of 2004 (reauthorization of earlier versions), special educators and transition specialists have tried to provide or have sought assistance from assessment specialists to plan services for students in special education. Due to the requirements under the Workforce Innovation and Opportunities Act (WIOA) of 2014 to provide services to transitioning students and young adults with disabilities, rehabilitation counselors, vocational evaluators, and other providers are serving more teenagers and young adults than in the past (Fabian et al., 2018). To fulfill these adolescent-related mandates, special educators and rehabilitation personnel need foundational knowledge of adolescent brain development. To assist and collaborate with them, vocational evaluators and career assessment specialists also need a basic understanding of working with teens and young adults whose brains are continuously developing. Without this knowledge, practitioners may misread behaviors or may provide inaccurate information to the teens and their referral sources regarding their vocational futures.

An additional layer of complexity must be considered because special educators, rehabilitation personnel, and vocational evaluators work with adolescents who have disabilities, many with multiple disabilities. Teenagers with attention deficit hyperactivity disorder, behavior disorders, brain injuries, autism, chronic illnesses, cognitive disabilities, substance abuse problems, or other disabilities may display behaviors as well as academic or work performances that could be interpreted as manifestations of their disabilities--or of their developing brains (Kubota et al., 2010). It is up to these professionals to determine which they are observing and how one might affect the other.

The Adolescent Brain

Adolescence is a critical period in one's life, allowing an individual to experience a gradual transition from childhood into adulthood (Kanwal et al., 2016). While some neuroscientists vary on the specific range of ages, the overall consensus is that adolescent brain development ranges from ages 13-25 (Giedd, 2015a; Meltzer, 2007). The brain develops from the back to front (Fuster, 2015; Giedd, 2015a; Steinberg, 2008). During this 10-year plus period, the brain is undergoing intense reconstruction and rewiring (Giedd & Denker, 2015). Adolescent development allows individuals to learn about personal identities, interests, needs, and responsibilities with others and the environment, as well as one's place in various settings (Casey et al., 2005; Steinberg & Icenogle, 2020). For example, during this developmental time, teenagers experience the right to drive, the opportunity to choose and vote for a particular candidate, to select high school and postsecondary courses or pathways, and, if appropriate, to consider and choose job opportunities based on offered benefits. Also, during this developmental period, peers and environments may influence teens' goal setting and decision-making. These influences combined with a propensity for risk-taking can lead to both positive and negative outcomes (Banich et al., 2013; Giedd & Denker, 2015; Jensen & Nutt, 2015).

Research has provided scientists, and, thus, vocational evaluators as well as other education and rehabilitation related personnel, with an initial understanding of the intricacies of the teenage mind (Armstrong, 2016; Chan et al., 2008; Jensen & Nutt, 2015; Steinberg, 2008). Through this research, one can better understand why certain behaviors during adolescent years are exhibited. There are times when teenage brains may resemble motorcycles with bicycle breaks (Jensen & Nutt, 2015). This means that adolescents can be agile in their thinking, excited in new interests, and emotionally engaged in an activity, but they may have difficulty managing time, prioritizing responsibilities, and staying focused on tasks that provide little interest. The brain's reconstruction influences an adolescent's sense of self during this period (Galván, 2017; Jensen & Nutt, 2015; Steinberg, 2008). Because they are constantly exploring their new identities, individuals in their teenage years to their mid-twenties need opportunities to learn how to respond to environmental triggers in an emotionally appropriate manner. Career exploration, as part of or separate from vocational evaluation, provides such opportunities, which eventually, may lead to career maturity. As observers of both performance and behavior, vocational evaluators document their findings to share with adolescents and those trying to facilitate their transitions into adult settings.

Puberty and Hormones

During the adolescent developmental period, various hormones influence adolescents' actions, interests, and sensation-seeking behaviors. In the early period of brain restructuring, adolescents experience a surge of hormones during puberty. Hormones create physical changes through growth of facial hair, lowering of one's voice, and having acne (Fields, 2015; Sisk, 2015). While hormones cause physical changes in teenagers, they also result in others, which adults may struggle to understand due to the differences between visible and invisible transformations of adolescents. Hormones also

exist in new forms and at new levels in teenagers' brains by way of altering levels of testosterone, cortisol, estrogen, and progesterone (Galván, 2017; Sisk, 2015; Viner, 2015). For example, it is estimated that a young male teen may experience increases in testosterone levels up to 30 times during puberty than before (Galván, 2017; Jensen & Nutt, 2015). As a result, this has a dramatic effect on their feelings, attitudes, and behaviors, which evaluators and other professionals observe, often while questioning if these new manifestations are permanent or temporary. Therefore, it is critical to provide teenagers with meaningful opportunities to explore interests and develop new behaviors.

The brain is constantly adapting and reforming connections. During puberty, teens are developing abilities to modulate or manage their behaviors (Banich et al., 2013; Galván, 2017; Joseph, 2017; Viner, 2015). For example, both adults and teenagers experience stress, but adults have experience understanding the feeling of stressors, triggers within the environment, and behaviors that help them alleviate and cope with situational pressures (Steinberg, 2007). Teenagers may have little experience navigating stressors (e.g., social hierarchy, schoolwork) and coping with these interactions, which is why they are more likely than adults to experience physical responses (e.g., stomach aches or headaches) as a result of stress (Gardner & Steinberg, 2005; Jensen & Nutt, 2015).

Understanding the impact on development and cognition across different environments for young people going through puberty, is necessary to provide appropriate services. During this stage, their hormones are connecting closely with a structure of the brain called the limbic system (Galván, 2017; Joseph, 2017). The limbic system is known as the emotional home of the brain (Galván, 2017; Jensen & Nutt, 2015). By understanding the development of the limbic system, vocational evaluators, educators, and family members can recognize and appreciate their emotional responses observed in the classroom, home, or community settings, including when using work samples or participating in situational assessments, job try-outs, or internships. While more research is needed to identify the roles of each hormone throughout puberty and on young teenagers' behaviors, adults working with them are challenged to understand the potential impact social inclusion and emotional responses may have on their performances (Gardner & Steinberg, 2005; Sisk, 2015). To identify which behaviors and performances are temporary or permanent, vocational evaluators and others must assess adolescents with disabilities across a variety of environments and during different developmental stages. Based on the knowledge that teenagers' brains are in such flux, professionals should provide on-going and diverse assessment opportunities trying to isolate the permanency of certain behaviors. What is accurate or clear-cut today, might not be true in another year.

Socioemotional and Cognitive-Control Networks

Adolescent brains have remarkable abilities to respond to triggers or cues within an environment (Fields, 2015; Giedd, 2015a; Giedd & Denker, 2015). These reactions influence neural networks and are continually adapting beyond high school. During the adolescent period, teenagers are increasing social understanding and awareness, but again, peers may influence actions and decisions (Gardner & Steinberg, 2005; Wiebe &

Karbach, 2017). This is a reason why many parents or caretakers worry about with whom and where their teens are socializing. The emotional responses being observed are, in part, due to the developing connections between the limbic system and the prefrontal cortex. The prefrontal cortex is located in the front of the brain and is responsible for planning, making decisions, and implementing complex cognition and behaviors (Fields, 2015; Galván, 2017; Giedd & Denker, 2015; Wiebe & Karbach, 2017).

Giedd (2015a) dissected the *why* behind teenagers' likely engagement in sensation-seeking and risk behaviors, which is more prevalent in adolescence than in childhood or adulthood. He reported that the limbic system, in conjunction with hormones and puberty, traditionally begins wiring with the prefrontal cortex around the ages of 10-12. As teenagers age and become young adults, the prefrontal cortex relies on networks created to implement positive decision-making skills and emotional regulation. Giedd (2015a; 2015b) also noted that these two significant regions play a pivotal role in allowing adolescents to learn about who they are and their social paradigms as they move towards more adult roles (e.g., independent living, career decision making and selection, employment).

Steinberg (2007) described the influence of the limbic system and prefrontal cortex at various times by presenting the developmental period in two overarching networks: the socioemotional network and the cognitive-control network. The socioemotional network is primarily located in the limbic system, again, often referred to as the emotional home of the brain. The socioemotional network relies on the structures within the limbic system (e.g., amygdala, basal ganglia, ventral striatum) to communicate with the prefrontal cortex (Steinberg, 2007; 2008). The amygdala takes an essential role during the initial period adolescent brain development. The amygdala, housed within the limbic system, plays a role in emotions, particularly regarding fear, avoidance, and aggression (Galván, 2017; Joseph, 2017). During early adolescent brain development, connections are heightened within the prefrontal cortex and the amygdala, which can influence emotional responses of teenagers (Giedd & Denker, 2015; Viner, 2015).

Nucleus accumbens, located in the limbic system, are critical to reward behaviors and outcomes (Galván, 2017; Joseph, 2017). For instance, nucleus accumbens activate when one seeks rewards from food, certain behaviors, sex, or mind-altering drugs (Joseph, 2017; Viner, 2015). These structures play a fundamental role in responding to emotional stimuli within the environment. Within this network, the social and emotional cues within a setting or experience can impact how the young person responds (Galván, 2017; Kanwal et al., 2016; Kubota et al., 2018; Steinberg, 2007). An example of this follows. A young man in study hall has to complete a late homework assignment. During this free time, he observes a group of peers discussing possible activities after the Friday football game. The interest toward social events and peer inclusion stimulates the socioemotional network causing the student to leave his homework duty and engage with peers. The response to participate with peers provides the reward and reinforcement for the decision (Gardner & Steinberg, 2005; Kubota et al., 2018). Steinberg (2007) asserted that "the presence of peers increases risk-taking substantially among teenagers, moderately among college-aged individuals, and not at all among adults" (p.57). Yet, more data and research on the influence of social support networks,

peers, and interests are needed to understand adolescents' emotional engagement when making choices, performing, or behaving in authentic environments, such as work settings.

The cognitive-control network is based upon connections within the prefrontal cortex and various regions of the brain (e.g., parietal lobes, anterior cingulate). These connections provide the opportunity for an individual to implement executive skills such as self-regulation, decision making, self-awareness, and planning (Steinberg, 2007; Wiebe & Karbach, 2017). As the adolescent brain is continually developing well into a person's mid-twenties, the cognitive-control network follows the same trajectory (Khurana et al., 2018). As the young person matures, so does the development of the network, allowing individuals to implement developing emotional control throughout decision-making processes, such as trying out work and making decisions about future careers they wish to pursue (Steinberg, 2007).

The Prefrontal Cortex

The prefrontal cortex is located behind the forehead in the front of the frontal lobe and plays an essential role in complex functioning, receiving communication from the cerebral cortex (Chan et al., 2008; Fuster, 2015; Poon, 2018). The prefrontal cortex, the last portion of the brain to develop, is the home of the executive functions, or cognitive skills that are involved in goal-oriented behaviors or actions (Fuster, 2015; Meltzer, 2007). Examples of executive functions are goal setting, working memory, attention, initiation of tasks, problem-solving, and time management (Poon, 2018; Meltzer, 2007). As these skills are developing, it is possible that encouraging adolescents to identify one career interest or goal too early may be unfair due to on-going exploration of their new identities. At best, their career or vocational interests may be fluctuating. However, as they gain more exposure to careers and vocational information, and as their prefrontal cortices continue to form, they may be better able to respond more realistically and concretely to making career choices. This underscores the rationale for ongoing career counseling that includes career exploration, assessment opportunities, and work-based learning (Fabian et al, 2018; Oertle & O'Leary, 2017; Test et al. 2009).

Executive functions, housed within the prefrontal cortex, assist individuals with decision-making, regulation, planning, working memory, emotional control, time management, behavior regulation, and attention (Poon, 2018). These goal-oriented behaviors are important for career development. As adolescents age closer to their mid-twenties and have more experiences refining and reinforcing connections within the prefrontal cortex, it becomes easier for them to evaluate risk while being emotionally charged, managing time, and creating or participating in goal-oriented tasks (Fuster, 2015; Gardner & Steinberg, 2005; Giedd, & Denker, 2015). Adolescents' career aspirations change from fluid to more concrete goals as they age, especially if they have had the opportunity to participate in career exploration, work sampling, community-based vocational assessment (i.e., situational assessment, on-the-job evaluations, job try-outs), or other work-based experiences.

Additionally, executive functions are crucial for successful employment. Adolescents' minds are continually being influenced and wired based on experiences within their environments (Fields, 2015; Jensen & Nutt, 2015; Poon, 2018). Therefore, when environments provide access to job shadowing, internships, and work-based learning and work experiences, their skills and executive functioning improve. The more exploratory experiences we provide adolescents, the better prepared we will be to target interventions that support executive functioning needs within actual work environments. The following sections describe decision making, working memory, and self-regulation as three examples of executive functioning relevant to adolescents' evolution in career exploration, choice-making, and engagement in vocational planning.

Decision making. Decision making is integral to adolescent development, and outcomes of teens' choices and decisions drive their judgment. Researchers have identified factors that play a role in adolescents' decisions, which include avoidance, motivation (e.g., peer influence), and potential achievement of personal goals (Banich et al., 2013; Kanwal et al., 2016). Yet, sensation-seeking behaviors can make it difficult for executive functioning skills, which allow for the coordination of thoughts and actions, to prevail. As vocational evaluators we must recognize that adolescents may have the skills to choose an appropriate behavior but may still be influenced by peers or emotions. Again, using multiple assessment experiences, techniques, and tools over time as adolescents age will help us isolate which decision-making information is most consistent and typical.

While teenagers are known for their high emotional response to external triggers, they are able to make choices or decisions without risk. Research has found that, when calm, teenagers can make choices and evaluate risks parallel to those of adults (Giedd, 2015a; Steinberg & Icenogle, 2020; Zimmerman et al., 2016). It is key to identify the environmental factors (e.g., peer-avoidance, intrinsic motivation) that may trigger an initial emotional response, which, in turn, can influence the positive or negative decisions an adolescent makes (Poon, 2018; Zimmerman et al., 2016). For example, when asked by a parent, "What are the consequences of speeding at night?", an adolescent may respond by stating a person may lose control of the car, or that causing a crash could harm others. However, when given the opportunity, the same teen may not overcome the desire to test the speed capabilities of a sports car while driving with peers. Novelty of the environment combined with sensation-seeking behaviors may override one's interpretation of risk, and may trump one's executive processing (Poon, 2018; Zimmerman et al., 2016). Thus, it is necessary that teenagers' have opportunities to practice and apply decision-making skills across a variety of environments. These decision-making opportunities also can reinforce working memory.

Working memory. Working memory is an executive function that provides a person with the capability to maintain and manipulate information (Steinberg & Icenogle 2020; Zimmerman et al., 2016). Working memory is vital to learning as a whole, and to developing decision-making skills in a variety of environments (Meltzer, 2007). There are two types of working memory, visual and spatial, which influence how an individual temporarily holds information (Wang et al., 2017). Adolescents' working memories provide opportunities to consider outcomes to a situation and determine which decision

to execute by taking in information within the environment and executing a goal-oriented behavior (Jensen & Nutt, 2015; Wiebe & Karbach, 2015). Choosing the best result may be impacted by the psychosocial conditions within the person's environment, again causing one to seek a reward associated with peers (Zimmerman et al., 2016). Further, environmental stimuli may distract adolescents and hinder their ability to hold information to complete a required task. It is common that adolescents can behave differently around peers than they do when they are alone (Steinberg & Icenogle, 2020), which reinforces the importance of self-regulation.

Self-Regulation. Self-regulation is an executive function that evaluators and others can easily observe throughout adolescent development (Dučić, et al., 2018). While adolescents' logical reasoning development can peak around the ages of 14-15, their self-regulation continues to grow throughout the second sensitive period (Casey et al., 2005; Poon, 2018). Self-regulation provides them with abilities to implement coping skills that may lessen the influence of external stimuli within the environment. This can be challenging for some when there are constant sensation-seeking cues swaying decisions and desires. Age and the connections being made in different parts of the brain can impact adolescents' ability to implement executive control and emotional and behavioral self-regulation (Jensen & Nutt, 2015; Steinberg 2007; 2008). Adolescents report that they dislike delaying gratification and prefer immediate rewards over those they could receive later, even if the delayed reward was greater than the reward instantly offered (Banich et al, 2013; Steinberg & Icenogle, 2020). Understanding the reasons for and nuances of decision making, working memory, and self-regulation allows vocational evaluators to gauge adolescents' readiness for career planning, formulating paths to achieving career goals, and eventually working in a satisfying career or employment.

Implications for Vocational Evaluation

Vocational evaluators have always collaborated with other professionals to provide optimal services (Dowd & French, 1991; Fourteenth Institute on Rehabilitation Issues, 1987) and used teachings from different disciplines within their practices (Leconte, 1994; Pruitt, 1986). Lessons from neuroscience simply add another type of collaboration which will inform vocational evaluation practices particularly for adolescents.

Understanding career trends helps vocational evaluators educate all clients about emerging careers. Having detailed knowledge of specific types of jobs assists in matching clients' attributes with work requirements, and using neuroscience can assist in explaining why teenagers may be responding emotionally during different assessment experiences and environments. Because vocational evaluators routinely observe adolescents as they perform tasks and respond to a variety of assessment techniques and instruments, they can identify some concrete aspects of their executive functioning. Specifically, they can describe teens' problem solving, decision making, and planning behaviors as they perform work-based tasks. Remaining aware that they are observing executive functions while identifying patterns of behavior allows them to note which executive functions are dominating. Vocational evaluators can use neuroscience to meet adolescents where they are developmentally and to individualize assessment processes. As noted earlier, depending on their findings, it may be necessary to recommend

additional assessment later in a teen's development. The following sections address general implications of neuroscience for vocational evaluation including social and emotional needs, executive functions, decision making, working memory, and self-regulation.

Social and Emotional Needs. When vocational evaluators and career assessment professionals observe certain, adolescent social (e.g., when among peers, a teen laughs while receiving directions for completing a task) and emotional (e.g., a teen displays fear about using a welder's tourch to run beads) responses, they need to ask teens privately *why* they are behaving so. Throughout assessment processes, professionals can try to figure out where in the evolution of adolescents' socioemotional and cognitive control networks the adolescents are at the time. If teenagers participate in vocational evaluation which includes work, real or simulated, as the focus, (i.e., career-related internships, job try-outs, actual competitive work experience), they may behave differently than they typically do in school or the community. Evaluators often note that when participating in work-based experiences, adolescents become more serious and focused.

The constant communication between both the socioemotional and cognitive-control networks provides opportunities to observe and assess career-related skills, interests, and abilities. By offering multiple career exploration opportunities and on-going assessment activities throughout the adolescent period, vocational evaluators, transition personnel, and others can assess changing interactions between brain networks observed as behaviors. Specifically, they can note communication interaction with the prefrontal cortex and implementation of behaviors to achieve a goal. Using these opportunities, evaluators and other professionals can determine which interests, preferences, and goals may be permanent as opposed to temporary. Again, evaluators frequently observe that when adolescents participate in work sampling or community-based vocational assessment, their attention and behaviors are more focused and they are intent on performing well, regardless of whether peers are around or not. Using career information systems such as the O*Net that can be integrated into adolescents' transition planning efforts may appeal to their intellectual curiosity, but actually "trying out" the tools, materials, equipment, etc. of different types of work may create more meaningful, lasting, and emotionally-engaging learning experiences.

Executive Functions. As stated above, a major purpose of the prefrontal cortex is to represent and execute "new forms of organized, goal-directed action" (Fuster, 2015, p. 1). Executive functions, housed in the prefrontal cortex, constantly communicate with various brain lobes or cortices to ensure that a behavior or skill is implemented (Jensen & Nutt, 2015). With such communication between different lobes, a feedback loop occurs, which supports the prefrontal cortex and assists in implementing specific goal-oriented behaviors. For instance, Richards et al. (2015) reported that children with dysgraphia and dyslexia have more functional connections throughout the brain than a control group without disabilities. This meant that individuals with dyslexia and dysgraphia had to work through more connections throughout the brain to execute the behavior of writing, while the control group had fewer, more streamlined connections. Simply, it took longer than peers without disabilities to complete the task. Furthermore,

researchers have documented executive function needs relating to implantation of goal-oriented behaviors with handwriting with people who have these specific disabilities in dysgraphia and dyslexia (Berninger & Richards, 2010). Evaluators and educators must understand the effectiveness and time associated with executing goal-oriented behaviors by individuals with disabilities to identify and accommodate potential needs that may surface in the workplace.

Some individuals may have a disability that provides a clear rationale for potential executive dysfunction as Richards et al. (2015) reported, while others may have a disability that may only surface under certain environmental stimuli or pressures (Steinberg, 2008). Therefore, it is critical individuals with disabilities have access to practice skills in authentic work environments while they explore careers so vocational evaluators have opportunities to observe potential barriers. For example, if the individual has thirty minutes to create an appetizer, a vocational evaluator will be able to observe executive functions needed to successfully complete the task such as time management, emotional and behavior regulation, task sequencing, problem solving, all while under pressure to create a dish that is edible.

Decision Making. Environment can play an important role in decision-making processes. Vocational evaluators have unique opportunities to provide formal and informal data from assessment experiences, especially those which are work-based, to equip adolescents with information on which they can build skills to make informed choices that will benefit their futures. Also, teenagers must become aware of who in their social support network may encourage risky, sensation-seeking behaviors (Poon, 2018) and how they respond to these influences. By providing on-going assessment processes, adolescents (and observers) can track if or how they are creating pathways that will support critical thinking while being aware of emotional influences. In addition, they also are developing self-awareness across different environments which can provide insight to interests, preferences, and temperaments related to different jobs. While individuals may be aware of making safe decisions when calm (Jensen & Nutt, 2015), they will eventually understand environmental factors that influence sensation-seeking behaviors and on-the-job performances. Vocational evaluators can provide opportunities informed by both informal and formal assessment that support decision-making skills, after which they can craft meaningful and specific recommendations. These will reinforce teens' executive function and decision-making needs, particularly within different learning or work situations.

Working Memory. Working memory, the ability to hold pieces of information for a short period of time, is required for learning, reasoning, and decision-making skills (Galván, 2017; Jensen & Nutt, 2015; Wang et al., 2017). Working memory is an executive function that is necessary for daily functioning, collaborative communication, and critical and abstract thinking (Wang et al., 2017). For example, in one study, individuals with autism spectrum disorder (ASD) were found to have superior visuo-spatial working memory that may act as a form of compensation for their difficulties with language (Wang et al., 2017). Evaluators and others can look for the presence of executive functions, such as working memory, which may exist as a skill or as a need, for some adolescents with disabilities. By specifying as much information as possible about

working memory and other executive functions, vocational evaluators and those who use their reports can support adolescents and educate them about how some of their needs may also be strengths. Also, observation of work performances and behaviors can be tracked to identify patterns regarding working memory and other executive functions to share with teachers, job trainers, or employers. If needs exist, environmental cues or visual accommodations can be recommended to support the individual.

Understanding teenagers' abilities to take in and absorb career and job-related data to execute skills and facilitate choices will give evaluators insight about their visual and spatial working memory, especially as these relate to transferrable skills and inform potential environmental accommodations and supports. Relating observations and subsequent recommendations about how adolescents learn to navigate stimuli within environments as they perform tasks, can provide insight about their preferred way to learn and practice skills. Supporting potential working memory needs can encourage success on the job (e.g., doing a task analysis so that distinct steps are apparent and understood by the individual). Accommodating adolescents' working memory needs, or any executive function, allows more energy for them to execute job-related behaviors. Thus, vocational evaluators' recommended task-related supports can help to ensure that adolescents have the cognitive bandwidth to implement behavior regulation for job success.

Self-Regulation. Self-regulation and working memory are necessary executive skills for coping with external stimuli pertaining to safety and success. Both of these executive functions are required for discourse and foundational social skills. For example, Dučić et al. (2018) reported that when focus was given to individuals with intellectual disabilities' working memories, their self-regulation and social skills improved. By observing and describing the external cues and accommodations that support working memory, vocational evaluators are highlighting teens' self-regulation skills to promote appropriate social skills for employment success.

Vocational evaluators often report observations of self-regulation in action while adolescents are participating in hands-on or authentic assessment. In fact, some evaluators have used video evidence to convince disbelieving referral sources, educators, and parents that teens can exercise self-regulation deemed appropriate for work requirements. This is useful if these behaviors differ from frequent lack of self-regulation behavior in school or at home. Watching a young person, who may have a history of "inappropriate behavior" or lack of self-regulation in classrooms, effectively operate a computer-assisted drafting activity or accurately demonstrate health care tasks, such as applying a splint or taking and recording blood pressure, provides evidence that the adolescent is capable of self-regulation. As vocational evaluators describe these positive behaviors to adolescents and include these findings in their reports, adolescents may realize they have the skills to implement self-regulation beyond tasks they find emotionally engaging. As with many teens, they may depend on the level of interest or the desire to do well in a simulated or authentic environment versus in a typical classroom.

Conclusion

The adolescent period provides distinct opportunities for learning and development. As their brains are undergoing intense reconstruction (Giedd, 2012), adolescents are discovering new interests, trying to understand peer-influences, and are increasingly involved in potentially risky behaviors. Also, they are learning how to engage in and implement executive functions appropriate for situations in various, and often, new environments. Vocational evaluators are in unique positions to observe and try to understand adolescents in both calm (e.g., one-on-one interviewing, locating specific information on O*Net) and emotionally engaging environments (e.g., performing a graphic arts battery of work samples or a situational assessment using a metal lathe in a Career Technical Education program's machine shop). As a first step, evaluators can revise task and general observation forms to include executive functioning elements. By including these on all forms, they can track patterns of decision making, sequencing, problem solving, working memory, self-regulation, self-awareness, planning, time management, attention, etc.

To provide equitable and optimal services, evaluators should try to access and acquire continuing education in adolescent development with an emphasis on the brain. Without such shared knowledge across disciplines, some personnel may mistakenly interpret adolescent behaviors as disinterest or disengagement (Jensen & Nutt, 2015) or inability, while actually they are witnessing the changing anatomy of teens' brains (Kanwal et al., 2016). With continual education about how teen brains develop, in conjunction with providing multiple opportunities for assessment across different environments, vocational evaluators can continue to demonstrate the relevance of their services to adolescents with and without disabilities as they plan their futures and recognize the need to develop career, college, and employment readiness skills. At this point, professional associations, such as the Vocational Evaluation and Career Assessment Professionals (VECAP) association, hopefully will advocate for graduate programs to integrate information about adolescent brain development in their curricula and should provide a series of short-term training or webinars about the subject. To do less could shortchange adolescent participants in career assessment and vocational evaluation services.

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About the Authors

Dr. Bridget Green is an assistant professor of Special Education in the Department of Counseling, Psychology, and Special Education at Duquesne University. Her research focuses on understanding the needs of students who have disabilities transitioning into college and employment, transition assessment, and developing best practices to ensure students with and without disabilities have access to meaningful career-based assessments in the general education classroom. Other interests include disability rights, accessibility for all, and self-advocacy for the disability community.

Cliff Oliech is a Ph.D. candidate and a graduate teaching assistant at Duquesne University pursuing a special education degree. He has a master of science degree in education from Duquesne University and is also a graduate of Maseno University in Kenya, from where he holds a bachelor of education in special education degree. Before joining Duquesne University, Cliff taught in Kenyan public school systems where he taught high school level students science between 2011 and 2018. His research interest is in transition and behavior among individuals with autism and intellectual and developmental disabilities.

Pamela Leconte worked as a vocational evaluator in community rehabilitation program settings and in public schools and served on the Commission on Certification of Vocational Evaluators and Work Adjustment Specialists for almost nine years and was a Certified Vocational Evaluator. For over 30 years she served on the faculty in the Special Education and Disability Studies Department at George Washington University. While there she directed the Collaborative Vocational Evaluation Training Master's and Education Specialist program, initiated the online Master's and Certificate programs in transition services, and taught a variety of courses, including vocational evaluation, legal issues and disability policy.