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The Role of Executive Function Skills for College-Age Students

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Abstract

This paper is a review of executive function skills and the role of these skills in college students. Executive functioning allows individuals to process their surroundings and manage oneself in order to successfully complete a task. During college, students are attempting to balance various aspects of their lives. Effective use of executive functioning can allow a college student to be successful across all areas of their life. However, when a breakdown in executive functioning occurs, students may have difficulty achieving goals and balancing their demanding lives. These students may benefit from speech language therapy services. This literature review brings together information regarding executive functioning across various domains of a students' life: academic, social, vocational, and independent living. The information collected provides the framework for executive function in college level students and functions as an introduction to the therapy manual.

Introduction

Executive function is the term used to describe a set of skills that controls a person's overall cognitive control. It is a person's ability to manage cognitive resources in order to function efficiently (Cooper-Kahn & Dietzel, 2019). While there are many different lists of executive functions, they all generally speak to the same capabilities. Cooper-Khan and Dietzel (2019) listed eight different components that make up executive function: inhibition, set shift, emotional control, initiation, working memory, planning/organizing, and self-monitoring are the seven domains. All of these skills facilitate self-regulation and adequate function in a given environment. Each specific skill as described by Cooper-Kahn and Dietzel (2019) are described below.

Inhibition is the ability to appropriately stop a behavior. This includes stopping impulses, physical actions, one's speech, and thoughts. Another skill is set shifting, which is moving between tasks or situations flexibly. This allows a person to properly react to a change in the environment. Emotional control is one's ability to manage an emotional response and think logically. This level of control can allow a person to think rationally by setting aside unnecessary feelings. Initiation is another executive function. This is the ability to start a task, activity, or process independently. Working memory is a person's ability to temporarily retain and manipulate information in order to complete tasks. Planning and organizing is the ability to manage and formulate tasks and demands. A person also needs to be able to organize materials so they are able to create a sense of order. Lastly, a person needs to self-monitor, which is being aware of performance and how it compares to the standard of what is expected (Cooper-Kahn and Dietzel, 2019). All of these executive function skills are important for everyone, especially students in college.

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Academics

Universities and colleges are centers for knowledge and learning. Students attending these institutions are responsible for completing rigorous coursework; this can be a challenging adjustment. Dembo and Seli (2008) note one of the main differences from high school academics and college academics is the student-directed learning environment. In high school, classrooms are general teacher-directed with the teacher leading the students through tasks and assignments (Dembo & Seli, 2008). High School students can generally be successful using minimal time and effort preparing their course work and studying. College academics generally require more responsibility and a different set of learning skills from those used in high school. To be successful at the college level, students need to be accountable and spend increasing time and effort on their coursework. Jacobi (1991) asserts it can be predicted that a student involved in their educational learning process will have academic success and graduate from their program. Dembo and Seli (2008) explain the four skills that relate to successful academic performance: "learning from text, learning from lectures, preparing for exams, and taking exams" (p.24). To execute these tasks students will need to refine and utilize their higher cognitive skills referred to as executive functions; inhibition, working memory, planning, set-shifting, self-monitoring, and emotional control. Executive functioning skills allow for the completion of goal oriented behaviors and influence academic achievement (Turkstra & Byom, 2010).

College students commonly have demanding schedules with various responsibilities, coursework being just one aspect of their life. However, academics are central to the idea of colleges and universities; success in this area is crucial for many reasons. Most institutions require their students to maintain a certain grade point average (GPA) to maintain enrollment.

Majors or specific colleges within universities also have GPA requirements for students transferring or entering into their program. Additionally, academic success and GPA are influential on future employment. Robin Reshwan of U.S. News (2016) spoke with managers from companies around the United States; she states that employers utilize GPA in order to decrease the number of potential candidates and as a gauge of future job performance. She explains that GPA can indicate how well a potential employee can handle pressure, their ability to learn, and their motivation for success. Academic success is vital to remaining within a desired program and can allow for a better and wider array of potential job offers.

Inhibition

In situations where concentration is required, the brain can inhibit inappropriate or unwanted thoughts in order to ensure focus on a given task. This is critical to the learning processes, especially in the collegiate setting. College level academics require long term success; poor inhibition or impulsivity may lead to emphasis on short term results (Spinella & Miley, 2003). St Clair-Thompson and Gathercole (2006) explained that inhibition is an essential function, allowing for acquisition of knowledge. The interference of inappropriate memories is distracting and can be detrimental to achieving a set objective; college students may find themselves distracted during lectures, going off topic in a paper, or spending too much time on an assignment. In such situations, inhibitory control functions takeover and hinder the memory or thought and allow for a more appropriate response (Hulbert & Anderson, 2008). Hulbert and Anderson (2008) stated whether it is participating in an academic discussion, writing a paper, or studying for a test, students are dependent on their ability to stay on task and inhibit unwanted responses. Spinella and Miley (2003) noted the inability to inhibit impulsivity corresponds with lower achievement scores and grades. Possessing and maintaining adequate inhibitory control

can allow a student to be more efficient and successful in completing assignments, test taking, and managing their academic requirements.

Working Memory

College level academics require students to continually learn new complex information, process, and manipulate it for a given task. In order to do this successfully, students need to be able to efficiently utilize working memory across contexts. Pearson (2016) explains working memory as a type of short term memory that allows for quick management and processing of information. During a college lecture, a student is required to paraphrase and transform information from instruction into their notes and assignments. A student will also need to remember task instructions and keep their place within a given reading or assignment. These tasks require the ability to remember and manipulate information, working memory (Pearson, 2016). Working memory should be utilized across classes and subjects. Effective and efficient working memory is vital for success specifically in "math, reading comprehension, complex problem solving, and test taking" (Pearson, 2016, p.5). The ability to be successful in these areas is highly influential on academic achievement.

Planning

College students rarely have just one item on their to-do list. Students may be trying to balance academics, work, and social life. In order to be successful, most students need to plan and prioritize their academics with the rest of their responsibilities. Petersen, Lavelle, and Guarino (2006) explained that planning is a skill linked to increased performance on educational tasks and retention within collegiate programs. The ability to formulate a plan requires the identification of the steps needed to complete a particular intention (Petersen et al., 2006). For college students planning may consist of mapping out multi-step tasks such as long-term class

projects and judging which assignments are most important to handle first ("College Executive Function Coaching", n.d.). Krumrei-Mmancuso, Newton, Kim, and Wilcox (2013) state organization and related skills are good predictors of GPA. Conversely, an inability to properly prioritize and plan a schedule may lead to student distraction and neglect of demands. Procrastination is normal, especially in college with competing social pressures and the abundance of new opportunities. Prioritizing and planning ahead can help decrease the amount of procrastination and allow for students to balance their workload.

Set-Shifting

Wixted, Sue, Dube and Potter (2016) described set shifting as the ability to appropriately change a behavior or cognitive action in response to a shift in context. During lectures, professors often transition between topics and students may attend several classes throughout the day. To successfully navigate these shifts students should be able to adapt their mindset to allow for the change in context and content. Similarly, set shifting is utilized when studying and completing assignments or maneuvering between tasks and concepts. Set shifting can also be explained as a change in perspective to formulate different solutions to a given problem ("College Executive Function Coaching", n.d.). This is a skill that can help students take the perspective of their professors and peers. Set-shifting is a skill needed for adequate problem solving and is crucial to college level learning (Wixted et al., 2016).

Self-Monitoring

College students face increasing amounts of stress, distractions, and academic demands. In order to be successful learners, it is imperative that students utilize self-regulatory skills (Petersen et al., 2006). Students need to reflect upon themselves and determine what helped them to be successful or what hindered their success. From there, students may further self-check to

ensure they carry out the proper steps to success. Young and Fry (2008) explained students are more academically successful when they are aware of how they learn and apply that knowledge to various settings. Students may self-monitor their behavior through goals and reflective activities such as analyzing behaviors linked toward achieving goals (Petersen et al., 2006). Self-monitoring is also involved in a student's ability to manage time and distractions. Successful time management has been linked to academic success; students control of their time ensures all tasks are completed and goals are met (Petersen et al., 2006). Students with adequate self-monitoring skills can identify potential distractions and take the proper steps to avoid these distractions. Self-monitoring skills allow college students to understand themselves and regulate their interactions in order to be successful.

Emotional Control

College level academics are demanding, students need to be able to process and manipulate new complex information. These skills require our emotions to be controlled and kept within a zone that will allow for alertness and readiness. Valiente, Swanson, and Eisenberg (2012) explained the relationship between emotion and academic success, stating negative emotions (anxiety, anger, fear, sadness, and frustration) can be inversely associated with GPA. Specifically, situational or dispositional anxiety has been associated with poor academic achievement. Anxiety has been linked to poor test performance, low course grades, and in some cases risk for school dropout (Valiente et al., 2012). Students experiencing these negative emotions need to be able to identify and adapt their emotions to allow for their learning experience. Conversely, overly positive emotions have the possibility to take away from academic achievement (Valiente et al., 2012). Valiente et al. (2012) differentiated between high-arousing positive emotions (excitedness, exuberance, and elatedness), low-arousing positive

emotions (relaxedness and contentedness), and those in between (joy, hope, and pride). Researchers have found that the “in between” positive emotions should be the goal zone for academic success (Valiente et al., 2012). Krumrei-Mmancuso et al. (2013) stated a student’s emotional and life satisfaction are variables that influence GPA, students are more successful when they are able to control feelings of anxiety and depression. Emotional control relies heavily on an individual's ability to self-monitor, identify an unproductive emotion and change one's own mind set associated with the emotion (Krumrei-Mmancuso et al., 2013).

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Social

Being social is a major part of life on a college campus. Some students choose not to engage in social activities and are perfectly content. Other students struggle socially and it negatively affects their time in school. McCabe (2016) reports that having friendships in college can provide students with both academic and emotional support. It may also enable students to engage in meaningful and stimulating conversations in and out of the classroom. Having a support network with friends may allow a student to cope in a more comfortable setting. If there are students whose social needs are not being met, they may not have access to any of the supports and engagement they need to have a positive college experience (McCabe, 2016). There are times when students may have difficulty adjusting to college life because they are unable to effectively engage socially.

A person's social life can also affect one's quality of life. Christakis and Fowler (2009) stated that a person's social network can impact health, happiness, and emotions. Portes (1998) suggested that in some cases, relationships can be harmful to a person. For example, a friend group may limit individual freedom or expression. While having friendships and carrying out a social life has many positive benefits, a person also needs to be able to manage social relationships. Coleman (1961) stated that students need to be able to create strategies for when friends get in the way of academics. It is perfectly healthy to spend time away from academics, but students need to be able to withdraw from friends to study and do homework if they do not share the same academic goals. While social time in college can take away from school, other social acquaintances can actually enhance a student's academic experience through motivation and by working as part of a team to succeed in college (McCabe, 2016). It is important for

students to build needed and productive social relationships while in college to help them both academically and emotionally.

Students who have difficulty managing their executive function, might struggle socially. As will be described below, students may have difficulty with one, a few, or all aspects of executive function when they engage in social communication.

Inhibition

Inhibition is an executive function skill that may benefit or hinder a person's social ability. While speaking with friends or a group of unfamiliar people, one needs to be able to gauge what would be appropriate or inappropriate to say. A person needs to be able to inhibit a negative response during interpersonal conversation and conflict. If a student does not use a skilled level of inhibition, it can lead to being perceived as rude, judgmental, or immature (Barkley, 1997; Fuster, 1997). There have been multiple studies that link disinhibition and attention deficit/hyperactivity disorder (ADHD). People without ADHD may also struggle with disinhibition, but research has suggested there may be a relationship between the impulsive and hyperactive behaviors of ADHD and disinhibition (Hilton, Jarrett, McDonald, & Ollendick, 2017). A student who struggles with attention or any other executive function, may have difficulty responding appropriately to peers. Inhibition is a skill that can help a student develop proper conversational discourse through appropriate responses and turn-taking.

Working Memory

Working memory is a crucial skill needed to engage in meaningful conversation. It helps a person listen to a speaker, gather visual stimuli, and retain that information while trying to use it to communicate with the social partner (Baddeley, 2007). People who struggle with working memory may be perceived as inattentive because they struggle to keep up with conversation and

respond inappropriately to questions or comments. People with ADHD or other attention deficits may not be able to efficiently use working memory due to a lack of attention (Bunford et al., 2015). If there is a student with ADHD or a student who has working memory deficit for any reason, it may be difficult to attend to other speakers and struggle to build social relationships because they are not attentive communication partners.

Planning/Organizing

Planning is important for both in-the-moment and future communication. While talking to someone, one needs to be able to plan a response to a person's question or comment, and also inhibit an irrelevant remark. That person may also need to plan ahead for a conversation or situation that is going to happen. This may include catching up on current events so that one is ready to discuss them with a large group, or it may be as simple as looking on someone's social media account to get a better sense of a person's hobbies or interests (Barkley, 1997; Fuster, 1997). Being able to plan what you are going to say is crucial to having a normal-paced conversation. If a person is always taking long pauses before a response, others may perceive them as having lower intelligence. As with working memory, students who have difficulty paying attention to details or in general conversation, may struggle to plan and organize (Bunford et al., 2015). This could cause difficulty when trying to plan or organize and event, or just organizing a conversation and planning what to say during it. Being able to plan before or during a conversation is crucial to maintaining a topic and showing interest to communication partners.

Emotional Control

Emotional control can influence how a person communicates. A student's ability to control emotions can have an effect on their relationships and also overall well-being. Emotional

intelligence is a critical skill that is needed for controlling emotions (Gross, 2002). There are four abilities that work together to process emotional information. A person must be able to perceive and differentiate between emotion, utilize emotional differences to organize thinking, and regulate the emotions of themselves and others. These qualities are crucial for social interaction because emotions may be involved in said interactions and are a way to connect with a communication partner (Keltner & Haidt, 2001). Emotional control is very important because it influences how the speaker is perceived by a partner. If a person displays a pleasant emotion, they are more likely to have a favorable interaction. If someone has a more negative emotional display, it may be more difficult to connect and sustain interactions with people (Argyle & Lu, 1990). If a college-age student does not have emotional control, they may not be a desired communication partner and become isolated.

Lopes, Salovey, and Straus (2003) indicated that students who had better emotional regulation were more likely to have an increased number of positive relationships, a decrease in conflict within close relationships, and had a greater sense of companionship and support from friends and parents. In addition, Lopes, Salovey, Cote, and Beers (2005) assessed how young adults with emotional regulation felt about their social life. Their participants generally felt that they were more likely to enter social situations and were viewed favorably by peers if they had strong emotional regulation. It is critical for people to have control over their emotions in social situations in order to establish positive social relationships.

Set-Shifting

One of the more general executive functions is set-shifting. It can be used in a variety of ways and also in addition to other executive functions. Set-shifting is the ability to switch between multiple tasks, operations, or situations (Miyake et al., 2000). When a college-age

student struggles with set-shifting, they may be inflexible to change and have difficulty responding to rapidly evolving or changing stimuli. If a person is unable to shift, they may find it hard to talk to different people, socialize in different situations, or stay engaged with a conversation that has changing topics. While interacting, one needs to be able to suppress old actions, schemas, or responses in order to adopt new ones (Ridderinkhof, Span, & Molen, 2002). If a person is unable to do this, it is known as a perseverative behavior, which is being unable to suppress a repetitive thought or behavior.

A person needs to be able to implement a new set of communication to replace the old one, or it may be hard to participate in a quick-moving conversation (Miyake et al., 2000). An example of poor set shifting would be when a person reverts back to old conversational talking points when the other speakers have already moved past it. Another example of poor set-shifting is when a person goes from talking to a classmate to a professor. The student may need to change set in order to sound more professional in front of faculty, after talking to a friend in a completely different manner. Lastly, it is important to shift across environments as well. A student may have difficulty if they are not able to gauge what is appropriate in all contexts (Miyake et al., 2000). Set-shifting is an important skill for college students while they are socializing. The student will need to engage working memory to help them shift in the moment, and it will help them interact more easily with peers in a variety of situations.

Initiation

Being able to initiate a conversation is very important for a college-age student, and it can help or hinder one's ability to create friendships or connect with professors. For people who are socially cautious, it can be difficult to initiate a social interaction. This may be because previously, there was a lack of success when trying to begin other conversations. An individual

may have past frustrations or uncomfortable memories that prevent them from wanting to engage with others socially. Others may not have the skills or the drive needed to walk up to someone and begin an interaction (Moreno, 2012). Students who have difficulty initiating conversation likely will need guidance and practice on how to start a conversation.

Self-Monitoring

Socialization relies heavily on a person being able to regulate emotions and expressions. Friedman and Herringer (1991) said that regulation of emotional expression is just as important as what is being said. An emotional state can change the message of the speaker and influence the conversation with the communication partner. If someone is unable to properly convey emotional expressions, that person may be seen as less likeable (Riggio & Friedan, 1986). Being able to self-monitor in social situations entails being aware of other aspects of communication as well. One needs to be self-aware of vocal loudness, body language, gestures, and observing personal space of others. In addition, a person also should be mindful of the status between communication partners, attitudes that are being portrayed, and that the message they want to send is the message being received by the listener through expressive and non-expressive behaviors (Snyder, 1974). A big part of self-monitoring during a conversation is being able to censor what is said and what non-verbal communication signs are being given to the listener.

Goffman (1955) stated that being able to control one's spoken language is a prerequisite to social interaction and functioning. If a college student wants to have what they see as a successful social life, they need to be able to plan, enact, and control social behaviors. Snyder (1974) indicated there are specific qualities a person can demonstrate that would show high self-monitoring skills. These individuals rely heavily on social cues to navigate through a conversation. They also have high interpersonal and situational skills and are able to quickly

tailor conversation accordingly. These students are able to set-shift quickly, relying on organization, emotional control, and working memory. Individuals with low self-monitoring skills are not as responsive to situational or interpersonal differences. Being able to self-monitor while socializing can be imperative to being perceived as a likable person to different kinds of socialization partners. Changing the way one communicates with an array of social partners is critical for college students, as college campuses tend to have a diverse population of people from different cultures, backgrounds, and past experiences.

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Vocational

Many college students seek employment to independently manage the cost of tuition due to the limited availability of student loans and financial aid. College students with a job are able to pay for other expenses such as apartment rent, textbooks, groceries, and any other additional expenses. However, a job requires more responsibility because they will need to quickly learn how to balance the social, academic, independent living, and vocational responsibilities to be successful in each aspect. There are some college students who prefer not to be employed due their hectic academic and social schedule and having the responsibilities of a job may lead to negative consequences in all aspects. Although being employed as a college student can increase workload and responsibilities, some students are able to hold a job in addition to their coursework and other obligations. Employed students may require a more developed and refined set of executive function skills.

The highest order of cognitive function is executive order because it controls the lower-order cognitive functions. Executive functions facilitate the process of goal attainments by modulating and coordinating various cognitive processes. A well-developed set of executive function skills are crucial to be successful in college and in work settings. College students, regardless of being employed or not, must develop their inhibition, working memory, problem-solving, planning and organization, emotional control, set-shifting, initiation, and self-monitoring. The ability to complete job related tasks such as meeting deadlines, scheduling appointments/changes in a schedule, interacting with co-workers and supervisors are only some of the crucial aspects experienced in a work environment. Students who do not develop their executive function skills may experience negative impact on their job performance. Students who struggle with executive function skills may forget deadlines or may complete tasks in an

inappropriate time frame, such behaviors can negatively affect their performance and job satisfaction (Rumrill et al., 2016). Individuals who have had a traumatic brain injury (TBI) demonstrate increased difficulties with executive function. TBI individuals commonly lose their job within 90 days of initial employment (Rumrill et al., 2016). Similarly, college students may demonstrate difficulty fulfilling the expectations of a job without the habitual progression of executive function skills. A well-developed set of executive function skills are essential for students to prosper and to achieve job satisfaction. It's crucial for college students to continuously refine their executive functions skills in order to succeed in all aspects of college and especially with an additional responsibility of maintaining employment.

Inhibition

Inhibition is one of the components of executive function and can assist a student in meeting job expectations and performance satisfaction. Inhibition is related to an individual's behavior and allows an individual to control and restrain natural, dominant behaviors or tendencies when necessary (Zhang, Zhang, Cao, Chen, 2018). Renn, Steinbauer and Fenner (2014) researched correlations among employee behavioral activation systems, behavior inhibition systems, and employee withdrawal or turnover. Researchers found that the behavioral activation system and behavior inhibition system are linked to anxiety, stress, depression and impulsiveness. Uncontrolled anxiety, stress, and depression combined with impulsive behavior can over time, manifest into dissatisfaction in the workplace and possible turnover (Renn et al., 2014). Regarding college students, various aspects of college can cause anxiety, stress, depression, and impulsive behavior. Employed college students might experience a higher degree of stress, anxiety, or depression in addition to impulsivity. Underdeveloped inhibitory control can increase impulsivity, which can in turn lead to inability to complete job-related tasks

and decrease job satisfaction. For example, an employed college student may be distracted by their cellular device or other distractions that can prevent them from completing their work-related tasks, which can decrease work quality and productivity.

Another research study focused on cognitive functions, such as inhibition, and how they relate to achieving an individual's desired goals. Allan, Johnston, and Campbell (2011) researched the relationship between attainting dietary goals and appropriate implementation of executive control processes. They found individuals who performed well in executing cognitive functions were more likely to improve or achieve their dietary intentions and individuals who demonstrated well in inhibition were unlikely to deviate from their intended dietary restrictions (Allan et al., 2011). Similar to the example regarding employed college students, if students are able to continuously and effectively suppress automatic and dominant responses that are not line with current task aims, they will most likely exceed job performance and satisfaction. The ability for employed college students to successfully demonstrate inhibitory control positively correlates to their capacity to increase productivity and efficiency in their workplace and reduces the likelihood of overturn and job dissatisfaction.

Working Memory

Working memory increases success in a work environment because it allows an individual to filter and process new information that is relevant to complete a specific task (Zhang et. al., 2018). Developed working memory results in positive work engagement and job satisfaction because it is responsible for updating, processing, maintaining and storing information, as well as retraining irrelevant information within short-term memory (Kulikowski & Orzechowski, 2019). This cognitive ability allows a person to meet complex work related tasks and goals, and to increase overall work engagement. Kulikowski and Orzechowski (2019)

investigated the relationship between working memory capacity and fluid intelligence and how they each affect work engagement and human cognitive capacities. These writers found working memory facilitates goal attainment, and the ability to solve complex problems and to increase one's potential to be a valuable resource. Working memory can facilitate an individual's ability to reach their potential in their work environment and to be viewed as a competent and valuable asset. This can lead to the likelihood of a promotion and reduce likelihood of turnover (Kulikowski & Orzechowski, 2019). For employed college students, refined working memory will be a resource that allows them to understand, shape, and control various aspects that facilitate successful goal attainment and raises levels of work engagement.

Emotional Control

Emotional control is another executive function skill that takes time to develop and can be valuable in one's success in achieving vocational aspirations. Emotional control allows individuals to choose an appropriate behavior to express to the current situation and to suppress unprofessional conduct. Without proper emotional control in a work place, an individual might demonstrate unprofessional behavior resulting in decreased job performance or even termination. Robbins, Allen, Casillas, Peterson, and Huy Le (2006) developed a student readiness inventory using a rational-empirical approach in order to plan and measure motivational skill, self-regulation, and social engagement. The purpose of their study was to develop a reliable and valid psychometric scale to predict both retention and college performance. Researchers found that social activity and emotional control helped predict academic performance and retention; emotional control was important in management and regulation. In relation to employed college students, when a student encounters a conflict at work, his ability to resolve the conflict without demonstrating inappropriate behavior highly depends on his emotional control. The manner in

which the student resolves the conflict and handles the situation will reflect upon his professional integrity. If a student demonstrates poor and unprofessional behavior, it can result in a negative work environment and, depending on the degree of misbehavior, can result in turnover.

Set-Shift

Set-shifting allows an individual to work on one task and then change to another among multiple tasks (Zhang, et al., 2018). Employed college students depend on the ability to switch among tasks in order to complete activities of daily living. Set-shifting allows them to switch between different cognitive tasks and make relevant, corresponding responses. In a working environment, it is natural to encounter frequent sudden changes requiring additional tasks to be completed. Sokka et.al (2017) investigated the association between the severity of burnout and shifting between task sets. The results suggested that severe burnout is associated with inability to process rapid set shifting due to poor job performance. It was found that adequate rapid task switching between simple to complex task sets is commonly associated with goal-directed attention. In relation to employed college students, in a workplace, they are required to complete several tasks at once. Set-shifting allows them to focus on specific targets and ignore unrelated stimuli to reduce distractions and modify their behaviors accordingly. For example, a student who works as a waitress/waiter frequently engages in set shifting when they're taking down orders, placing orders in the kitchen, and bringing out the food to multiple tables ranging from small to significantly large parties. College waiters/waitresses won't be successful in their work environment if they are unable to efficiently switch their attention from one task to another. A well-developed set-shifting skill can decrease the likelihood of experiencing severe burnout and turnover in a work environment.

Initiation

Initiation is a critical component of executive function; it is simply the ability to start a task. Initiation continues to develop, especially during the typical college years. Every day college students are called on to overcome procrastination and start on unwanted tasks. Before becoming employed, college students need to initiate the employment process by researching available jobs within their interests, contacting the organization, setting up and preparing for the interview process. The entire job process is only possible if the student is able to initiate each step of the sequence. In a work environment, employed students are given new tasks each day to complete by a certain deadline. If they are unable to initiate a task and give themselves adequate time to finish the task, then there could be negative consequences. In a study researching the quality of life in adults with a learning disability, researchers found participants with impaired executive function skills such as initiation had lower scores on questionnaires regarding quality of life (Sharfi & Rosenblum, 2016). The results of the study show that individuals with limited initiation also had difficulties in daily functioning. Although not all college students have a learning disability, without initiation, it would be difficult to initially find a job and maintain employment without the executive function of starting the task first.

Self-Monitoring

Self-monitoring is a later developing skill because it requires individuals to observe and evaluate their own behaviors. This practice facilitates the transfer of training and can encourage improvements in various aspects of life over time. College students learn to become more independent by living on their own while balancing the academic and physical health in order to maintain or improve quality of life. Guarino, Michael, and Hocevar (1998) investigated self-monitoring skills between genders regarding academics and social integration. They found that participants who had better self-monitoring skills had a clearer understanding of their actions and

behavior in relation to its social consequences. Such individuals were able to consider various perspectives outside of themselves for cues about how to respond in different situations and were more situationally controlled (Guarino, et al., 1998). However, participants who demonstrated a lower ability to self-monitor tended to invest in themselves emotionally in particular situations and to openly display their attitudes and dispositions. Guarino, et al. (1998) found that negative consequences occur socially and academically to students with poor self-monitoring skills. Similarly, employed college student who cannot demonstrate well-developed self-monitoring skills are less likely to control their actions, emotions, and dispositions, are most likely experience negative consequences in their work environment.

Planning and Organizing

Planning and organizing are also critical skills to continuously develop as a college student and as a student who is employed. Vocational tasks require employees to plan and organize multiple and complex tasks to meet job requirements and attain goals. Academically and vocationally, students are required to plan tasks, track assignments, and meet deadlines. Kofler et. al (2018) conducted a research study regarding working memory and organizational skills problems in ADHD. These authors concluded that individuals with ADHD exhibit an organizational impairment across multiple settings. They found that individuals with an organizational impairment demonstrated difficulty with consistently predicting, planning, executing, and maintaining goal-directed actions. Although not all employed college students have ADHD, college students who have a planning and organization impairment may demonstrate more difficulty meeting deadlines and work expectations resulting in negative job performance and dissatisfaction. Employed college students who have an underdeveloped planning and organizing skill set may frequently misplace materials, come to work unprepared,

and display a disorganized workplace resulting in more negative consequences. It's important for employed students to have the ability to plan and organize in their workplace, so they are seen as reliable, and able to exceed work expectations and responsibilities and have successful job performance.

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Independent Living

Introduction

For many college aged students, independent living is first experienced when beginning a college career. Independent living can include (but is not limited to) time management skills and punctuality, maintaining a budget, grocery shopping, cooking/nutrition, self-care and hygiene, personal safety, housekeeping skills, and managing transportation (Milani, n.d.). Regardless of age, individuals have perceived independence and other attributes such as "relationships, intrinsic values, financial concerns, accomplishments and cognitive functioning to be important to aging successfully" (Charbonneau-lyons, Mosher-Ashley, & Stanford, 2002, pg. 833). Prior to college, students may rely on family members or caregivers to assist with activities of daily living (ADLs). Traditionally, ADLs have been divided into two categories which are instrumental activities of daily living (IADLs) and basic activities of daily living (BADLs) . IADLs facilitate independent living while BADLs are considered basic habituated behaviors (Jefferson, Paul, Ozonoff, & Cohen, 2006). Examples of IADLs include "telephone use, food preparation, medication management, meal preparation, housekeeping, laundry" (Jefferson, et al., 2006, p.311). Examples of BADLs include "feeding, toileting, bathing, grooming, ambulating, and dressing" (Jefferson, et al., 2006, p.311).

While limited research has been published about executive functioning and its relationship to successful independent living in college aged students, research has been done to observe this relationship in individuals with dementia, autism, and other diagnoses. These studies can help highlight the importance of executive functioning and its effects on daily independent living.

Inhibition

Inhibitory control can have effects across all aspects of successful independent living. Some research has suggested that “the relationship between inhibition and IADLs is not driven by one IADL in particular, but rather the relationship is consistent across multiple instrumental activities” (Jefferson, et al., 2006, p.317). In other words, the ability to have inhibitory control across all activities of daily living is crucial to successful independent living. Therefore, while some instrumental tasks of everyday living may seem to warrant more inhibitory control, like managing finances, other tasks, like laundry, still affect an individual's ability to live independently. When shopping for household items or groceries, students must be able to inhibit thoughts or desires to buy items that they cannot afford. Similarly, students must be able to inhibit the desire to buy or consume unhealthy foods for all meals. Research has also suggested “susceptibility to interference while performing instrumental functional activities is more important to the integrity of IADLs than other executive functioning elements, including planning, sequencing, generation, or working memory” (Jefferson, et al, 2006, p. 317). This is not to say that these areas of executive functioning are not important to successful independent living, but rather than inhibition must be addressed in order to successfully live independently.

Working Memory

While inhibition place a crucial role in the ability to live independently, working memory also plays a large role. Research has “argued that working memory and inhibition are practically inseparable constructs that comprise the core of [executive functioning]” (Best, Miller & Jones, 2009). This is because when using working memory and an action is activated, other actions must be inhibited. However, working memory, unlike inhibition, involves the ability to process, maintain, and manipulate information over brief periods time (Best, et al., 2009). Working memory is needed to perform many cognitive tasks such as reading, problem solving, or learning

(Baddeley, 1983). In order to live independently a student must be able to maintain and manipulate information in order to successfully carry out activities of daily living. Adequate working memory skills may also affect student safety. For example if a student had to handle a fire drill in the middle of the night, acquire safe and reliable transportation, or flooding, they must be able to process and manipulate information to ensure their safety as well as address the problem at hand (Adreon & Durocher, 2007).

Planning and Organizing

The ability to plan and organize efficiently and effectively is a crucial part of success for college aged students. Students must be able to schedule classes, time for homework, jobs, planning meals, and more. In addition to organizing and managing their time, they must also be able to organize the environment they live in. Martin, Quintin, Hall and Reiss (2016) suggested that planning is one of the most complex executive function skills because it is involved with problem solving. Problem solving situations that require planning and organizing may include budgeting, managing bank accounts, and shopping, which are all essential to living independently (Adreon & Durocher, 2007). Research has shown that executive functioning skills, specifically the ability to plan and organize, are crucial for students academic and vocational performance (Miller, Nevado-Montenegro, & Hinshaw, 2011). The inability to successfully plan and organize could result in students neglecting their finances, academics, and living environment.

Emotional Control

When first beginning college, students will be exposed to many new and potentially challenging changes. Students must be able to adapt to these changes in order to be successful across all aspects of their college career. Emotional control refers to the ability to

"self-manage or regulate attitudes and feelings" (Robins, Oh, Le, & Button, 2009). In order to live independently students must have emotional control to handle the potential stress of managing and completing ADLs. Students must also be emotionally prepared to live independently without the support of parents, guardians, or other caregivers. Additionally, research has suggested that a students ability to have emotional control along with motivational and social control can have direct effects on academic performance, which can indirectly affect the overall success of a college student (Robins, et al., 2009).

When observing the effects of independent living on students' health, researchers discovered that living at home compared to living independently may subject students to less peer pressure. Students who are living independently and are subjected to peer pressure may engage in health-risk behaviors such as smoking or drinking (Jones, Harel, & Levinson, 1992). If a student has strong emotional control and executive functioning skills, they may be able to more easily manage and regulate their feelings in order to support a healthy lifestyle.

Set Shifting

The ability to be cognitively flexible, manage various tasks, and attend to relevant stimulus is a critical part of executive function known as set shifting (Fleming, Heintzelman, & Bartholow, 2016). Specifically, set shifting can allow an individual to "attend to relevant stimulus features that only moments earlier were irrelevant, while simultaneously ignoring now irrelevant features that previously were important" (Fleming, et al., 2016). This is important for independently living because students must be able to attend to various activities of daily living while simultaneously attending to the environment they live in. A study observing set shifting in children with ADHD, specifically their ability task switch, after cognitive training discovered that "performance improvements in executive control functioning can be achieved" (Kray,

Karbach, Haening, & Freitag, 2012). In other words, improving task switching abilities can improve executive functioning skills, which can help an individual successfully live independently.

Initiation

Planning, organizing, and problem solving are all important factors that can allow a student to successfully live independently. However, without initiation these factors may not possible. The ability to initiate activities or actions can "influence an individual's ability to interact with the world and live independently" (Martin, et al., 2016, p. 499). When living alone, students are expected to initiate whether it be cleaning, cooking, managing bills, or performing other ADLs. In some cases, students who wish to disclose a disability must initiate contact to receive proper accommodations (Adreon & Durocher, 2007). In regards to independent living, students may have to initiate contact with a resident assistant or leasing company. If a student is struggling to live independently, they must initiate to ask for guidance or assistance. Without initiation, a student may struggle to perform simple tasks and therefore struggle to successfully live independently.

Self Monitoring

While initiation is important for student success, students must also be able to self monitor. Self monitoring may encompass a student evaluating their own performance, holding themselves accountable for completion of ADLS as well as creating and monitoring goals to ensure they are maintaining their ability to live independently. In most college settings, "students are responsible for advocating for themselves" (Adreon & Durocher, 2007, p. 276). However, for a student to advocate for themselves, they must also be aware of limitations that are hindering their ability to live independently.

Conclusion

The ability to live independently is reliant on various domains and cognitive processes. Independent living would not be possible without the ability to inhibit, engage in working memory, plan and organize, have emotional control, set shift, initiate, and self monitor. College students must be able to manage and complete activities of daily living in order to promote their health, safety, and prepare them for their future beyond college.

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Executive Function Treatment

Clients with impairments in executive functioning are commonly unaware of their specific deficits, this may cause them to have difficulty changing problematic behaviors. Clients are also going to have specific needs due to the different presentations of executive function impairments. To these factors, Gurd, Kischka, and Marshall (2010) argue that deficits in executive functioning skills are some of the most challenging areas to treat within the SLP scope of practice. The authors continue to explain that patients may have underlying impairments, such as attention and anxiety that should be targeted in therapy as well. SLPs targeting executive functioning skills in therapy should utilize evidence-based practice and provide patient and family education and training.

Environmental Modifications

Patients may need modification to the therapy environment or daily surroundings in order to be successful. Environmental modifications can include adjustments to physical surroundings or social setting where a person is performing executive functioning tasks (Gurd et al., 2010). Some patients may benefit from changing the layout or reducing distractions of the therapy room. Socially, patients can reduce background noise and distractions by moving to quieter areas. The SLP and the patient should identify potential causes of distraction and frustration and take the steps to minimize these potential disturbances.

Compensatory vs. Restorative Therapy

Therapy targeting the implementation of compensatory and/or restorative strategies is a common way to treat cognitive deficits (Gurd et al., 2010). Restorative therapy aims to restore or reestablish a lost function; whereas, compensatory therapy attempts to implement new ways of

doing things to minimize the effects of the lost function (Horn, n.d.). Every patient will benefit from a different combination of the two therapy approaches.

Prioritizing Deficits

When developing treatment goals and long-term outcomes, SLPs should communicate with the patient and his/her family (Gurd et al., 2010). The clinician should use patient and family perspectives, patient functional needs, available resources, and clinical knowledge to determine a treatment approach. This will allow the clinician to prioritize the patient's deficits prior to implementing a therapy intervention.

Functional Activities

Gurd et al. (2010) argued that activities and tasks used for intervention should be practical and functional based on the client's goals. Therefore, modifications should and can be made to therapy activities to make them client specific. The authors further explain that the SLP should avoid implementing tasks that are constrained, these activities would allow only for the SLP to be accountable for correcting the patient's performance. Clients should be able to identify their errors and self-correct. Clients may also benefit from stages of intervention, these stages would slowly increase in complexity until mastery of the skill, this is evident in short- and long-term goals. Gurd et al. (2010) explain the importance for patients to generalize skills developed in therapy; to allow for this, treatment should be delivered across a variety of settings and using functional daily activities.

Counseling

Speech therapy is highly interactive, a piece of this interaction is counseling. American Speech-Language-Hearing Association (ASHA) (n.d.) states a therapist can provide either informational counseling or personal adjustment counseling. Information counseling is more

educational and involves explaining and discussing various aspects of disorders, therapy, strategies, outcomes, and more. Personal adjustment counseling is more client centralized and addresses their emotions and beliefs. A clinician should use both approaches with clients. According to Misra and McKean (2000) students commonly report anxiety and strong negative emotions throughout their college experience. An SLP will need to utilize both counseling methods in order to help the client manage these emotions and find ways to cope with their stress. White, Ollendick, and Bray (2011) report the population of college students with autism spectrum disorder (ASD) has risen considerably in the past two decades. This population is at risk for varying levels of anxiety and depression. Speech therapy for students with ASD and will likely involve large amounts of counseling services.

Conclusion

This paper provides the framework for executive function in college level students and functions as an introduction to the therapy manual. Each lesson provides step-by-step intervention, including activities and materials. This manual is housed in the Eckelmann-Taylor Speech and Hearing Clinic Materials Room. Each activity within the manual includes accommodations corresponding to deficits in attention, hearing, and vision. Best practice for executive function training was taken into account during the development of this therapy manual. Please refer to the manual for a 16-week therapy program. This therapy program was created specifically for improving the executive functioning skills of college level students.

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