Self-Report Assessment of Executive Functioning in College Students with Disabilities

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Abstract

This study presents a unique assessment of executive functioning (EF) among postsecondary students with disabilities, with the aim of understanding the extent to which students with different disabilities and in different age groups assess their own difficulties with relevant and educationally-adaptive skills such as planning, initiating, managing time, staying on task, and controlling emotions. Students from a large Midwest public university applying for and/or receiving services at a university-based disability office (n = 50) completed the Behavior Rating Inventory of Executive Function- Adult Version (BRIEF-A) and a demographic questionnaire. Study groups were formed according to participants' self-reported disability or disabilities—including attention deficit hyperactivity disorder (ADHD), psychiatric disabilities, learning disabilities, traumatic brain injury, autism spectrum disorder, deaf and hard of hearing, and/or visual impairment—as well as those reporting single versus multiple disabilities and freshman versus all other class standings. Results revealed elevated EF ratings by students in the ADHD and psychiatric groups, particularly with regard to metacognitive skills. Freshman students reported less frequent EF challenges than older students, and identifying with more than one disability group was not a risk factor for elevated EF scores. Practical implications are discussed in terms of the utility of EF self-assessment in this population, and in supporting metacognitive strategies for postsecondary students with disabilities.

Keywords: Executive functioning, self-report, college, disability

This study was developed as a result of the authors' experiences working with postsecondary students with disabilities and the anecdotal observation that students seeking accommodation services often identify challenges with some aspects of executive functioning (EF). The brain processes associated with impairments in EF have functional implications in everyday life, especially with academic learning. Challenges or weaknesses in specific areas of EF can create inefficiencies in school and difficulty demonstrating knowledge, compromising for example, study skills and test performance (Kornell & Metcalfe, 2006). Therefore, this study addresses what may be ostensibly considered an initial step: exploring self-perception of EF.

While postsecondary students who disclosed a disability comprise approximately 11 percent of the total postsecondary population (National Center for Education Statistics, 2009), graduation statistics indicate that college students with disabilities are underrepresented in students who earn a degree. The National Center for Education Statistics (2009) reports that half of enrolled students with a disability earn a degree compared to two-thirds of their peers who do not have a disability. With this knowledge of specific EF domains of strength and challenge that students perceive, practical mechanisms can be identified for supporting postsecondary students with disabilities toward the management and organization of goal-directed behaviors that promote academic achievement and, ultimately, degree attainment.

Executive Functioning

Overview and conceptualization. The DSM-IV defines EF as the ability to think abstractly and to plan, initiate, sequence, monitor, and stop complex behavior (American Psychiatric Association, 2000). However, researchers have proposed a number of working definitions for the umbrella term which may represent distinctly different—yet interrelated—abilities that all contribute to desired goal-directed behaviors. Examples of some of these concepts include anticipating, planning, strategizing, organizing, inhibiting, monitoring, shifting, initiating, self-regulating, adapting, judging, and deciding (Gioia, Isquith, Guy, & Kenworthy, 2000; Gioia, Isquith, Retzlaff, & Espy, 2002; Mahone et al., 2002; Mangeot, Armstrong, Colvin, Yeates, & Taylor, 2002). In a review of the historical evolution of conceptualizing EF, Royall et al. (2002) identified two major themes that emerged: that EF (1) are higher order *cognitive functions* such as will, abstraction, and judgment, which are acquired skills that can be directly measured, and (2) these function to *control* the execution of complex activities. Indeed, personal agency is required to produce desired outcomes over time, and that a sense of self-efficacy—essential for developing human agency—is reflective of one's cognitive control abilities and contingent upon the experience of successfully executing complex activities.

The interrelated behaviors indicative of EF are necessary for cognitive and behavioral problem-solving (Gioia et al., 2002). For example, when faced with a task such as writing a college-level paper, a student must formulate a goal (e.g., producing a written product within topic guidelines and other limits), expect particular outcomes (e.g., desired grade received, positive self-evaluation, ownership of the final product, encouragement/reinforcement from others), and subsequently employ sets of strategies (e.g., visualizing, cognitive and behavioral planning, regulating emotion, creating/accessing a work-conducive environment) to use materials and resources (e.g., research materials, computer/software, adaptive technology) within specified limits (e.g., time) in order to successfully complete the task (e.g., submitted written product). These interrelated steps are indicative of the individual's executive processes that facilitate independent goal-attainment. Indeed, individuals rely on such processes on a daily basis to self-direct behavior within all tasks that are novel and/or complex and require effortful responses (Henry & Bettenay, 2010).

Suchy (2009) outlined seven approaches to defining EF: (1) overarching evolutionary purpose, (2) clinical syndromes, (3) complex skills, (4) elemental neurocognitive processes, (5) atheoretical approaches, (6) neuroanatomic substrates, and (7) constructivistic definitions. The applicable settings and purposes for examining EF are diverse and apply to clinical applications in rehabilitation, health promotion, educational interventions, medical and surgical interventions, and substance abuse treatment. Approaches to conceptualizing EF constructs in line with Suchy's definitions thus largely depend on the setting and purpose of the researcher or clinician, such that a psychologist or educator might be interested in functional behavioral applications to the concepts while a neurosurgeon would be interested in the direct influences of specific brain structures.

While it is recognized that the conceptualization of EF is still evolving, there seems to be a consensus among researchers that EF refers to brain circuits that prioritize, integrate and regulate other cognitive functions and provide a mechanism for self-regulation (Vohs & Baumeister, 2004). EF has been referred to as the management system of the brain that controls and facilitates several cognitive or brain processes including, for example, cognitive flexibility, initiating appropriate actions and inhibiting others, planning/organizing, working memory, self-monitoring, and emotional control. This definition of EF provides the theoretical and practical framework for this study focused on self-perception of EF strategies and skills among postsecondary students with disabilities.

Furthermore, EF will be understood as a combination of complex cognitive processes that promotes successful task completion through self-directed behaviors. This conceptualization of EF is most consistent with two of the approaches outlined by Suchy (2009): the complex skills and constructivistic approaches. The complex skills approach defines EF by the behavioral skills that are considered to fall under the "umbrella term," including such skills as planning, reasoning, problem-solving, organizing, and social appropriateness. Describing EF by identifying a set of skills that are purported to fall under the term can be helpful because the terms can be operationalized, observed, and reported on fairly readily, and research outcomes involving any of the skills can be explained in understandable terms. This definition values the extent to which executive functions emerge and are observable

in everyday life. The constructivistic approach values theoretical models that introduce new constructs or latent variables into the understanding of EF (Suchy, 2009), which could include the notion of a "central executive" that Baddeley (1998) has proposed. This concept can be useful in separating functional analyses from anatomical localization, as the central executive places a greater focus on understanding the complex behavioral subcomponents of EF before attempting to localize particular brain structures responsible for those behaviors. Suchy (2009) proposes a "tripartite" model of EF that consists of the abilities to (1) form, (2) maintain, and (3) shift mental sets. This model of delineating executive processes into three major subcomponents can be useful in conceptualizing EF in a manner that accounts for the complexity of the concept while including factors included in each of the definitional approaches presented in this review.

EF, Disability and the Tasks of Postsecondary Students. Given the complex and higher order nature of EF, the development and maturation is more prolonged suggesting ongoing development into adulthood. For example, self-regulation of both emotion and behavior can extend through adolescence and early adulthood (Span, Ridderinkhof & van der Molen, 2004; van der Molen, 2000; Zelazo, Craik, & Booth, 2004). Therefore, EF processes are continuing to develop and mature during the time that many individuals are involved in postsecondary education, which is a key focus of this study.

EF challenges are identified among many disability groups. Barkley (2012) asserts that the underlying psychological difficulties in ADHD giving rise to symptoms of inattention and distraction and hyperactivity involve deficits in all of the major EFs, and each of these EFs is a type of self-regulation – a special form of self-directed action. Morris et al., (1998) note that many students with learning disabilities experience impairments with EF. Furthermore, many researchers have suggested that students with EF impairments can experience functional limitations including difficulty with activating and sustaining effort across time, regulating intense emotional reactions to daily frustrations and effectively managing the transition to postsecondary environments given the greater demand to organize and maintain goal-directed behavior (Parker & Benedict, 2002). Many studies have focused on injuries and illnesses that are directly associated with brain damage/lesions or other neurological deterioration (e.g., traumatic brain injuries, stroke, Parkinson 's disease) and those that are directly associated with functional and adaptive impairment (e.g., dementia, schizophrenia; Bak et al., 2008; Jurado & Rosselli, 2007; Krpan, Levine, Stuss, & Dawson, 2007). Executive impairments are often quite obvious in these conditions and therefore a focus of intervention and rehabilitation efforts is to aggressively re-train lost skills that can support independent living or improve aspects of cognitive functioning through psychopharmacologic intervention (Reynolds & Horton, 2008; Royall et al., 2002). Despite the focus on disorders for which EF is a prominent contributor to the disability, emerging evidence that EF is associated with protective health behaviors (Hall, Elia, & Crossley, 2006), stress regulation (Williams, Suchy, & Rau, 2009), and treatment adherence (Schillerstrom, Horton, & Royall, 2005) supports broader inquiry into EF for individuals with disabilities not traditionally considered to be associated with EF deficits.

Assessment of EF. Performance-based measures of EF can be found in neuropsychological test batteries such as the *Cognitive Assessment System* ([CAS]; Naglieri & Das, 1997), the *Halsted-Reitan Neuropsychological Battery* (Reitan & Wolfson, 1993), and the *Delis-Kaplan Executive Function System* ([D-KEFS]; Delis, Kaplan, & Kramer, 2001) that have compiled similar tasks including trail-making, categorization, verbal fluency, and the Stroop effect (Stroop, 1935). Others such as the *Wisconsin Card Sorting Test* (Heaton, Chelune, Talley, Kay, & Curtiss, 1993) and the *Connors' Continuous Performance Test* (Connors, 2004) are stand-alone instruments to measure aspects of EF in a clinical setting. Aspects of EF are also tapped by widely-used intelligence tests. For example, the Block Design subtest of the Wechsler (Wechsler, 2008) scales requires some degree of cognitive and motor planning and strategy use in addition to the 'pure' visual-perceptual skills required to match the blocks to the stimuli. Working memory has been proposed as a central executive skill (Baddeley, 1998), and is included as a composite of the WISC-IV and WAIS-IV. The *Stanford-Binet—Fifth Edition* (Roid, 2003) includes a sorting/categorization task that elicits executive components similar to those being tapped in stand-alone sorting tasks (e.g., WCST, D-KEFS Sorting).

While performance-based neuropsychological tests attempt to measure EF constructs (i.e., planning, strategizing, shifting, etc.), it has not been reliably

demonstrated that deficits on these measures necessarily translate to deficits in real-life situations that require comparative abilities (Gioia et al., 2002). It may be argued, then, that EF tests currently used in clinical settings may lack ecological validity as a result of the narrow abilities that each test attempts to measure (Goldberg & Podell, 2000). For example, poor performance on the Stroop task might not necessarily have behavioral challenges with verbal inhibition, such as making inappropriate or impulsive comments to peers or professors.

An alternative to assessing EF via performance-based neuropsychological tests is the use of a behavioral rating scale that measures the degree of EF impairment in everyday tasks/behaviors. The *Behavior Rating Inventory of Executive Function-Adult* ([BRIEF-A]; Gioia et al., 2000) is a self- and other-report rating scale that was developed with the recognition of brain complexity and interconnectedness, but relies on a self- and/or other/ proxy-reports of practical, observable behaviors that represent facets of EF from an adult's everyday life.

There are several versions of the BRIEF normed for different age populations. The original BRIEF was designed for school-aged children and included a teacher and parent rating scale (Gioia et al., 2000). There is also a BRIEF-Preschool version (BRIEF-P; Gioia, Espy, & Isquith, 2003) and an adolescent self-report version ([BRIEF-SR]; Guy, Isquith, & Gioia, 2004). The BRIEF was originally developed to provide a standardized measure of EF in children that was easy to administer and score, while also generating clinically meaningful information. The adolescent version offers a self-perception component focused on the adolescent's view of self-regulatory functioning ([BREIF-A]; Roth, Isquith, & Gioia, 2005). These forms of the BRIEF with demonstrated appropriate internal consistency, stability over time, strong content validity, and good clinical utility for detecting EF challenges in populations with a variety of disabilities form the catalyst for the development of the adult based BRIEF (Roth et al., 2005).

Study Rationale and Aims

The current study was developed around three primary aims: (1) to elucidate EF factors for postsecondary students with disabilities, including an identification of self-perceptions of strengths and challenges across disabilities, (2) to establish an initial stage of utilizing self-reports of EF that can inform supportive interventions in the context of a disability services office, and (3) to provide participants with the opportunity to increase self-awareness of underlying factors that may be contributing to academic and/or social difficulties.

Method

Participants

A sample of undergraduate and graduate students in a large Midwestern university participated in this study (N = 50). All participants were in the process of applying or approved for formal classroom accommodations due to one or more disabilities through the university disability resource center, which was the sole inclusionary criterion. Demographic data are presented in Table 1. Students' electronic records – containing information including documented disability type, class standing, grade point average, and case notes – were not accessed in this study, in an effort to maintain the separation between clinical/educational and research files. Therefore, all demographic information was gained via self-report on a demographic form constructed for this study. Participants were recruited through the disability resource center through a combination of posted flyers and informational materials describing the study that were provided to students as they arrived for an appointment with the staff psychologist, an accommodations specialist, or a pre-doctoral intern. After students were provided with information describing the study, disability resource center staff did not actively recruit their clients, in an effort to prevent perceptions of coercion to participate and dual clinical-research relationships with students. Materials directed students to discuss the study with their assigned center staff if interested in participating.

Materials

The *Behavior Rating Inventory of Executive Function—Adult Version* (Roth et al., 2005) is a self-report instrument designed for individuals aged 18-90 years old and measures an individual's perception of their own EF. The BRIEF-A consists of 75 items that comprise nine clinical scales: Inhibit, Shift, Emotional Control, Self-Monitor, Initiate, Working Memory, Plan/ Organize, Task Monitor, and Organization of Materials. Table 2 presents a description of each subscale. These nine scales are summarized in two broader index scores, the Behavioral Regulation Index (BRI) and the

Table 1

Demographic Data for Study Participants

Characteristic	*n*	%	Characteristic	*n*	%
Gender			Race/Ethnicity		
Male	28	56	Caucasian/White	41	82
Female	22	44	Asian	4	8
Reported Disability[a]			Hispanic/Latino	3	6
ADHD	21	42	Other	5	1
Learning Disability	20	40	Class Standing		
Psychiatric Disability	12	24	Freshman	23	46
Chronic Health Condition	8	16	Sophomore	8	16
Autism Spectrum Disorder	2	4	Junior	3	6
Mobility Impairment	1	2	Senior	6	12
Deaf / Hard of Hearing	1	2	Graduate/Professional School	9	18
Blind / Visual Impairment	1	2	Other[b]	1	2

Note: [a]Categories are those used by the university disability resource center. Participants could identify with more than one disability category; [b]"Special Student," the term used by the study university to refer to those who take classes for credit but are not currently part of a degree program.

Metacognition Index (MI). The BRI measures one's ability to regulate emotion and behavior, while the MI measures one's ability to actively problem solve across a variety of situations. The summary score of all clinical scales is represented in the Global Executive Composite (GEC). This instrument also includes three validity scales: Negativity, Infrequency, and Inconsistency. The internal consistency of the BRIEF-A was classified as being moderate to high, with Cronbach's alpha coefficients spanning from .73 to .90 among the clinical scales and from .96 to .98 for the broader indexes and GEC. The BRIEF-A has been found to distinguish different patterns of responding between diagnostic groups including ADHD, Alzheimer's disease, mild cognitive impairment, multiple sclerosis, traumatic brain injury, and epilepsy.

Procedure

After providing written informed consent, participants completed a demographic form and the BRIEF-A while in the disability resource center before or after a scheduled appointment, or at a different time convenient for the student, scheduled during the center's standard weekday hours. All study materials were identified by study number with no identifying information aside from demographics, and participant files were stored separately from the disability resource center client file containing disability documentation and case notes. Participants were given the option of scheduling time with the staff psychologist or pre-doctoral psychology intern to discuss individual results.

Data Analysis

Self-reported disability categories were the independent grouping variables of interest for this study and determined on the basis of demographic questionnaire responses. Groups included (1) male / female, (2) those who did / did not endorse ADHD as a disability category, (3) those who did / did not endorse having a psychiatric disability, (4) those who did / did not endorse having a learning disability, (5) those who endorsed a single disability category / multiple disability categories, and (6) freshman undergraduate students / all other university class standings. Small cell sizes for the categories of chronic health condition, autism spectrum disorder, mobility impairment, deaf/hard of

Table 2

Domains of Behavior Rating Inventory of Executive Function–Adult (BRIEF-A)

Domain	Description
Inhibit	The ability to resist impulses and the ability to stop your own behavior at the appropriate time
Shift	The ability to move with ease from one situation, activity, or aspect of a problem to another as the circumstances demand. Key aspects include the ability to (a) make transitions, (b) tolerate change, (c) problem-solve flexibly, (d) switch or alternate attention, and (e) change focus from one mindset or topic to another.
Emotional Control	The ability to modulate or control your emotional responses; reacting to events appropriately, without outbursts, sudden and/or frequent mood changes, or excessive periods of emotional upset
Self-Monitoring	Aspects of social or interpersonal awareness; the degree to which you are aware of the effect that your behavior has on others
Initiate	The ability to begin a task or activity and to independently generate ideas, responses, or problem-solving strategies
Working Memory	The capacity to hold information in mind for the purpose of completing a task, encoding information, or generating goals, plans, and sequential steps to achieving goals.
Plan/Organize	The ability to manage current and future-oriented task demands. Plan: The ability to anticipate future events, set goals, and to develop appropriate sequential steps ahead of time in order to carry out a task or activity. Organize: The ability to bring order to information and to appreciate main ideas or key concepts when learning or communicating information
Task Monitoring	The ability to keep track of your problem-solving success or failure, and to identify and correct mistakes during behaviors
Organization of Materials	The orderliness of work, living, and storage spaces; keeping belongings reasonably well-organized, and finding them when needed

Note: Adapted from Gioia, Isquith, Guy, & Kenworthy (2000)

hearing, and blind/visual impairment precluded specific examination of students who identified as having a disability in one of these categories.

Data were preliminarily examined for demographic differences. Age differences were tested via independent samples t-tests for each of the disability groupings. Chi-squared tests were performed to determine whether gender and race/ethnicity were proportionally distributed across disability groups. Total GEC scores were examined and interpreted categorically as an indication of overall executive impairment reported by students in each of the disability groupings.

Variable demographic groupings within the sample were compared via planned sets of independent sample t-tests to achieve the primary study aims. To limit the number of variables tested, the Behavior Regulation Index (BRI) and Metacognition Index (MI) were initially examined for significant differences. Scales within each index were only examined in the event of significant group differences between the BRI and MI. Overall alpha level was set at $p = .05$, which was used as the value for determining significant index score differences. Bonferroni adjustment was used in each instance that individual scale differences were examined. Therefore, scales within the BRI were evaluated at $p = .0125$ and scales within MI were evaluated at $p = .01$ to determine significance.

Results

Preliminary demographic analysis revealed age differences in the ADHD and freshmen comparison groups, with older participants self-identifying as having ADHD, $t(48) = 2.45$, p = .022, and having a class standing other than freshman, $t(48) = -3.84$, $p = .001$. Gender was equally distributed within each of the disability groups. Participants who identified as a racial/ethnic minority were evenly distributed within each disability grouping, with the exception of the ADHD study grouping. In this grouping, participants identifying with racial/ethnic minority status were more likely to identify with a disability category other than ADHD, whereas Caucasian participants were evenly distributed between ADHD and other disability categories, $X^2(1) = 4.30$, $p = .038$.

Global Executive Composite. The full sample of participants endorsed overall EF to be in the average range ($M = 58.94$, $SD = 11.47$). Table 3 presents the means and group differences for each study grouping. Descriptively, male participants, those with ADHD, and those with a disability other than a learning disability endorsed an overall at-risk level of EF challenges. Participants with a psychiatric disability and those with upper class standings endorsed overall EF to be in the clinically significant range. Figure 1 depicts subscale and composite scores across ADHD, learning disability, psychiatric disability, and freshmen groups.

Gender. While both male ($n = 28$; $M = 56.14$, $SD = 12.31$) and female ($n = 22$; $M = 51.95$, $SD = 9.25$) ratings fell within the average range on BRI, male participants' mean MI fell in the at-risk range ($M = 63.82$, $SD = 12.11$), while the mean MI for female participants fell in the average range ($M = 58.18$, $SD = 11.32$). However, males and females did not differ on the BRI, $t(48) = -1.33$, $p = .191$, or *MI*, $t(48) = -1.68$, $p = .099$.

ADHD. Those who identified ADHD as a disability category had a BRI in the average range ($n = 21$; $M = 56.43$, $SD = 10.69$), with a mean MI that fell in the clinically significant range ($M = 67.86$, $SD = 11.88$). Participants who did not identify ADHD as a disability category rated both BRI ($n = 29$; $M = 52.76$, $SD = 11.42$) and MI ($M = 55.31$, $SD = 10.23$) to be in the average range. These groups did not differ on the BRI, $t(48) = 1.15$, $p = .255$. MI was significantly higher in the ADHD group, $t(48) = 3.66$, $p = .001$. Examination of MI scales revealed significant differences on Working Memory, $p = .001$, Plan/Organize, $p = .003$, Task Monitor, $p = .003$, and Organization of Materials, $p = .008$.

Psychiatric Disabilities. BRI scores were in the average range for those who reported having a psychiatric disability ($n = 12$; $M = 59.5$, $SD = 11.78$) as well as those who did not ($n = 38$; $M = 52.66$, $SD = 10.59$). The group who reported having a psychiatric disability had a mean MI that fell in the clinically significant range ($M = 69.33$, $SD = 10.39$) while the mean MI for those who did not report having a psychiatric disability fell in the average range (M=58.82, $SD = 11.44$). While these groups did not differ with regard to BRI, $t(48) = 1.90$, $p = .063$, MI was significantly higher within the psychiatric disability group, $t(48) = 2.83$, $p = .007$. The metacognitive Initiate, $t(48) = 2.67$, $p = .010$, and Plan/Organize scales, $t(48) = 3.49$, $p = .001$, were rated significantly higher by those who identified as having a psychiatric disability.

Learning Disabilities. BRI was in the average range for those who reported having a learning dis-

Table 3

Study Group Comparisons of the Global Executive Composite (GEC)

Grouping		n	Global Executive Composite (GEC)		*t*	*p*
			M	SD		
Gender	Female	22	55.82	10.18	-1.74	.088
	Male	28	61.39	12.00		
ADHD	Yes	21	63.95	11.41	2.81	.007
	No	29	55.31	10.23		
LD	Yes	20	52.75	7.59	-3.75	<.001
	No	30	63.07	11.85		
Psychiatric Disability	Yes	12	66.50	10.88	2.80	.007
	No	38	56.55	10.70		
Multiple Disabilities	Yes	15	58.80	13.00	-0.06	.956
	No	35	59.00	10.95		
Freshman	Yes	23	50.30	7.04	-6.83	<.001
	No	27	66.30	9.15		

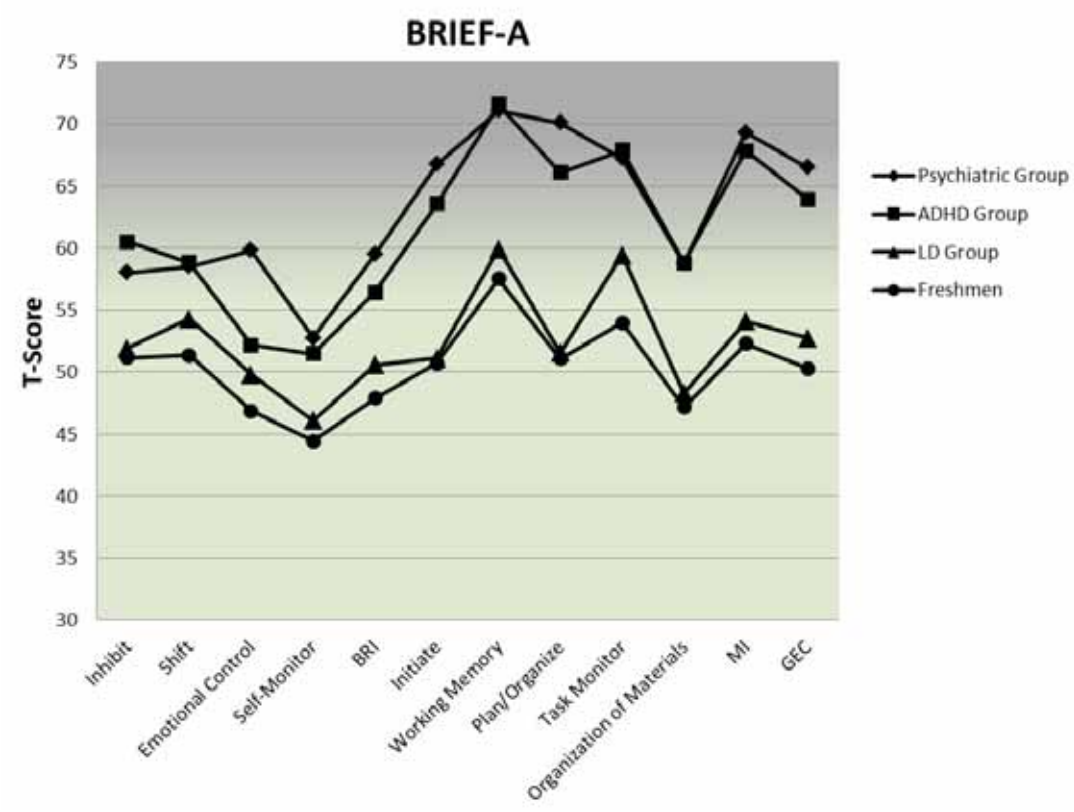

Figure 1. T-scores of study groups across BRIEF-A subscales and composites

ability (n = 20; M = 50.60, SD = 8.38) and those who did not report having a learning disability (n = 30; M = 56.77, SD = 12.20). MI was elevated in the clinically significant range for those who did not report having a learning disability (M = 66.17, SD = 12.13) and in the average range for those who reported having a learning disability (M = 54.10, SD = 7.36). These groups did not significantly differ on the basis of BRI, $t(48) = -1.97$, $p = .055$). Those with a learning disability reported significantly less frequent concerns regarding metacognition than students who reported disabilities other than a learning disability, MI $t(48) = -4.37$, $p < .001$. Metacognitive scales that were rated significantly lower by those who identified as having a learning disability in comparison to those who identified with other disability categories include Initiate, $t(48) = -4.65$, $p < .001$; Plan/Organize, $t(48) = -4.64$, $p < .001$; and Organization of Materials, $t(48) = -2.98$, $p = .008$.

Multiple Disabilities. BRI ratings were in the average range for those who identified with one disability category (n = 35; M = 54.46, SD = 11.22) and those who identified with more than one disability category (n = 15; M = 53.93, SD = 11.41). MI ratings for both of these groups fell in the at-risk range (Single Disability group M = 61.37, SD = 11.55; Multiple Disability group M = 61.27, SD = 13.38). Those who endorsed one vs. multiple disability categories did not differ by BRI, $t(48) = -0.15$, $p = .881$, or MI, $t(48) = -0.03$, $p = .978$.

Class Standing. Freshman undergraduate students endorsed average-range BRI (n = 23, M = 47.91, SD = 6.20) and MI (M = 52.30, SD = 8.22). All other students endorsed average-range BRI (n = 27, M = 59.74, SD = 11.63) but MI in the clinically significant range (M = 69.04, SD = 8.94). Scores were significantly different between these groups on BRI, $t(48) = -4.37$, $p < .001$, as well as MI, $t(48) = -6.84$, $p < .001$. Examination of scales within each index reveals significant differences across all scales, with freshman students rating themselves as having less frequent concerns than other students on all scales (MI scales p range .001 - .006; BRI scales all $p < .001$). The largest magnitude of mean difference was on the Plan/Organize scale, with freshmen endorsing average range concerns (M = 51.09, SD = 8.47) and students other than freshmen endorsing concerns in the clinically significant range (M = 67.19, SD = 11.56). Other Metacognition subscales to fall in the clinically significant range for those other than freshmen were Initiate, (M = 66.41, SD = 9.45), Working Memory (M = 71.59, SD = 10.30), and Task Monitor (M = 69.33, SD = 7.89).

Discussion

Major findings

Results suggest that college students identifying within ADHD and/or psychiatric disability (e.g., depressive and/or anxiety disorder) groups can be considered risk factors for perceiving more frequent difficulty with metacognitive skills. Students who identified within one of these disability groups reported more elevated concerns with EF compared to college students in other disability groups. Students who considered themselves as having a learning disability, however, did not report elevated difficulties with behavioral regulation or metacognitive skills, thus reporting significantly fewer and less frequent EF concerns than those who identified as having a disability other than LD. Somewhat surprisingly, identifying as belonging to more than one disability group did not have an additive effect on perceived EF challenges. Also surprising was the finding that freshmen reported significantly fewer EF challenges than students with higher class standings. While developmental evidence might suggest that younger students would have less-developed EF, an explanation for this finding may lie in the method of assessment rather than actual higher skills across the EF domains assessed. That is, freshman students may rightfully *perceive* themselves to have few EF challenges because they have had fewer instances of required independence for academic and self-management, problem-solving and formulation/execution of independent, goal-directed behavior. Older students who have been more academically and adaptively independent for a longer period, may conversely have a more accurate perception of their daily challenges with regard to EF.

Implications for Research and Practice

The finding that freshman students perceive themselves to have fewer EF challenges has tremendous implications for postsecondary support staff. Concerted efforts can focus on preventing EF difficulties from arising by providing some level of scaffolding for postsecondary academic and independent living tasks while also increasing younger students' capacities for independent problem-solving around increasing task demands over time. This finding may indicate that

freshman students may need initial support and follow-up concerning issues of EF. Those working with college freshmen in disability settings might foster more robust EF skills by (1) helping to increase awareness of supports and resources available on campus that can aid students in increasing strategies of EF; and, (2) continuing to check-in with students as they progress though their college experiences about issues of EF as areas of perceived weakness may emerge later in an individual's academic career.

In the later years of college, students with disabilities may come to a more accurate understanding of their EF-related challenges, having experienced the multiple demands for independent problem-solving and work completion inherent to college. Given the common goal in work with postsecondary students with disabilities of increasing self-advocacy regarding disability-related needs, a more accurate self-perception can foster a more accurate assessment of related needs. However, disability support specialists should be mindful of the EF processes involved in self-advocating (e.g., planning how and when to communicate needs, regulating emotions related to seeking and accessing accommodations, following through in steps necessary in accessing accommodations, and self-monitoring changing needs over time). If perceptions of greater EF challenges do, in fact, emerge in the later college years, then support staff can utilize that information to facilitate students' successes in college and foreshadow, model, and role-play situations related to independent living and employment accommodations after college.

Indeed, the process of transitioning from high school to college and from college to the workforce or graduate school could be considered large-scale cognitive and behavioral shifting. With the knowledge that college students with particular disabilities might perceive immediate task-to-task switching to be challenging, the processes of transitioning to and from college represent ideal time periods to provide targeted support to college students experiencing such shifts. The current results also discovered significant differences when grouping individuals by disability. Further exploring these differences could be informative in identifying particular EF difficulties based on disability group and lead to more effective interventions and referrals. Also, pairing disability in conjunction with difficulties identified on the BRIEF-A domains may eventually further inform clinicians on the appropriateness of specific interventions. For example, an individual diagnosed with Depression and having difficulties initiating may require different intervention than an individual with ADHD presenting with similar difficulties. While the BRIEF-A would likely not be used within a postsecondary disability services office as a diagnostic tool or as a primary decision-making method regarding eligibility for academic accommodations, its utility would likely arise for students who would benefit from individualized support in managing their EF challenges.

One fitting example of a support method that has recently increased in prevalence and for which the BRIEF-A could inform practice is that of "coaching" for individuals with ADHD, an intervention approach that has established both empirical (Kubik, 2009; Prevatt & Yelland, 2013) and qualitative evidence for its treatment utility (Parker & Boutelle, 2009; Parker, Hoffman, Sawilosky, & Rolands, 2011; Parker, Hoffman, Sawilosky, & Rolands, 2013). Much like coaching that occurs in sports or for general life or professional skills, ADHD coaching involves a focus on individualized goals within clients' daily lives, motivation-building, and assistance in addressing barriers. Each of these factors takes on a particular quality in relation to the features that define ADHD (i.e., inattention, distractibility, hyperactivity, and impulsivity) and the resulting challenges that people with ADHD might encounter in their lives can be highlighted with the BRIEF-A.

Using the instrument within a coaching model might assist in structuring communication between coach and student/client, thus acting as a mechanism for self-reflection and goal articulation. With the current results suggesting elevated perceptions of EF challenges in those students with ADHD and psychiatric disabilities – particularly with regard to metacognitive skills – a coaching model could be used to support students by assisting with concrete strategies that relate to individually-identified daily life tasks that are frequently challenging. For example, elevated domains of working memory, planning/organizing, and task monitoring might be addressed by specifically coaching students through concrete tasks and strategies such as (1) using self-talk on the steps necessary to complete a task, (2) developing a time line for completing multi-step tasks, and (3) establishing a plan for self- or external monitoring of task completion.

Whereas motivation and self-determination are central factors of ADHD coaching, the finding that EF

ratings were elevated within the older student group is both in line with developmental readiness to recognize EF-related challenges and to initiate behavioral changes given the higher stakes of academic success with the looming prospect of post-college independence. While the coaching framework has been highlighted as an applicable approach for utilizing the results of the BRIEF-A, it is important to note that behavioral coaching can be appropriately used in conjunction with other intervention strategies such as cognitive-behavioral therapy, psychoeducational programming, and/or pharmacological intervention as appropriate for each student (Kubik, 2010).

Limitations

Several issues require particular attention. First, although attempts were made to include a larger sample size, this proved to be more challenging given the dual roles of the authors (i.e., clinical staff within the Disability Services Office and researchers) and the commitment to follow the specific IRB guidelines related to recruitment of study participants (University of Wisconsin Education Research and Social & Behavioral Sciences, Internal Review Board, 2012). Second, of the 50 participants in the study 23 were freshman, who for the most part completed the BRIEF-A during the very beginning of their college experience, the first week of classes. While all participants completed the BRIEF-A independently at the Disability Services Office, the vast majority of freshmen did so within a group setting similar to a seminar style class with an authority figure present. All other participants completed the BRIEF-A either individually or with one other person, the Accommodation Specialist, also identified in a position of authority. The strong preference is to implement consistent methods throughout the study minimizing the chance for confounding factors. Finally, a control group of postsecondary students without a disability would have likely provided more robust information regarding the impact of EF both in terms of disability related issues as well as developmental factors for postsecondary students regardless of disability status.

Future Directions

Future studies should attempt to recruit more diverse samples to continue to explore potential group differences within postsecondary disability populations as well as the utility of the BRIEF-A in larger and different disability populations. As the current sample was conducted at a large Midwestern university and included a majority of Caucasian/White students, it would be useful to further determine the utility of the BRIEF-A in other postsecondary settings (e.g., institutions with varying missions, sizes, locations) and greater variation among study participants in terms of, for example, ethnicity, class ranking, and disability.

Another area of future study is to explore the stability of BRIEF-A domains over time. The current study results indicated that significant group differences existed between college freshmen versus other class standings in regards to EF. A potential follow-up study would be to monitor BRIEF-A responses at the individual level over the course of enrollment to determine if fluctuations occur in relation to an underlying developmental process as individuals progress through college. The construct of self-awareness, a possible basis to the EF differences between college freshmen and other class standings, should be further studied by use of additional self-report measures of self-perception and informant report in conjunction with the BRIEF-A to determine the relationship of self-perception and BRIEF-A profiles.

Investigating response patterns of postsecondary students with disabilities on the BRIEF-A pre- and post-intervention is a future direction that can further explore the clinical utility of this instrument as well as the effectiveness of various interventions on improving EF over time (i.e., coaching, cognitive-behavioral therapy, psychoeducation, and/or pharmacological intervention). With increased knowledge regarding the utility of the BRIEF-A as an instrument to increase self-awareness and monitor progress of a targeted intervention, EF factors may be more routinely and widely considered in postsecondary disability service delivery. With expanded evidence and disseminated information about assessment utility and intervention effectiveness, a wider spectrum of students – both with and without disabilities – may benefit from a broader focus on EF factors in college students.

The present study provides a basis for expanding future research in the area of understanding self-awareness and perception of executive function among postsecondary students. As well, this study promotes the BRIEF-A as an informative measure of EF and a helpful intervention tool with postsecondary disability populations. Though additional research is necessary to further delineate the clinical utility of the BRIEF-A,

current results are promising in how this instrument might be of use to clinicians and staff within disability resource centers. Furthermore, future focus on the EF construct may further elucidate impact within disability groups and suggest more specific interventions for accurate self-perception of EF and appropriate interventions for supporting postsecondary students with disabilities.

References

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: American Psychiatric Association.

Baddeley, A. (1998). The central executive: A concept and some misconceptions. *Journal of International Neuropsychological Society, 4*, 523-526.

Bak, M., Krabbendam, L., Delespaul, P., Huistra, K., Walraven, W., & van Os, J. (2008). Executive function does not predict coping with symptoms in stable patients with a diagnosis of schizophrenia. *BMC Psychiatry, 8*, 39.

Barkley, R. A. (2012). *Executive functioning and self-regulation: Extended phenotype, synthesis, and clinical implications.* New York: Guilford Publications.

Connors, C. K. (2004). *Connors' continuous performance test II.* North Tonawanda, NY: Multi-Health Systems, Inc.

Delis, D. C., Kaplan, E., & Kramer, J. H. (2001). *Delis-kaplan executive function system.* San Antonio, TX: The Psychological Corporation.

Gioia, G. A., Espy, K. A., & Isquith, P. K. (2003). *BRIEF-P: Behavior rating inventory of executive function-preschool version.* Lutz, FL: Psychological Assessment Resources, Inc.

Gioia, G. A., Isquith, P. K., Guy, S. C., & Kenworthy, L. (2000). *Behavior rating inventory of executive function.* Lutz, FL: Psychological Assessment Resources, Inc.

Gioia, G. A., Isquith, P. K., Retzlaff, P. D., & Espy, K. A. (2002). Confirmatory factor analysis of the behavior rating inventory of executive function (BRIEF) in a clinical sample. *Child Neuropsychology, 8,* 249-257.

Goldberg, E., & Podell, K. (2000). Adaptive decision making, ecological validity, and the frontal lobes. *Journal of Clinical and Experimental Neuropsychology, 22*, 56-68.

Guy, S. C., Isquith, P. K., & Gioia, G. A. (2004). *BRIEF-SR: Behavior rating inventory of executive function – self-report version.* Lutz, FL: Psychological Assessment Resources, Inc.

Hall, P. A., Elias, L. J., & Crossley, M. (2006). Neurocognitive influences on health behavior in a community sample. *Health Psychology, 25*, 778-782.

Heaton, R. K., Chelune, G. J., Talley, J. L., Kay, G. G., & Curtiss, G. (1993). *Wisconsin card sorting test manual: Revised and expanded.* Odessa, FL: Psychological Assessment Resources.

Henry, L. A., & Bettenay, C. (2010). The assessment of executive functioning in children. *Child and Adolescent Mental Health, 15*, 100-119.

Jurado, M. B., & Rosselli, M. (2007). The elusive nature of executive functions: A review of our current understanding. *Neuropsychological Review, 17*, 213-233.

Kornell, N., & Metcalfe, J. (2005). A region of proximal learning model of study time allocation. *Journal of Memory and Language, 52*, 463-477.

Krpan, K. M., Levine, B., Stuss, D. T., & Dawson, D. R. (2007). Executive function and coping at one-year post traumatic brain injury. *Journal of Clinical and Experimental Neuropsychology, 29*, 36-46.

Kubik, J. A. (2010). Efficacy of ADHD coaching for adults with ADHD. *Journal of Attention Disorders, 13*, 442-453.

Mahone, E. M., Hagelthorn, K. M., Cutting, L. E., Schuerholz, L. J., Pelletier, S. F., Rawlines, C., et. Al. (2002) Effects of IQ on executive function measures in children with ADHD. *Child Neuropsychology, 8,* 52-65.

Mangeot, S., Armstrong, K., Colvin, A. N., Yeates, K. O., & Taylor, H. G. (2002) Long-term executive function deficits in children with traumatic brain injuries: Assessment using the behavior rating inventory of executive function (BRIEF). *Child Neuropsychology, 8*, 271-284.

Morris, R. D., Stuebing, K. K., Fletcher, J. M., Shaywitz, S. E., Lyon, G. R., Shankweiler, D. P., Katz. L., . . . Shaywitz, B. A. (1998). Subtypes of reading disability: Variability around phonological core. *Journal of Educational Psychology, 90*(3), 347-373.

Naglieri, J. A., & Das, J. P. (1997). *Cognitive assessment system.* Itasca, IL: Riverside Publishing Company.

Parker, D. R., & Benedict, K. B. (2002). Assessment and intervention: Promoting successful transitions for college students with ADHD. *Assessment for Effective Intervention, 27*(3), 3-24.

Parker, D. R., & Boutelle, K. (2009). Executive function coaching for college students with learning disabilities and ADHD: A new approach for fostering self-determination. *Learning Disabilities Research & Practice, 24*, 204-215.

Parker, D. R., Hoffman, S. F., Sawilowsky, S., & Rolands, L. (2011). An examination of the effects of ADHD coaching on university students' executive functioning. *Journal of Postsecondary Education and Disability, 24*, 115-132.

Parker, D. R., Hoffman, S. F., Sawilowsky, S., & Rolands, L. (2013). Self-control in postsecondary settings: Students' perceptions of ADHD college coaching. *Journal of Attention Disorders, 17*, 215-232.

Prevatt, F., & Yelland, S. (2013). An empirical evaluation of ADHD coaching in college students. *Journal of Attention Disorders,* Published online before print March 18, 2013, doi: 10.1177/1087054713480036

Reitan, R. M., & Wolfson, D. 1993. *The Halstead-Reitan Neuropsychological Test Battery: Theory and clinical interpretation* (2nd ed.). Tucson, AZ: Neuropsychology Press.

Reynolds, C. R., & Horton, A. M. (2008). Assessing executive functions: A life-span perspective. *Psychology in the Schools, 45*, 875-892.

Roid, G. H. (2003). *Stanford-Binet Intelligence Scales*, (5th ed.). Itasca, IL: Riverside Publishing.

Roth, R. M., Isquith, P. K., & Gioia, G. A. (2005). *Behavior rating inventory of executive function - adult version (BRIEF-A) professional manual.* Lutz, FL: Psychological Assessment Resources, Inc.

Royall, D. R., Lauterbach, E. C., Cummings, J. L., Reeve, A., Rummans, T. A., Kaufer, D. I., et al. (2002) Executive control function: A review of its promise and challenges for clinical research. *Journal of Neuropsychiatry and Clinical Neuroscience, 14*, 377-405.

Schillerstrom, J. E., Horton, M. S., & Royall, D. R. (2005). The impact of medical illness on executive function. *Psychosomatics, 46*, 508-516.

Span, M. M., Ridderinkhof, K. R., & van der Molen, M. W. (2004). Age-related changes in the efficiency of cognitive processing across the life span. *Acta Psychologica, 117*, 155-183.

Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology, 18*, 643-662.

Suchy, Y. (2009). Executive functioning: Overview, assessment, and research issues for non-neuropsychologists. *Annals of Behavioral Medicine, 37*, 106-116.

van der Molen, M. W. (2000). Developmental changes in inhibitory processing: Evidence from psychophysiological measures. *Biological Psychology, 54*(1-3), 207-239.

Vohs K. D., & Baumeister, R. F. (2004). Understanding self-regulation: An introduction. In R. F. Baumeister & K. D. Vohs (Eds.) *Handbook of self-regulation: research, theory, and applications*. New York: Guilford.

University of Wisconsin Education Research and Social & Behavioral Sciences, Internal Review Board. (2012). Retrieved from https://rcr.gradsch.wisc.edu/irbwebkit/myprotocols.asp.

U.S. Department of Education, National Center for Education Statistics. (2009). *Number and percentage distribution of students enrolled in postsecondary institutions, by level, disability status, and selected student characteristics: 2003-04 and 2007-08*. Retrieved May 19, 2012, from http://nces.ed.gov/programs/digest/d10/tables/dt10_240.asp

Williams, P. G., Suchy, Y., & Rau, H. K. (2009). Individual differences in executive functioning: Implications for stress regulation. *Annals of Behavioral Medicine, 37*, 126-140.

Wechsler, D. (2008). *Wechsler individual achievement test-fourth edition*. San Antonio, TX: Pearson.

Zelazo, P. D., Craik, F. I., & Booth, L. (2004) Executive function across the life span. *Acta Psychologica, 115*, 167-183.

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