

TRANSITION TO ADULthood: EXECUTIVE FUNCTIONS AND INDEPENDENT
LIVING SKILLS IN AUTISM SPECTRUM DISORDER

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DEDICATION

For Sam. Thank you for teaching me so much.

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ABSTRACT

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The transition to adulthood is particularly challenging for young adults with autism spectrum disorder (ASD). These challenges exhibit themselves with poor outcomes in independent living, employment, education, and community participation. Broad executive functioning deficits have been indicated as a key factor in the development of independent living skills for young adults with ASD. This study aims to expand the understanding of the impact of executive functions on independent living skills in young adults with ASD and examine (1) differences in independent living and executive functioning skills between young adults with ASD and neurotypical peers and (2) the contribution of executive functions to independent living skills for young adults with ASD. This study utilizes a novel performance-based assessment of executive function, utilizing an everyday activity that challenges the integration of cognitive skills, the Weekly Calendar Planning Activity (WCPA). Eighty-four age-matched participants (52 in the ASD group and 32 neurotypical peers) completed a battery of assessments of independent living and executive functioning skills. These included the Montreal Cognitive Assessment (MoCA), Adaptive Behavior Assessment System (ABAS-3), Daily Living Questionnaire (DLQ), Behavior Rating Inventory of Executive Function (BRIEF-A), and the WCPA. Independent living skills in young adults with ASD, as measured by ABAS-3, were significantly lower than their neurotypical peers ($p < .001$) and fell 2 standard deviations below the mean. Executive functioning skills, as measured by the BRIEF-A and WCPA were all significantly lower in young adults with ASD. WCPA was able to significantly differentiate

young adults with ASD and neurotypical peers; as demonstrated by following fewer rules, utilizing fewer strategies, performing with less accuracy, and stating lower self-awareness of performance than their neurotypical peers. Executive functioning skills as measured by BRIEF-A robustly correlated with independent living skills (ABAS-3 and DLQ). However, WCPA scores did not significantly correlate with independent living skill measures, highlighting the heterogeneity of executive dysfunction within ASD. Though no significant relationships were found between WCPA scores and independent living, WCPA shows promise at providing a window into how the integration of multiple executive functions impact challenges with everyday living.

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CHAPTER I

INTRODUCTION

The transition to adulthood is a challenging time of taking on new roles, responsibilities, and challenges such as living independently, pursuing post-secondary education, gaining employment, and building social relationships (First et al., 2016). Typically, development through adolescence to adulthood involves a shift to increased independent decision making and behavior. This shift facilitates independent functioning in more complex contexts and environments without support, monitoring, or supervision of adults (Hume et al., 2014). Development in cognitive abilities and capacities to think, feel, act, and make goal-directed decisions in response to greater environmental opportunities and demands results in an increase in autonomous behaviors that contribute to improved independent living skills (Wray-Lake et al., 2010).

Independent living skills are defined as skills that support everyday life within the home and community, whether performed independently by the individual, in an adapted or modified environment, with the use of devices or strategies, or while overseeing the activity completion by others (American Occupational Therapy Association [AOTA], 2020). Independent living skills include activities of daily living (ADL) and instrumental activities of daily living (IADL). ADLs are activities that an individual performs to take care of their body on a routine basis (AOTA, 2020). IADLs are activities that an individual performs to support daily life within the home and community (AOTA, 2020). IADLs include home establishment and management, health management and maintenance, meal preparation and cleanup, financial management, driving and community mobility, communication management, care of others and pets, religious activities, shopping, and safety and emergency maintenance (AOTA, 2020). During the transition to

adulthood, an individual learns to perform these living skills without prompting, reminders, or assistance from another adult (Hume et al., 2014).

The transition to adulthood is particularly challenging for young adults with autism spectrum disorder (ASD). ASD is a lifelong, neurodevelopmental disorder and is characterized by difficulties with social communication and interaction, as well as restricted and repetitive behaviors, interests, and activities (American Psychological Association, 2013). These diagnostic deficits in the core areas of ASD contribute to challenges with independence. Communication deficits can impair an individual's ability to understand expectations, ask questions, and respond appropriately in a variety of social environments. Rigid patterns of behavior impact the ability to adapt to change, which creates difficulty with reducing adult assistance and generalizing abilities in a variety of environments. The level of independence with living skills is highly associated with the ability of adults with autism to sustain employment (Chan et al., 2018; Shattuck et al., 2012)

Young adults with ASD have higher rates of unemployment or under-employment, low participation in education beyond high school, high rates of living with family members, and limited community involvement (Centers for Disease Control and Prevention [CDC], 2020b). Less than 19% of young adults with ASD have ever lived away from parents without supervision following high school, as compared to 66% of those with mental illness and 34% of those with intellectual disabilities without ASD (US Department of Health and Human Services, 2017). Of these 19%, only 12% of young adults with ASD have been able to sustain independent living (Bathje et al., 2018). Nearly two thirds of adults with ASD receive supplemental security income (SSI) benefits (US Department of Health and Human Services, 2017). Only 58% of adults with ASD have had any employment during their 20s, compared to 90% for adults with other

disabilities (US Department of Health and Human Services, 2017). Deficits in independent living skills are highly prevalent in individuals with ASD regardless of intellectual disability and individuals with ASD have lower rates of independent living than intellectually matched peers with other disabilities (Bathje et al., 2018; Duncan and Bishop, 2015; Hume et al., 2014).

Over the past 20 years, prevalence rates of childhood diagnosis of ASD have risen from 1 in 150 children to 1 in 44 children (CDC, 2020a). Approximately 75,000 people with ASD age into adulthood each year, and this number is increasing yearly (Shattuck, 2019). As more and more adolescents with ASD transition to adulthood, the need for improved transition programs and supports has become more urgent (Anderson et al., 2018). Factors such as lack of financial resources, uncertainty about changing parent roles, poor person-environment fit, poor collaboration between school transition services and adult service providers, and a lack of comprehensive, integrated adult services following high-school are attributed to poor outcomes (Anderson et al., 2018, Jonsson et al., 2021). Despite the need for continued services following public high school, parents describe the transition to adulthood as a time when previously accessible services are lost with the transition into adult community services, often referred to as the “service cliff” (Bathje et al., 2018; Chen et al., 2019, Duncan & Bishop, 2015; McCollum et al, 2016; Ohl et al., 2020; Thompson et al., 2018; Wilson et al., 2018). Parents are the primary support structure for adults with ASD. They are left to fill any gaps in teaching skills needed for successful transition to adult independence, and they have difficulty knowing how to scaffold growth, either pushing too hard with unrealistic expectations, or promoting prompt dependency (Duncan et al., 2018; Jonsson et al., 2021; Sullivan & Smith, 2021).

Many professionals have described this “service cliff” as a public health crisis because so many individuals with ASD are coming of age at a time when there are few services available to

meet their specific needs (Duncan et al., 2018). Available services are difficult to access following graduation from the public school system, including speech therapy, occupational therapy, social skills training, and one-to-one support (Dudley et al., 2019). Few occupational therapists specialize in working with adults with ASD (Mankey et al., 2014; Ohl et al., 2020). While occupational therapy related literature is sparse, evidence supports the efficacy of occupation-based intervention in adults with ASD (Bathje et al., 2018; Marcotte et al., 2020; Wilson et al., 2018). There is an abundance of research addressing the transition to adulthood focused on youth in the public school system, ages 14-22; however, there is currently a paucity of evidence to support occupation-based assessment and intervention that address independent living skills for adults with ASD (Bathje, et al., 2018; Olsson et al., 2013). The available evidence is difficult to generalize due to the low number of participants and the use of non-standardized outcome measures (Bathje et al., 2018; Marcotte et al., 2020; Wilson et al., 2018). Occupational therapists are uniquely positioned to address independent living skills during the transition to adulthood for young adults with ASD and there exists a valuable opportunity to improve research evidence and advocate for occupational therapy service provision for young adults with ASD who are transitioning to independent living.

To advocate for targeted integrated services following high school, research needs to be done to understand the underlying cognitive factors that influence independent living skills during the transition to adulthood for young adults with ASD. Recent studies have sought to understand the factors related to delayed independent living skills in adults with ASD. Independent living skills have been found to improve into the early 20s, plateau in the late 20s, followed by a decline during the 30s (Baker et al., 2021). No significant correlation has been found between independent living skills and measures of ASD symptomatology, gender, socio-

economic status, or parent education level (Baker et al., 2021; Johnston et al., 2019; Lord et al., 2020; Pugliese et al., 2016). Although intellectual abilities (as measured by IQ) are strongly associated with independent living skills in individuals with other disabilities, that is not found to be the case for individuals with ASD (Pugliese et al., 2016). Higher IQ (i.e., over 70) is not found to be significantly correlated with the development of independent living skills in individuals with ASD (Pugliese et al., 2016).

Parents and professionals that work closely with adults with ASD describe challenges with executive functioning, such as planning, organization, time management, and managing multiple responsibilities being major contributing factors to difficulties with developing independent living skills in adults with ASD (Anderson & Butt, 2017; Cheak-Zamora et al., 2020; Jonsson et al., 2021; Marcotte et al., 2020; Ohl et al., 2020). Executive functions are an interrelated set of cognitive abilities that support planning, organizing, problem-solving, and executing purposeful, goal-directed, and future-oriented activities. Difficulties with executive functions lead to a continued reliance on caregivers to assist with planning and organizing activities, problem solving, and with setting and maintaining schedules, which limit the development of independent living skills. Executive functioning deficits that were identified in children with ASD, including difficulty with inhibition, self-monitoring skills, and goal-directed behaviors have been identified to be strongly correlated and predictive of independent living skills in early adulthood (Pugliese et al., 2016).

Impairments in executive functioning have been widely cited in ASD literature, and the “executive dysfunction hypothesis” has been proposed to explain the core difficulties for individuals with ASD. Neuropsychological tests are often used to assess executive functioning in individuals with ASD across childhood, adolescent, and adult samples, and have consistently

been able to differentiate between those with ASD and neurotypical peers (Johnston et al., 2019). However, performance on these metrics do not often reflect real-world complex task performance. Self-report behavioral inventories of executive function have also consistently differentiated ASD populations from neurotypical peers (Johnston et al., 2019).

Executive functioning performance on subdomains of neuropsychological measures are heterogeneous for adolescents and adults with ASD (Brady et al., 2017; Demetriou et al., 2019; Johnston et al., 2019). Studies that have examined the relationship between individual subdomains of these tests to independent living skills have resulted either insignificant correlations or significant yet low correlations (Brady et al., 2017; Demetriou et al., 2019; Johnston et al., 2019). When tested with an ecologically valid, self-report behavioral inventory of executive functioning, which focuses on executive functions in everyday behaviors, there are significant moderate to high correlations with measures of independent living skills in young adults with ASD (Alvares et al., 2020; Baker et al., 2021; Demetriou et al., 2018; Johnston et al., 2019; Pugliese et al., 2016; Wallace et al., 2016).

Statement of Problem

Transitioning from childhood to adulthood is a major milestone in an individual's life. Several personal, familial, and social factors contribute to facilitate this transition. An optimal transition often helps the individual accomplish major life goals including post-secondary education, employment, and independent living. However, significant difficulties with the transition to adulthood in young adults with ASD have been well documented. Similar to neurotypical adults, development of independent living skills is vitally important for young adults to obtain their goals of living on their own and sustaining employment (Chan et al., 2018; Shattuck et al., 2012). Amongst many factors, executive dysfunctions may contribute to

challenges in the transitioning process for adults with ASD. Gaining understanding of the role of executive dysfunctions in development of independent living skills will help clinicians and caregivers guide these young adults with ASD toward their goals. Recent research has gained insight into the significant correlation between a self-report measure of executive function and independent living skills in adults with ASD. Therefore, researchers in the field of psychology specially call for the use of a performance-based ecologically valid measure of executive functioning to better capture executive functioning challenges in young adults with ASD that impact the development of independent living skills (Demetriou et al., 2019). The use of an ecologically valid, real-world task, performance-based assessment of executive functioning would provide quantitative information about the relationship between executive functions and independent living skills in adults with ASD.

Therefore, to fill this critical void in the literature, this study aims to examine the relationship between executive functions and independent living during the critical period of transitioning to young adulthood in young adults with ASD. This study will utilize a standardized performance-based test of executive function that uses an everyday task (calendar planning) that provides measures and normative comparisons of how the person utilizes complex executive functioning skills. We anticipate that examining the quantitative relationship between measures provided by this assessment and measures of independent living skills will provide valuable insights that will have significant clinical and policy implications for informing occupational therapy assessment and intervention and improving outcomes for young adults with ASD transitioning to independent living.

CHAPTER II

LITERATURE REVIEW

Transition to Adulthood

The transition to adulthood is a time of significant change and growth in an individual (Stewart, 2012). This growth leads to a transformation that affects virtually every life domain (Jonsson et al., 2021). The individual's roles and responsibilities evolve to include living independently, pursuing post-secondary education, gaining employment, and building social relationships (First et al., 2016; Stewart, 2012). Expectations for self-responsibility, making independent decisions and becoming self-sufficient also increases, and the management of the tasks and responsibilities of daily life shifts from the parent to the young adult (Keller et al., 2007; Munsell et al., 2020). During this transition there is an increase in autonomous decision making that reflects improved cognitive skill development and the ability to respond to more expectations for complex independent behaviors in varied environments (Hume et al., 2014; Wray-Lake et al., 2010). A major developmental transition towards adulthood is the person's ability to coordinate multiple functional skills in unison in increasingly complex environments, without the support, assistance, or advice from adults to carry out tasks in daily life (Hume, et al., 2014; Munsell et al., 2020). An impairment in any of these multiple functional skills, as a result of a developmental challenge (e.g., ASD), can significantly impact the transition to adulthood.

Characteristics of Autism Spectrum Disorder

The diagnostic criteria for ASD are described in the *Diagnostic and Statistical Manual for Mental Disorders, fifth edition* (American Psychiatric Association, 2013). To meet the criteria for a diagnosis of ASD, a person must have:

- Persistent deficits in social communication and social interaction across multiple contexts, as manifested by all of the following, currently or by history (examples are illustrative, not exhaustive):
 - Deficits in social-emotional reciprocity, ranging, for example, from abnormal social approach and failure of normal back-and-forth conversation; to reduced sharing of interests, emotions or affect; to failure to initiate or respond to social interactions.
 - Deficits in nonverbal communicative behaviors used for social interaction, ranging, for example, from poorly integrated verbal and nonverbal communication; to abnormalities in eye contact and body language or deficits in understanding and use of gestures; to a total lack of facial expressions and nonverbal communication.
 - Deficits in developing, maintaining, and understanding relationships, ranging, for example, from difficulties adjusting behavior to suit various social contexts; to difficulties in sharing imaginative play or in making friends; to absence of interest in peers.
- Restricted, repetitive patterns of behavior, interests or activities, as manifested by at least two of the following, currently or by history (examples are illustrative, not exhaustive):
 - Stereotyped or repetitive motor movements, use of objects, or speech (e.g., simple motor stereotypes, lining up of toys or flipping objects, echolalia, idiosyncratic phrases).

- Insistence on sameness, inflexible adherence to routines, or ritualized patterns of verbal or nonverbal behavior (e.g., extreme distress at small changes, difficulties with transitions, rigid thinking patterns, greeting rituals, need to take same route or eat same food every day).
- Highly restricted, fixated interests that are abnormal in intensity or focus (e.g., strong attachment to or preoccupation with unusual objects, excessively circumscribed or perseverative interests).
- Hyper- or hypo-reactivity to sensory input or unusual interests in sensory aspects of the environment (e.g., apparent indifference to pain/temperature, adverse response to specific sounds or textures, excessive smelling or touching of objects, visual fascination with lights or movement). (American Psychiatric Association, 2013).

Transition to Adulthood for Individuals With ASD

The transition to adulthood is particularly challenging for young adults with ASD, many of whom have significant impairments in independent living skills and require significant assistance in everyday life (Bal et al., 2015; Cribb et al., 2019). The transition can be similar to neurotypical young adults in many ways (Stewart, 2012). They graduate high school and have a desire to find work and move out of their parent's house at some point (Stewart, 2012). Though adults with ASD often have the ability to perform many independent living skills in isolation, they struggle to integrate multiple responsibilities in varied environments (Olsson et al., 2013). They also have difficulties managing multiple independent living skills simultaneously (Cheak-Zamora et al., 2020; Olsson et al., 2013).

Adults with ASD experience challenges with the transition to adulthood and gaining independence, which are related to the characteristics related to the diagnosis of ASD (Hume et al., 2014). Individuals with ASD often have difficulty reading the social and physical environments, which create challenges for them with independent living involving engagement in varied contexts (Hume et al., 2014). This challenge involves processing environmental cues and adapting their behavior to match different settings and can create difficulties with prompt dependency, or requiring cues from another person (Cheak-Zamora et al., 2020; Hume et al., 2014). Difficulty attending to multiple cues in the social and physical environments impacts the ability to manage multiple responsibilities required in daily life (Hume et al., 2014). Discomfort in unfamiliar environments and social situations can lead to reliance on parents or caregivers for support (Hume et al., 2014).

Communication deficits are reflected by difficulties in asking and responding to questions, clarifying instructions, communicating preferences, and interacting with friends, family, strangers, and authority figures (Hume et al., 2014). Verbal, non-verbal, and social communication challenges create difficulties with following verbal instructions and learning by observing others (Hume et al., 2014). These communication challenges impact their ability to learn new skills.

Challenges characterized by repetitive and restricted patterns and behaviors can be reflected by preferences for very strict routines and schedules (Hume et al., 2014). This rigidity creates a need for consistency and sameness that can cause challenges with the frequent changes that happen in daily living (Hume et al., 2014). Parents and caregivers frequently create and maintain schedules of activities including self-care, chores, employment, and community participation (Cheak-Zamora et al., 2020). Challenges with flexibility for adults with ASD create

problems with shifting thoughts and goal-directed behaviors according to changes in routine or environments, which results in difficulty generalizing skills across multiple environments (Hume et al., 2014). Many adults with ASD also demonstrate difficulty with self-regulation, setting goals, organizing, and planning, which limits their ability to independently manage multiple roles and responsibilities in independent living (Cheak-Zamora et al., 2020).

Outcomes

Autism is a lifelong neurodevelopmental disorder. Currently, an estimated 2.21% adults in the United States have ASD (CDC, 2022). Despite estimates that indicate that nearly 70% of individuals with ASD do not have an intellectual disability, many young adults with autism experience poor outcomes in the transition to adulthood, including post-secondary education, low rates of employment, and the majority continue to live with their family or relatives (Baker et al., 2021; CDC, 2022; Wallace et al., 2016). Only 12% of adults with ASD live independently in their own residence without support (Duncan et al., 2018).

Over the past 20 years, prevalence rates of childhood diagnosis of ASD have risen from 1 in 150 children to 1 in 44 children (CDC, 2020a). Approximately 75,000 people with ASD age into adulthood each year, and this number is increasing yearly (Bishop-Fitzpatrick et al., 2016; Shattuck, 2019). Many adults with ASD need ongoing services and support. Nearly two thirds of adults with ASD receive SSI benefits to support their daily living due to their inability to sustain employment (US Department of Health and Human Services, 2017). With this increasing prevalence rate, the total economic burden of ASD in the United States is forecasted to increase dramatically to \$461 billion by 2025 (Ohl et al., 2020).

Individual education plans (IEPs) are required by IDEA to address transition plans with goals in the areas of employment, postsecondary education, and independent living. Regardless,

high school students with ASD without intellectual disability are less likely to receive any life skills training in high school due to a full load of classes that prevents them from having time during school to address goals for independent living (Duncan et al., 2018). Following high school, there is an abrupt shift to a lack of comprehensive, integrated adult services (Anderson et al., 2018, Jonsson et al., 2021). Despite the need for continued services following public high school, parents describe the transition to adulthood as a time when previously accessible services are lost. Consequently, the transition into adult community services is often referred to as the “service cliff” (Bathje et al., 2018; Chen et al., 2019, Duncan & Bishop, 2015; McCollum et al., 2016; Ohl et al., 2020; Thompson et al., 2018; Wilson et al., 2018). This service cliff is a public health crisis because so many individuals with ASD are coming to age at a time when there is a lack of available services to meet their specific needs (Duncan et al., 2018).

As more and more adolescents with ASD transition to adulthood, the need for improved transition programs and access to supports has become more urgent (Anderson et al., 2018). Families report that barriers to effective and successful transition to adult living includes complex state and federal programs, poor communication with school-based providers, and insufficient time working on appropriate living skills (Ohl et al., 2020). Parents are the primary support structure for adults with ASD. After graduating from high school, parents of individuals with ASD are responsible for navigating complex systems, understanding eligibility criteria, funding, and searching for available services (Ohl et al., 2020). Parents are left to fill any gaps in teaching skills needed for successful transition to adult independence, and they have difficulty knowing how to scaffold growth, either pushing too hard with unrealistic expectations, or promoting prompt dependency (Duncan et al., 2018; Jonsson et al., 2021; Sullivan & Smith, 2021). Independent living skills are predictive of employment outcome, more so than other

factors such as cognitive ability, language and communication skills, and ASD symptomatology (Duncan et al., 2018). These findings demonstrate the importance of understanding the development of independent living skills for achieving successful outcomes (Baker et al., 2021)

Experiences of Parents and Young Adults With ASD

Young adults with ASD aspire to live independently, secure and maintain employment, develop relationships, and gain autonomy in decision-making; however, they have difficulty achieving these goals (Bennett et al., 2018; Sosnowy et al., 2018). Their parents also dream of this future independence and are the primary support for their adult child's transition to adulthood (Sosnowy et al., 2018). Despite these aspirations, adults with ASD have a 12% rate of independent living, which is significantly lower than IADL of intellectually matched peers with other disabilities (Bathje et al., 2018; Dudley et al., 2019; Duncan et al., 2018). Difficulty with independent living skills also impacts the mental health and quality of life for adults with ASD (Krempley & Schmidt, 2021; Roseblum et al., 2017).

Extensive literature supports the roles and aspirations that parents and young adults with ASD have with transitioning to independent living. For example, parents support their adult children by arranging and managing therapies and services, seeking out meaningful activities in the community, and assisting with daily life tasks and activities (Chen et al., 2019; Thompson et al., 2018). Parents report feeling overwhelmed by the lack of services available as they continued to be the primary support by performing daily living tasks for their adult children such as cooking, managing finances, medication management, and arranging appointments or by closely supervising their adult child to perform these tasks (Anderson et al., 2018; Sosnowy et al., 2018). Parents carefully consider future living arrangements for their adult child with ASD; many prefer a semi-independent apartment connected to their home as they anticipate needing to provide

continued support as their adult children age (Thompson et al., 2018). Parents also describe difficulty finding service providers who have experience working with adults with autism and they feel responsible to educate adult health care providers and support professionals about autism (Anderson et al., 2018).

Parents report experiencing high levels of stress and anxiety during the transition to adulthood as they learn to navigate adult services and set up support systems for their adult children with ASD (Anderson et al., 2018; First et al., 2016). Parents' primary goal is to help their children develop autonomy and independence, despite the lack of adult services and community support (Cribb et al., 2019; First et al., 2016). Parents express concern that the young adults with ASD do not fully understand all that living independently entails and that they lack self-awareness of their challenges and need for support (Sosnowy et al., 2018).

In an interview-based study, researchers reported that young adults with ASD view adult living as having a job and living away from their parents, signifying the importance of making their own decisions (Sosnowy et al., 2018). These young adults also spoke of their understanding of their challenges and their desire to have supports to help them learn and develop independence skills (Jonsson et al., 2021). Descriptions of challenges included problems with planning, organizing, thinking of possibilities for their future, and that they needed more time to make decisions and develop everyday skills (Cribb et al., 2019).

Parents of young adults with ASD identified several factors that they felt hindered their child's transition to independent living. These including social skills, comorbid anxiety and depression, low motivation, and executive functioning deficits in skills such as flexibility, problem solving, planning, organization, time management, self-determination, emotional regulation, and managing multiple responsibilities (Anderson & Butt, 2017; Cheak-Zamora et

al., 2020, Cribb et al., 2019, First et al., 2016; Hedley, et al., 2018). The ability to utilize all these executive functioning skills is important for an individual to be able to adaptively respond to a variety of complex environmental demands with appropriate independent living skills.

Executive Functions

Executive functions are higher-order cognitive abilities that regulate goal-directed, future orientated actions such as goal initiation, planning and organization, managing time, problem solving, exercising restraint, self-motivation, and emotional regulation (Craig et al., 2016; Demetriou et al., 2019; Elias & White, 2018; Hume et al., 2014). That is, they support the integration and management of basic cognitive processes such as sensation, motor functions, perception, attention, and memory and include cognitive flexibility, working memory, response inhibition, planning, initiation, and self-monitoring (see Table 1; Brady et al., 2017; Johnston et al., 2019).

Table 1*Descriptions of Executive Functions*

Executive function	Definition
Cognitive flexibility	The ability to intentionally shift attention between thoughts, strategies, tasks, and actions in response to our constantly changing environment (Brady et al., 2017; Pugliese et al., 2016). This allows a person to shift between different activities and to apply different rules in different activities or contexts.
Working memory	The ability to retain, manipulate, and update information in short term memory (Brady et al., 2017; Demetriou et al., 2019). The ability to hold and manipulate information is involved in successful task execution of a goal-directed behavior (Chai et al., 2018).
Inhibition	The ability to prevent or inhibit a dominant, automatic response to a stimulus in order to select an action consistent with their goal. (Brady et al., 2017; Demetriou et al., 2019; Pugliese et al., 2016).
Planning	The ability to think about the future and create a roadmap to reach a goal. This requires constant monitoring, evaluation and updating actions, understanding changing environmental demands. This requires looking ahead and predicting outcomes to create future-oriented behaviors. (Brady et al., 2017).
Self-monitoring	The ability to observe and evaluate own behavior in response to feedback from self or external environments. (Demetriou et al., 2019)
Initiation	The ability to generate and initiate novel thoughts and behaviors (Brady et al., 2017; Dichter et al., 2009)

Executive functioning difficulties are well documented in ASD, and are consistent through childhood, adolescence, and adulthood (Demetriou et al., 2019). Adults with ASD have a decreased ability to plan multi-step sequences, demonstrate mental flexibility to deal with new situations, and process complex information, which are all common occurrences when functioning independently in real life (Hume et al., 2016). The ability to implement strategies to compensate for these cognitive difficulties across varied environments is crucial for successful transition to independent living (Johnston et al., 2019; Rosenblum et al., 2017).

Independent Living Skills in Adults With ASD

Independent living skills are defined as: skills that support everyday life within the home and community, whether performed independently by the individual, in an adapted or modified environment, with the use of devices or strategies, or while overseeing the activity completion by others (AOTA, 2020). Independent living skills include ADL and IADL. ADLs are activities that an individual performs to take care of their body on a routine basis (AOTA, 2020). IADLs are activities that an individual performs to support daily life within the home and community (AOTA, 2020). IADLs include home establishment and management, health management and maintenance, meal preparation and cleanup, financial management, driving and community mobility, communication management, care of others and pets, religious activities, shopping, and safety and emergency maintenance (AOTA, 2020).

During the transition to adulthood, an individual learns to perform these living skills without prompting, reminders, or assistance from another adult (Hume et al., 2014). Adaptive behavior is the description of the person's ability to consistently perform daily living skills in a real-world, ever-changing environment with no reminders or assistance from others (McCollum et al., 2016). Evidence suggests that independent living status is dependent on the development of adaptive behavior skills in adults with ASD (Baker et al., 2021; Pugliese et al., 2016). Adaptive behavior skills consist of the observable typical performance of daily activities, rather than the ability, that an individual displays that are important for functional independence, including verbal and nonverbal communication, socialization skills, and daily living skills (Alvares et al., 2020; Bal et al., 2015; McCollum et al., 2016; Pugliese et al., 2016).

Integration of multiple learned daily living skills simultaneously throughout varied environments is critical for independent living. Individuals with ASD often are able to perform

individual daily living skills; however, they have difficulty knowing where, when, and how to perform them in continuously changing environments in daily life, particularly with activities that are unstructured (Olsson et al., 2013). This inability to adapt behaviors in response to changing environments leads to poor adaptive behavior skills and thus ability to perform independently in daily life (Olsson et al., 2013). For individuals with ASD, poor independent living skills are not a matter of their ability to perform individual tasks, but of actually executing multiple responsibilities in real life changing environments (First et al., 2016).

Compared to typically developing peers, or peers with other disabilities, individuals with ASD consistently demonstrate poorer adaptive behavior skills (Alvares et al., 2020). Adaptive behavior skills increase throughout childhood and adolescence for individuals with ASD, though at a slower rate than peers, creating an increasing discrepancy over time between those with ASD and neurotypical peers (Alvares et al., 2020; Baker et al., 2021; Bal et al., 2015; Hume et al., 2014; Pugliese et al., 2016). Children with ASD demonstrate lower adaptive behavior than their peers, however, as the children age through adolescence into adulthood, this discrepancy widens, suggesting that individuals with ASD fail to acquire adaptive behavior skills at rates that correspond to peers (Bal et al., 2015; Pugliese, et al., 2016). Though adaptive behavior skills increase throughout childhood and adolescence for individuals with ASD, they plateau in the early 20s and decrease during the 30s (Baker et al., 2021; Bal et al., 2015; Hume et al., 2014; Pugliese et al., 2016). This pattern is in contrast to a continued increase in adaptive behavior throughout the 20s and 30s for individuals with other disabilities without ASD (Pugliese et al., 2016).

Impairments in adaptive behavior skills exist in adults with ASD despite average to high IQ level (Baker et al., 2021). Following the delayed trajectory of adaptive skill development,

adults with ASD without intellectual disability ($IQ > 70$) are measured to have adaptive behavior skills that fall one to two standard deviations below the mean (Pugliese et al., 2016). Adaptive behavior skills in individuals with ASD tend to follow a pattern of relative strengths and weaknesses where socialization scores are the lowest, followed by communication and daily living skills (Baker et al., 2021). Interestingly, delays in socialization and communication are directly linked to diagnostic criteria of ASD, yet despite not being indicated in the diagnostic criteria of ASD, daily living skills are consistently delayed for individuals with ASD (Baker et al., 2021). Daily living skills that are frequently delayed for adults with ASD include personal hygiene, household management such as doing laundry, planning and preparing meals, and managing medication, money management, and community transportation (Duncan et al., 2018).

Many studies have sought to understand the factors related to delayed adaptive behavior skills in young adults with ASD. No significant correlation has been found between adaptive behavior skills in young adults with ASD and gender, socio-economic status, parent education level, or measures of ASD symptomatology (Baker et al., 2021; Duncan & Bishop, 2015; Johnston et al., 2019; Lord et al., 2020; Pugliese et al., 2016). There is a significant correlation between IQ and adaptive behavior in young adults with autism with intellectual disability ($IQ < 70$). Conversely, there is no significant correlation between adaptive behavior skills and IQ in individuals with ASD with no intellectual disability ($IQ > 70$; Alvares et al., 2020; Baker et al., 2021; Bal et al., 2015; Kenny et al., 2019; Pugliese et al., 2016).

Parents report that the biggest challenge to developing adaptive behavior skills is the young adult with ASD having executive functioning problems (Alvares et al., 2020). Difficulties with executive functioning and adaptive behavior are commonly seen in ASD (Cheak-Zamora et al., 2020). Retrospective longitudinal studies report that measures of childhood executive

functioning correlate with functional outcomes and adaptive behavior skills for adults with ASD without intellectual disabilities (Pugliese et al., 2016). Global measurements of executive functioning, such as the self-report Behavioral Rating Inventory of Executive Functioning - Adult version (BRIEF-A), in adults with ASD correlates with measures of adaptive behavior and is a better measure of functional outcomes (Alvares et al., 2020; Baker et al., 2021; Kenny et al., 2019; Pugliese et al., 2016). The self-report BRIEF-A overall score and subdomain scores contribute to measurements of adaptive behavior skills more than individual subdomains of executive functioning utilizing neuropsychological tests (Pugliese et al., 2016; Wallace et al., 2016).

Executive Functioning Skills in Adults With ASD

Executive functioning deficits are common in individuals with ASD and are hypothesized as an important factor contributing to poor outcomes during the transition to adulthood as the complexities and expectations of independent living increase (Elias & White, 2018; Hume et al., 2014; Wallace et al., 2016). Individuals with ASD demonstrate difficulty with planning multi-step activities and creating their own routines and structure (Hume et al., 2014; Olsson et al., 2013). Furthermore, a common challenge for young adults with ASD is to be able to adapt to new situations and environments that are common in independent living; challenges with mental flexibility create difficulties (Hume et al., 2014). Executive functions are foundational for effective execution of goal-directed behaviors, and these are important for learning and developing adaptive behavior skills including communication, socialization, and independent living skills (Pugliese et al., 2016).

Global executive functioning deficits are found to be associated with adaptive behavior skills, and this association is seen when utilizing neuropsychological measures of executive functioning subdomains, as shown in Table 2.

Table 2

Executive Functions Associated With Adaptive Behavior Skills in ASD

Executive function	Association with adaptive behavior skills in ASD
Flexibility	Flexible thinking scores (Tower of Hanoi; Wisconsin Card Sorting Test) significantly correlated with adaptive behavior skills in children and adults with ASD without intellectual disability (Hume et al., 2014; Williams et al., 2014). Flexible thinking is required for the ability to change strategies to accomplish a task and to manage unexpected changes in routine (Olsson et al., 2013). Neuropsychological tests find deficits that persist across the lifespan for individuals with ASD (Demetriou et al., 2019).
Shifting	Poor shifting skills is significantly associated with the socialization domain of adaptive behavior skills. This relates to difficulty compromising, avoiding new social situations, and difficulty with transitions between activities (Pugliese et al., 2016).
Response inhibition	Poor inhibition scores, measured in children with ASD without intellectual disability, are predictive of later adaptive behavior skills in the daily living skills and socialization domains. (Pugliese et al., 2016).
Self-monitoring	Poor self-monitoring skills are strongly correlated with adaptive behavior skills across all domains. Challenges with self-monitoring have also been linked to perseveration, repetitive behaviors, and joint attention (Pugliese, et al., 2016).
Planning	A meta-analysis of studies revealed pervasive impairments in planning across age groups for individuals with ASD. Planning difficulties were independent of age, intellectual functioning level, and type of assessment (Demetriou et al., 2019).
Working memory	Impairments in working memory were seen across children and adolescents with ASD, though spatial working memory was typically more impaired than verbal working memory (Demetriou et al., 2019).

Executive Dysfunction Hypothesis of ASD

The executive dysfunction hypothesis of ASD focuses on describing atypical executive functioning profiles in ASD (Demetriou et al., 2019). This hypothesis states that executive dysfunctions are an endophenotype of ASD and underlie the core deficits of ASD (Demetriou et al., 2019; Johnston et al., 2019; Wallace et al., 2016). The executive functions that contribute to the pattern of executive dysfunction in ASD include cognitive flexibility when dealing with new situations, planning, working memory, response inhibition, generativity, and self-monitoring (Craig et al., 2016; Demetriou et al., 2019). A meta-analysis consistently showed a moderate effect size of executive dysfunction in individuals with ASD that distinguishes those with ASD from neurotypical peers (Demetriou et al., 2018). These executive dysfunctions impact many areas including social cognition, mental health, and lifelong functional outcomes including independent living (Demetriou et al., 2019).

Although there is broad executive dysfunction in ASD, there is variability in performance across subdomains of executive function measurement in adolescents and adults with ASD (Brady et al., 2017; Demetriou et al., 2019; Johnston et al., 2019). Deficits in flexibility, generativity, working memory, response inhibition, and planning are characteristic of the executive functioning profile in ASD, though the research results that determine the importance of each executive functioning subdomain are mixed (Demetriou et al., 2019; Wallace et al., 2016). In one review of 17 studies, conducted between 1985 and 2014, of executive functioning in adults with ASD as compared to neurotypical peers, there were mixed findings, with differing executive dysfunction profiles between included studies, though individuals with ASD consistently demonstrated more variability in performance across subdomains than neurotypical peers (Wallace et al., 2016). In another meta-analysis of 235 studies that examined executive

functioning subdomains in ASD as compared to a neurotypical control group, including moderators such as age, gender, IQ differences, and assessment type, significant differences were observed for all executive function subdomains (Demetriou et al., 2018). This meta-analysis also showed that informant or self-report behavioral inventories of executive functioning had a larger effect size than neuropsychological tests of executive functioning in distinguishing between ASD and neurotypical populations (Demetriou et al., 2018).

Standardized, performance-based neuropsychological tests typically involve measurement of accuracy and/or response time to complete a task (Toplak et al., 2013). Informant or self-report measures of executive function measure a report of competence with carrying out complex everyday tasks that require executive functioning skills (Toplak et al., 2013). In an analysis of 20 studies that examined the association between performance-based neuropsychological tests and behavioral rating inventories of executive function, only 24% of the comparisons concluded with significant correlations (Toplak et al., 2013). For adults with ASD, behavioral rating inventories of executive function (BRIEF-A and Dysexecutive (DEX) Questionnaire) demonstrate a low correlation between scores on performance-based tests of executive function (Johnston et al., 2019). These measures are argued to be complementary tools that measure different underlying cognitive constructs that contribute to functional problems in clinical populations (Toplak et al., 2013; Wallace et al., 2016).

Though there is a consensus regarding the executive dysfunction hypothesis of ASD, researchers have been identifying factors that correlate with measures of executive dysfunction in individuals with ASD. Cognitive flexibility, working memory, and inhibition have been strongly associated with stereotyped and repetitive behaviors in adults with ASD (Johnston et al.,

2019). Flexibility and planning have been strongly associated with problems with perseverative errors and adaptive behavior skills (Craig et al., 2016; Wallace et al., 2016).

Behavioral executive function difficulties are more strongly correlated with everyday function, including independent living skills, than standard neuropsychological executive functioning assessment (Johnston et al., 2019; Wallace et al., 2016). Studies show that ecologically valid, real-world behavioral measures of executive functioning, such as the self-report BRIEF-A, show a moderate to large effect size with adaptive behaviors (Alvares et al., 2020; Baker et al., 2021; Demetriou et al., 2018; Johnston et al., 2019; Pugliese et al., 2016; Roth & Gioia, 2005; Wallace et al., 2016).

Neural Mechanisms Implicated in Executive Dysfunction in Adults With ASD

Brain imaging studies show structural and functional differences in the prefrontal cortex (PFC) in individuals with ASD, supporting the hypothesis that executive functioning challenges are a core feature of ASD (Brady et al., 2017; Johnston et al., 2019). Characteristics common in both ASD and those with frontal lobe damage include a preference for sameness, poor impulse control, perseveration, difficulty with transitions and shifting attention (Brady et al., 2017).

Functional Hypoconnectivity

When compared to neurotypical controls, adolescents with ASD showed the weakest global connectivity, with specific areas of hypoconnectivity in the visual processing network and the default mode network (DMN; Moseley et al., 2015). Hypoconnectivity affects integration and coordination of different brain networks, which influences many cognitive processes (Padmanabhan et al., 2017).

The strength of the connectivity within the major hubs of the DMN significantly correlates with cognitive flexibility, sensory processing, abstract thought processing, and social

and communication deficits (Assaf et al., 2010; Joshi et al., 2017; Lau et al., 2020). Functional connectivity between the default mode network and sensory networks are reduced in adults with ASD (Hong et al., 2019). This system-level imbalance affects integration within brain networks, with long-range connectivity more affected than short-range connectivity (Hong et al., 2019). The severity of sensory-motor, cognitive, and behavioral symptoms significantly correlates with changes in functional connectivity in the brain for adults with ASD (Hong et al., 2019). Global hypoconnectivity can influence the ability to regulate and reduce brain activity (Moseley et al., 2015). Weaker connectivity with the DMN influences cognitive processing; typically, components of the DMN decrease their activity during overt cognitive processing and increase in “mind-wandering” states (Moseley et al., 2015). People with ASD (who have hypoconnectivity) tend to have difficulty toggling between states (Moseley et al., 2015).

Structural Differences

Atypical brain development exists across the lifespan, beginning with early brain overgrowth (<age 5) followed by a period of arrested growth, followed by an accelerated decline in whole brain volume and cortical thickness across the remaining lifespan (Ecker, 2017). Atypical developmental cell migration is thought to impact connectivity of the DMN, which is a major hub in whole-brain connectivity (Padmanabhan et al., 2017). Reduced cortical volume and thickness has been measured in the PFC and other brain regions (Demetriou et al., 2018). There are also increased neuronal numbers in the PFC and abnormal cell patterning at the cortical gray/white matter boundary (Ecker, 2017). The density and diameter of myelinated excitatory axons in the orbitofrontal cortex (OFC) are significantly lower in individuals with ASD, and fMRI studies show reduced activation in the OFC, and hypoconnectivity between the OFC and neighboring cortical areas (Liu et al., 2020). The OFC is involved in assessing emotional

significance, emotion-based learning, allocation of attentional resources, and social cognition (Liu et al., 2020). Consistent with research that shows hypoconnectivity within the DMN and reduced activation of the DMN nodes, there are atypical structural changes in the DMN nodes with accelerated thinning in bilateral PCC gray matter and decelerated volume reduction in ventral mPFC and the temporoparietal junction (TPJ; Padmanabhan et al., 2017).

GABA/Glutamate Imbalance

Gamma-aminobutyric acid (GABA) and Glutamate are reciprocal neurotransmitters that work on excitation and inhibition of different attentional large-scale networks within the brain (Padmanabhan et al., 2017). Imbalance between neural excitation (driven by Glutamate) and neural inhibition (driven by GABA) leads to a disorder of network-level brain organization seen in ASD (Demetriou et al., 2019). The DMN regulates the excitation and inhibition of other large scale neuronal networks within the brain (Padmanabhan et al., 2017). Hypoconnectivity within the DMN and an excitation/inhibition imbalance modulated by the DMN in ASD yields disordered network-level brain organization and poor inhibitory control over behavior in ASD (Carlisi et al., 2017; Padmanabhan et al., 2017). This disorganization impacts the ability to toggle between brain states and is hypothesized to be related to response inhibition and contributing to broad executive function difficulties in ASD (Demetriou et al., 2019; Padmanabhan et al., 2017; Uddin, 2021).

Gap in the Literature

Recent research that has gained insight into the significant correlation between a self-report measure of executive function (BRIEF-A) and independent living skills, as measured by adaptive behavior skills, in adults with ASD (Baker et al., 2021; Demetriou et al., 2018; Johnston et al., 2019; Pugliese et al., 2016; Wallace et al., 2016). In a study exploring self- and informant-

report behavioral questionnaire results (DEX Questionnaire), the level of characteristics associated with dysexecutive functioning were significantly correlated with those with acquired brain injury and were able to significantly distinguish those with ASD and controls (Johnston et al., 2019). In a meta-analysis of 235 studies that compared executive functioning between individuals with ASD and controls measured with traditional neuropsychological tests and self- or informant-report ratings scales, overall effect size was large and statistically significant across all studies (Demetriou et al., 2018). Of note is that there was a significant difference between the type of assessment (traditional neuropsychological test or questionnaire) with the questionnaire format with the largest effect size in distinguishing individuals with ASD from controls (Demetriou et al., 2018). In a longitudinal study, scores on the parent-report of the BRIEF (pediatric version) for individuals with ASD without intellectual disability were strongly predictive of adaptive behavior skills as measured by the Vineland Adaptive Behavior Scale (VABS) in young adults with ASD (Pugliese et al., 2016). In particular, self-monitoring skills were strongly associated with adaptive behavior skills across all domains, problems with inhibition were associated with poor daily living skills and socialization, and poor shifting abilities were associated with later skills in the socialization domain (Pugliese et al., 2016). In a study with 35 adults with ASD without intellectual disability, scores across all domains of the BRIEF-A were impaired as compared to normative data (Wallace et al., 2016). Further analysis revealed that flexibility (based on the shift score from the BRIEF-A) and metacognition (including initiation, working memory, planning/organizing and task monitoring domains of the BRIEF-A) were the most prominent executive functioning deficits identified (Wallace et al., 2016). Metacognition subdomains were significantly correlated with adaptive behavior skills as

measured by the conceptual skills and practical daily living skills portions of the Adaptive Behavior Assessment System, second edition (ABAS-II; Wallace et al., 2016).

These research studies reveal a robust association between self- or informant-report, ecologically valid rating scales of executive function and adaptive behavior skills. There is an opportunity to better understand this relationship, utilizing a performance-based, ecologically valid measurement tool to capture the executive functioning challenges in young adults with ASD that impact the development of independent living skills (Demetriou et al., 2019). This study will utilize a standardized performance-based test of executive function that uses an everyday task (calendar planning) to provide measures of how the person utilizes complex executive functioning skills. The researcher anticipates that examining the quantitative relationship between measures provided by this assessment and measures of independent living skills, as measured by an adaptive behavior scale (Adaptive Behavior Assessment Scale, third edition; ABAS-3), will provide valuable insights and significant clinical and policy implications for informing occupational therapy assessment and intervention, and improve outcomes for young adults with ASD transitioning to independent living.

Characterizing Executive Functions and Independent Living Skills

Measurement of Executive Functioning

Montreal Cognitive Assessment

The Montreal Cognitive Assessment (MoCA) is a 30-item test used to screen for mild cognitive impairment (Nasreddine et al., 2005). The MoCA tests cognitive abilities in the areas of orientation, short-term memory (delayed recall), attention, executive function and visuospatial ability, language, abstraction, animal naming, and has more emphasis on attention and executive functioning than other cognitive screeners, such as the mini-mental state exam (MMSE; Powell

et al., 2017). Study results show that total IQ, as measured by the Wechsler Adult Intelligence Scale, fourth edition (WAIS-IV) battery, are significantly correlated with MoCA scores (Di Nuovo et al., 2018). Internal consistency reliability of the MoCA was determined (Cronbach's $\alpha = .905$; Freitas et al., 2011). A population study performed on a diverse population determined an optimal cutoff score of 22 points to distinguish adults with mild cognitive impairment from controls (Frietas et al., 2011; Rossetti et al., 2011).

For adults with ASD with IQ measured to be > 85 by the Wechsler Abbreviated Scale of Intelligence, all but one of these adults had scores > 22 with the other scoring a 21 on the MoCA (Powell et al., 2017). In a study comparing estimated IQ > 80 as measured by the vocabulary and matrix reasoning subtests of the Dutch Wechsler Adult Intelligence Scale, third edition (WAIS-III-NL) in adults with ASD, IQ was a significant predictor of MoCA scores (Groot et al., 2021). Based on these research studies, the MoCA is a useful cognitive screening tool for adults with ASD to screen for intellectual disability.

Behavior Rating Inventory of Executive Function for Adults

The BRIEF-A is a 75-item, standardized, self- or informant-report scale that measures executive functioning (Roth & Gioia, 2005). The BRIEF-A provides a Global Executive Composite overall score, which is sub-divided into two index scores: Behavior Regulation Index (BRI) and Metacognitive Index (MCI; Roth & Gioia, 2005). The BRI includes information on subdomains of inhibition, shifting, emotional control, and self-monitoring (Roth & Gioia, 2005). The MCI includes information on initiation, working memory, planning and organization, task monitoring, and organization of materials (Roth & Gioia, 2005). Each item assesses the frequency (often, sometimes, or never) of behaviors related to executive functioning that have occurred in the past 4 weeks. Each score can be compared to normative scores, and higher scores

indicate lower executive functioning skills. In a study with 406 individuals with ASD, reliability of the BRIEF-A was strong (Cronbach's $\alpha = .89$; Bishop-Fitzpatrick et al., 2016).

Weekly Calendar Planning Activity

The WCPA is a norm-referenced, performance-based measure of executive functioning during a multi-step everyday activity (Togia, 2015). This assessment aims to examine patterns of executive functioning and how they influence the performance of the multi-step activity of planning a calendar. During the assessment, the participant is asked to enter a list of 17 appointments into a weekly calendar, while following five rules (ignore questions from the administrator designed to be a distraction, identify when 7 minutes have passed, leave Wednesday free, do not cross out anything after entering it on the calendar, and tell the administrator when they are finished). These rules provide information about the ability to inhibit impulses, promote planning, encourage strategy use and self-recognition of errors, and to discourage a trial-and-error approach to the task. There are additional challenges built into this assessment including conflicting appointments, time blocks changing from 15- to 30-minute intervals in the evening portion of the calendar, and Saturday/Sunday reversal. Some appointments offer multiple options, and some are fixed appointments. The administrator observes and notes which strategies (from a pre-determined list of 13 strategies) that the participant uses throughout the task. When the participant is finished, the administrator conducts a brief interview where the participant describes their strategies and estimates their own performance on the task. The WCPA provides a wealth of information, including accuracy, type of errors, planning time, total time, number of strategies, and estimated accuracy.

For this research study, the measures of accuracy, number of strategies used, and self-awareness were used for statistical study. Accuracy is obtained by calculating the number of

accurately placed items onto the calendar, out of the 17 possible appointments. The number of strategies is determined by observation and any additional observations identified by the participant during the interview. Self-awareness is calculated by comparing the participant's estimated accuracy (out of 17 correct appointments) to the actual performed accuracy (Zlotnik & Toglia, 2018).

In previous research comparing an ecologically valid assessment of executive function (using the BRIEF), researchers identified the areas of initiation, working memory, planning/organizing, task monitoring, and metacognition as correlating with independent living skills in adults with ASD (Wallace et al., 2016). Initiation, working memory, and planning/organizing are all aspects of being able to accurately complete the WCPA (accuracy score). Task monitoring correlates with the number of strategies used on the WCPA, and the metacognition index on the BRIEF correlates with the self-awareness measurement from the WCPA.

This assessment has high interrater reliability and high discriminant validity for populations with executive functioning deficits including ADHD, at-risk youth, adolescents with epilepsy, adolescents with traumatic brain injury, and adults with multiple sclerosis (Goverover, et al., 2020, Weiner et al., 2012, Wolf et al., 2019, Zlotnik et al., 2020). Concurrent validity and inter-rater reliability has also been demonstrated between the WCPA and other assessments of executive function (Goverover et al., 2020; Lahav et al., 2018; Weiner et al., 2012).

Measurement of Independent Living Skills

Adaptive Behavior Assessment System 3rd Edition

The ABAS-3 is a commonly used, norm-referenced scale that provides a complete assessment of adaptive behavior skills across the lifespan (Harrison & Oakland, 2015). The

measure of adaptive behavior skills encompasses what the individual can do and actually does, without reminders or assistance from others. The adult version of this assessment is valid for ages 16 through 89 and is either a parent-report or self-report measure of adaptive behavior skills including social, communication, and daily life skills. The ABAS-3 consists of 239 items that focus on practical, everyday activities that are required to function, meet environmental demands, self-care skills, and effective interaction with others. Each item consists of a 4-point Likert scale ranging from 0 (*not able to perform*) to 4 (*always performs the behavior when needed, without reminders and without help*). The ABAS-3 provides a total score and sub-scores across three broad domains: conceptual, social, and practical skills.

The ABAS-3 assessment is validated in populations of developmental delays, ASD, intellectual disability, learning disabilities, and neuropsychological disorders (Harrison & Oakland, 2015). ABAS-3 adaptive skill scaled scores had high internal consistency, inter-rater reliability, and alternate-form reliability (.85-.98; Harrison & Oakland, 2015). Convergent validity was determined with comparison to the VABS-II (Harrison & Oakland, 2015). ABAS-3 scores demonstrate discriminate validity between typically developing individuals and those with intellectual disability, ASD, and ADHD (Harrison & Oakland, 2015).

Daily Living Questionnaire

The Daily Living Questionnaire (DLQ) is a 52-question, self-report measure of everyday difficulties with participation and performance of daily life activities that involve higher-order cognitive skills, including household tasks, activities involving language and communication skills, community and social participation, and complex IADL tasks (Rosenblum et al., 2017). This assessment is designed to capture independent living challenges and characterize the cognitive effects of independent living tasks that require higher level executive functioning skills

(Rosenblum et al., 2017). Each question is rated on a 5-point Likert scale to rate the level of mental or cognitive difficulty required for each task. Based on the organization of the International Classification of Functioning, Disability and Health (ICF), this assessment is written in two parts: participation and performance. Part 1 addresses activity limitations and participation in IADL including home, community, social, and work activities that could be impacted by cognitive difficulties. Examples of tasks in Part 1: “Organizing and scheduling own daily activities and errands,” “Searching for information,” “Finding your way in unfamiliar environments,” and “Fixing / repairing things.” Part 2 focuses on dimensions of executive functioning required in everyday activities, including difficulty with working memory, organizing, and multi-tasking. Examples of tasks in Part 2 include: “Remembering things you needed to do during the day,” “Keeping track of where things are,” “Responding quickly to situations when necessary,” and “Attending to all aspects of a task or situation without missing information.” Internal consistency has been determined to be high for the two parts (Cronbach’s $\alpha = .97$; Rosenblum et al., 2017). This assessment has been validated using participants with higher level cognitive deficits resulting from acquired injuries, such as mild stroke, brain tumor, traumatic brain injury, multiple sclerosis, or lupus (Rosenblum et al., 2017). Internal consistency reliability for all 52 items was calculated; Cronbach’s $\alpha = .97$ for all 52 items; .93 for part 1 and .95 for part 2 (Rosenblum et al., 2017). Due to similar executive functioning challenges reported in the literature for adults with ASD, this assessment was used to assess independent living skills and cognitive difficulty in everyday life activities for the participants in this study.

CHAPTER III

METHODOLOGY

Research Aims

The overall goal of this quantitative study is to understand the role of executive functions in transitioning to independent living. Establishing these relationships in young adults with ASD will lead to more comprehensive occupation-based assessment and intervention approaches.

Specific Aim 1

Firstly, this study compares independent living skills and executive functioning between young adults with ASD and neurotypical young adults. It is hypothesized that independent living skills will be significantly lower in young adults with ASD as compared to neurotypical young adults, as measured with the ABAS-3 (Harrison & Oakland, 2015). It is also hypothesized that executive functioning skills will be significantly lower in young adults with ASD as compared to neurotypical young adults as measured by the WCPA (Toglia, 2015).

Specific Aim 2

Secondly, this study examines the overall contribution of executive functioning skills to independent living skills in young adults with ASD. It is hypothesized that executive functioning skills will have a significant positive correlation with independent living skills in young adults with ASD. It is also hypothesized that executive functioning skills will contribute significantly to independent living skills in young adults with ASD.

Participants

The target population for this study included young adults with ASD (ages 18-30) and neurotypical young adults (ages 18-30). The researcher recruited a minimum of 45 young adults with ASD and 30 neurotypical adults, as determined by the power analysis discussed below.

Participants were recruited through local organizations that work with young adults with autism (such as Association for Independent Living, 29 Acres, Nonpareil Institute, Segue Center, local college autism support groups, and others). Participants were also recruited through snowball sampling, social media, and local colleges. Permissions were obtained from each location or social media group moderator prior to recruitment.

In total, 52 participants were in the ASD group, and 32 participants were in the neurotypical group. The distribution of age between the two groups was significantly similar. Individuals with ASD had a diagnosis by a medical professional. Since it is likely that the diagnosis would have been made several years ago and access to the documented evidence may be difficult to obtain, self-report was accepted as evidence of ASD diagnosis. Inclusion and exclusion criteria are described in Table 3.

Table 3

Inclusion and Exclusion Criteria

Inclusion criteria	Exclusion criteria
• Age 18-30 • Diagnosis of ASD (for ASD group) • Cognitive ability (Screen by MoCA score ≥ 22)	• Untreated psychiatric condition • Other genetic conditions, traumatic brain injury, or other neurological disorders that affect cognitive functioning.

Procedure

A full Institutional Review Board (IRB) review was completed due to participants being a protected population. Once IRB approval was received, the community partners and support groups (as listed above) were contacted. The research project was described briefly to the

assigned contact at each potential recruitment site and permission to recruit participants was obtained. Once each participant was identified, they were contacted either over email, telephone, or in person at the site.

Upon initial contact, eligibility to participate in the study was determined. After determining eligibility, a 2-hour meeting was scheduled to conduct the assessments in this study. The study was conducted in a safe, quiet location where the participant was comfortable. Each participant was informed that they would be able to bring a support person with them, if desired, to provide clarification and support during the session.

During the session, each participant (or legal guardian, if applicable) reviewed and signed an informed consent form, indicating that they understood and agreed to being a participant in this research study. The participants then completed the packet of assessments, which included the MoCA, WCPA, BRIEF-A, ABAS-3, and DLQ. The researcher or support person was able to assist the participant with understanding instructions and completing questionnaire assessments as needed. Following completion of the battery of assessments, participants received \$35 in appreciation for their time.

Analysis

Data was analyzed using IBM SPSS statistics software. Descriptive statistics were calculated for each group (ASD and neurotypical) including age, sex, and level of education. *A priori* power analysis using G*Power was conducted to determine the minimum sample size for the ASD group to reach an adequate power of 0.8. Previous articles (Demetriou et al., 2018; Pugliese et al., 2016; Wallace et al., 2016) indicated moderate-large effect size (Cohen's $d = .47 - .86$, $f^2 = 0.26-0.53$), so a moderate-large effect size of 0.3 (f^2) was used for the power analysis. With the alpha set as 0.05 and three predictors for multiple linear regression, a

minimum sample size of 41 is needed. A total of 52 young adults with ASD participated in this study.

A *priori* power analysis using G*Power was conducted to determine the minimum sample size for the neurotypical group to reach an adequate power of 0.8 in independent *t*-test comparisons with the ASD group. A large effect size of .65 was used, based on previous research comparing adults with ASD to neurotypical adults (Demetriou et al., 2018). With the alpha set as 0.05, a minimum sample size of 30 neurotypical adults is sufficient. A total of 32 neurotypical young adults participated in this study.

Specific Aim 1 was to compare independent living skills and executive functioning between young adults with ASD and neurotypical young adults. This aim was addressed by using *t*-tests to compare young adults with ASD to neurotypical young adults for independent living skills (ABAS-3 and DLQ) and executive functioning skills (WCPA and BRIEF-A).

Specific Aim 2 was to examine the overall contribution of executive functioning skills to independent living skills in young adults with ASD. This aim was addressed by using correlation and multiple linear regression to determine correlations between executive functioning skills (WCPA subscales) and independent living skills (ABAS-3 and DLQ).

CHAPTER IV

RESULTS

Description of Participants

Eighty-four participants completed this study. Of these, 32 were in the neurotypical group and 52 were in the ASD group. The proportion of males to females in each group was significantly different with males comprising 78.8% of the ASD group and 56.3% of the neurotypical group, $\chi^2(1, N = 84) = 4.84, p = .028$ (see Table 4). The age distribution for the ASD and neurotypical groups are not significantly different, indicating similar age distribution between groups (see Table 4). MoCA scores are significantly different between groups (see Table 4). The difference in MoCA scores was not unexpected due to communication differences in the ASD group (Groot et al., 2021; Powell et al., 2017). The majority of participants in the ASD group live at home with their family and attend therapeutic autism programs. Most participants in the neurotypical group live independently and either work full-time or are in college full-time. Table 5 describes participants' work, and highest level of education.

Table 4

Description of Participants

	ASD group	Neurotypical group	<i>p</i>
	Mean (<i>SD</i>)	Mean (<i>SD</i>)	
<i>n</i>	52	32	
Age	22.99 (3.29)	23.56 (2.57)	.405
MoCA score	25.88 (2.16)	28.09 (1.84)	<.01*
% male	78.8%	56.4%	.028*

Note. *SD* = Standard deviation

**p* < .05

Table 5*Description of Work and Education Participation*

Work participation		
	ASD group	Neurotypical group
None	65.4%	18.8%
Part-time	32.7%	62.5%
Full-time	1.9%	18.8%
Highest level of education		
High school diploma	59.6%	15.6%
Some college	32.6%	34.4%
Bachelor's degree	7.7%	15.6%
Some graduate school	0%	34.4%

Differences Between ASD and Neurotypical Groups

The first aim of this study was to determine if there are significant differences in independent living skills and executive functioning skills between young adults with ASD and a comparison group of neurotypical young adults.

Independent Living

Independent samples *t*-tests were conducted to compare adaptive behavior skills and daily living skills between neurotypical and ASD young adults. Results indicate that young adults with ASD have significantly lower independent living skills than their neurotypical peers as measured by both the ABAS-3 and the DLQ Part 1 assessments (see Table 6). Both measures of independent living skills are able to differentiate between young adults with ASD and neurotypical peers. In the ABAS-3, neurotypical young adults had normative average adaptive

behavior t -scores (mean = 99.16, SD = 12.19). Young adults with ASD had adaptive behavior t -scores approximately 2 standard deviations below the mean (mean = 79.98, SD = 11.07).

Table 6

Differences Between ASD and NT Groups in Independent Living Skills

Variable	Group	Mean	<i>SD</i>	<i>p</i>
ABAS-3				
Conceptual	ASD	80.84	11.09	< .001**
	Neurotypical	99.13	11.82	
Social	ASD	86.02	9.87	< .001**
	Neurotypical	98.56	10.85	
Practical	ASD	78.33	12.14	< .001**
	Neurotypical	98.00	13.99	
Total Score	ASD	79.98	11.07	< .001**
	Neurotypical	99.16	12.19	
DLQ Part 1				
Household tasks	ASD	1.68	0.56	.035*
	Neurotypical	1.57	0.58	
Language	ASD	2.17	0.91	< .001**
	Neurotypical	1.54	0.51	
Community	ASD	2.69	1.44	< .001**
	Neurotypical	1.53	0.71	
Complex Tasks	ASD	3.12	1.30	< .001**
	Neurotypical	1.93	0.82	
Part 1 Total Score	ASD	2.42	0.73	< .001**
	Neurotypical	1.64	0.55	

Note. ABAS-3 scores are reported as t -scores

* = $p < .05$, ** = $p < .001$

Executive Functions

The results of this study indicate that young adults with ASD have significantly lower executive functioning skills than their neurotypical peers as measured by the BRIEF-A, the WCPA, and the DLQ part 2 (everyday cognitive symptoms).

Behavioral Rating Inventory of Executive Function - Adult Version

Independent samples *t*-tests were conducted to compare mean executive functioning skills (BRIEF-A total score and BRI and MI sub-scores) between neurotypical and ASD young adults. Results show significant differences between the ASD and neurotypical groups in all measures (see Table 7).

Weekly Calendar Planning Activity

The WCPA is a performance-based measure of executive functioning, utilizing a multi-step everyday activity that challenges executive functions (planning a calendar). The WCPA provides insight into the difference in performance of individuals with ASD compared to the neurotypical group. There was no significant difference between both groups in the total time required to complete the activity (see Table 7). Individuals with ASD followed significantly fewer rules during the activity, indicating poorer response inhibition skills. This is consistent with significant differences between groups in the BRIEF-A inhibit *t*-score. Individuals with ASD utilized significantly fewer strategies to complete the activity. On average, individuals with ASD utilized 4.23 strategies and the neurotypical group utilized 7.22 strategies. Strategy use provides information about task monitoring, which is consistent with significant differences in this study between groups on the task monitoring sub-scale of the BRIEF-A.

The WCPA provides information about the participant's self-awareness by comparing the accuracy of performance to the participant's estimated accuracy. Difference in self-awareness

was significant between groups, and the ASD group over-estimated their accuracy by 3.66 points on average. This provides information in line with the MCI on the BRIEF-A, which was also significantly different between groups, with lower MCI skills in the ASD group. Performance on the WCPA, as measured by the accuracy of the completed calendar, was also significantly different between groups, with the ASD group having an average of 11.31 accurate appointments (out of 17 possible) and the neurotypical group having an average of 14.75 accurate appointments. The accuracy measurement on the WCPA provides information about the participant's ability to integrate the executive functions of initiation, working memory, planning, and organizing. This is consistent with significant differences between groups on the BRIEF-A initiate sub-score, working memory sub-score, the planning sub-score, and the organization sub-score. These data indicate that the WCPA provides a valid measure to differentiate executive functioning skills between individuals with ASD and neurotypical peers (see Table 7).

Daily Living Questionnaire Part 2: Everyday Cognitive Symptoms

The DLQ Part 2 (everyday cognitive symptoms) provides sub scores including memory, monitoring, and executive functions. There was no significant difference between groups on the measurement of memory (see Table 7). There were significant differences between groups in the areas of monitoring and executive functions, which is consistent with significant differences in these areas indicated by both the WCPA assessment and BRIEF-A assessment utilized in this study (see Table 7).

Table 7*Differences Between ASD and NT Groups in Executive Functioning Skills*

Variable	Group	Mean	<i>SD</i>	<i>p</i>
BRIEF-A				
BRIEF-A BRI	ASD	59.42	11.25	< .001**
	Neurotypical	46.97	9.06	
BRIEF-A MCI	ASD	61.17	11.29	< .001**
	Neurotypical	50.44	10.98	
BRIEF-A GEC	ASD	60.87	10.29	< .001**
	Neurotypical	48.91	10.35	
WCPA				
Number of rules	ASD	1.68	0.56	.035*
	Neurotypical	1.57	0.58	
Total time (min)	ASD	2.17	0.91	< .001**
	Neurotypical	1.54	0.51	
Strategies	ASD	2.69	1.44	< .001*
	Neurotypical	1.53	0.71	
Accuracy	ASD	3.12	1.30	< .001**
	Neurotypical	1.93	0.82	
Self-awareness	ASD	2.42	0.73	< .001**
	Neurotypical	1.64	0.55	
DLQ Part 2				
Memory	ASD	1.87	0.57	.112
	Neurotypical	1.66	0.60	
Monitoring	ASD	1.76	0.45	.009*
	Neurotypical	1.50	0.40	
Executive functions	ASD	1.76	0.42	< .001**
	Neurotypical	1.41	0.38	
DLQ Part 2 Total	ASD	1.78	0.37	< .001**
	Neurotypical	1.48	0.36	

Note. Scores are reported as *t*-scores

* = $p < .05$; ** = $p < .001$

Data Analysis Within ASD Group

Correlation Between Independent Living Measures Within ASD Group

Pearson's correlation examined the relationship between independent living measures (ABAS-3 GAC score and DLQ Part 1 total score). Results indicate a significant negative association between these two measures of independent living skills ($r = -.608, p < .001$). This correlation indicates a large effect size between these measures, which indicates consistency between the two measures in quantifying independent living skills in young adults with ASD. The correlation is negative due to a high score for the ABAS-3 indicating high adaptive behavior skills, and a high score on the DLQ Part 1 indicates more challenges with activity participation.

Correlation Between Executive Function Measures Within ASD Group

Within the ASD group, there is a significant correlation with a large effect size between the BRIEF- A GEC and the DLQ part 2 score ($r = .554, p < .001$), which indicates that DLQ Part 2 is a valid measure of executive functions utilized in everyday living. Correlations between WCPA scores and the BRIEF- A or DLQ part 2 were insignificant with small effect sizes within the ASD group in this study. One exception is the WCPA accuracy sub-score, which approaches significant correlation with the BRIEF-A BRI t -score in the ASD group, with a small to moderate effect size ($r = -.262, p = .060$). Table 8 summarizes the correlations between measures of executive functioning used in this study.

Table 8*Correlation Between Executive Function Measures Within ASD Group*

	BRIEF-A GEC		DLQ Part 2 Total Score	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
WCPA Strategies	-.029	.841	.044	.755
WCPA Accuracy	-.262	.060	-.101	.476
WCPA Self-awareness	.141	.318	-.196	.163
WCPA Rules	-.034	.813	.154	.276
DLQ Part 2	.554	<.001*		

Note. *r* = Pearson's correlation

**p* < .05

Correlation Between Independent Living and Executive Function Within ASD Group

Pearson's correlation was conducted to examine the relationship between independent living measures (ABAS-3 GAC) and executive functioning skills (BRIEF-A GEC, DLQ Part 2, and WCPA scores). Results indicate a significant negative association between ABAS-3 and BRIEF-A and DLQ Part 2 (see Table 9). These correlations indicate a medium effect size between these measures. Correlations between ABAS-3 and all WCPA sub-scores are insignificant with low correlation (see Table 9).

Pearson's correlation was conducted to examine the relationship between daily living skills (DLQ Part 1) and executive functioning skills (BRIEF-A, DLQ Part 2, and WCPA). Though ABAS-3 and DLQ Part 1 were significantly correlated with a large effect size as measures of independent living skills, there is no significant correlation between executive functions as measured by the BRIEF-A GEC or DLQ Part 2 (see Table 9). However, the independent living measure of the DLQ Part 1 has a significant correlation with WCPA Accuracy, and it approaches significant correlations with small to medium effect sizes with the

WCPA sub scores of the number of strategies used and self-awareness with medium effect sizes (see Table 9).

Table 9

Correlation Between Independent Living and Executive Function Skills Within ASD Group

	ABAS-3 GAC		DLQ Part 1	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
BRIEF GEC	-.312	.026*	.205	.148
DLQ Part 2	-.279	.047*	.167	.241
WCPA Strategies	.030	.833	-.255	.071
WCPA Accuracy	.125	.381	-.318	.023*
WCPA Self Awareness	-.058	.688	.257	.069
WCPA Rules	.120	.400	-.067	.597

Note. *r* = Pearson's correlation

**p* < .05

Multiple Regression of Adaptive Behavior and Executive Functioning

A multiple regression analysis was used to examine the contribution of executive functioning (measured by BRIEF-A sub-scores) to adaptive behavior (measured by ABAS-3 GAC) in young adults with ASD (see Table 10). Results indicated that the executive functions did not contribute significantly, $F(2, 48) = 1.89, p = .162$, and accounted for only 3.4% of the variance in adaptive behavior. Neither BRI ($\beta = -.132, p = .433$) nor MI ($\beta = -.173, p = .305$) were significant predictors of adaptive behavior (see Table 10). These are consistent with previous research that found that neuropsychological measures of executive functioning account for 4-7% of the variance in daily living skills (Pugliese et al., 2016).

Table 10*Summary of Analysis Predicting Adaptive Behavior From BRIEF-A*

Predictor	<u>Unstandardized</u>		<u>Standardized</u>	<i>T</i>	<i>p</i>
	β	<i>SE</i>	β		
BRIEF-A BRI <i>t</i> -score	-.13	.16	-.13	-.79	.43
BRIEF-A MI <i>t</i> -score	-.17	.16	-.17	-1.04	.30

Note. Adjusted $R^2 = .034$

Similarly, executive functioning (measured with WCPA) did not contribute significantly to adaptive behavior skills with young adults with ASD ($F(3, 47) = .270, p = .847$; see Table 11).

Table 11*Summary of Analysis Predicting Adaptive Behavior From WCPA*

Predictor	<u>Unstandardized</u>		<u>Standardized</u>	<i>T</i>	<i>p</i>
	β	<i>SE</i>	β		
Strategies used	-.152	.807	-.031	-.189	.851
Accuracy	.382	.603	.125	.633	.530
Self-awareness	-.077	.573	.024	-.134	.894

Note. Adjusted $R^2 = -.046$

Multiple Regression of Daily Living Skills and Executive Functioning

A multiple regression analysis was used to examine the contribution of executive functioning (measured by BRIEF-A sub-scores) to daily living skills (measured by DLQ Part 1) in young adults with ASD (see Table 12). Results indicated that the executive functions did not contribute significantly, $F(2, 48) = 2.163, p = .126$, and accounted for only 4.4% of the variance in daily living skills (see Table 12). Though the BRIEF-A sub-scores were not significantly

associated with daily living skills, the BRIEF-A BRI sub score is approaching significance with DLQ Part 1 measure of daily living skills (see Table 12).

Table 12

Summary of Analysis Predicting Daily Living Skills From BRIEF-A

Predictor	<u>Unstandardized</u>		<u>Standardized</u>	<i>t</i>	<i>p</i>
	β	<i>SE</i>	β		
BRIEF-A BRI T-Score	.020	.011	.311	1.869	.068
BRIEF-A MI T-score	-.003	.011	-.047	-.281	.780

Note. Adjusted $R^2 = -.044$

Similarly, executive functioning (measured with WCPA) did not contribute significantly to daily living skills (measured by DLQ Part 1) with young adults with ASD, $F(3, 47) = 2.108$, $p = .112$, and accounted for 6.2% of the variance in daily living skills. Neither Strategies ($\beta = -.144$, $p = .353$), Accuracy ($\beta = -.223$, $p = .237$), nor Self-awareness ($\beta = -.051$, $p = .768$) were significant predictors of daily living skills (see Table 13).

Table 13

Summary of Analysis Predicting Daily Living Skills From WCPA

Predictor	<u>Unstandardized</u>		<u>Standardized</u>	<i>T</i>	<i>p</i>
	β	<i>SE</i>	β		
Strategies used	-.047	.050	-.144	-.938	.353
Accuracy	-.045	.038	-.223	-1.197	.237
Self-awareness	.011	.036	.051	.297	.768

Note. Adjusted $R^2 = .062$

CHAPTER V

DISCUSSION

The transition to adulthood and independent living for all young adults is a complex, multifactorial process. Executive functions are foundational cognitive skills related to the development of independent living skills in young adults. As an individual matures during the transition to adulthood, expectations of self-responsibility, making independent decisions, and becoming self-sufficient also increase (Keller et al., 2007). This transition has been shown to be especially difficult for young adults with ASD. Many young adults with ASD experience poor outcomes in the transition to adulthood, including low rates of successful employment and independent living (Baker et al., 2021; Centers for Disease Control and Prevention [CDC], 2022, Wallace et al., 2016).

As stated in the results, independent living skills and executive functioning skills were significantly lower in young adults with ASD as compared to neurotypical controls. Within the group of young adults with ASD, there were significant correlations between adaptive behavior skills (measured by ABAS-3) and executive functions as measured by rating inventories (BRIEF-A and DLQ Part 2). Surprisingly, the current study found that executive functions as measured by the performance-based measure of executive functions (WCPA) did not significantly correlate with adaptive behaviors or daily living skills in young adults with ASD.

Independent Living in ASD

Consistent with prior results, there was a significant difference in adaptive behavior between young adults with ASD and neurotypical peers, as measured by the self-report version of ABAS - 3, with the young adults with ASD measuring on average two standard deviations below the neurotypical group. Prior studies utilized informant-report versions of adaptive behavior scales, that reported adaptive behavior in individuals with ASD to be one to two

standard deviations below the mean (Bathje et al., 2018; Duncan & Bishop, 2015; Hume et al., 2014; Pugliese et al., 2016). This study also supports the validity of the self-report version of this assessment of adaptive behavior in contrast to informant-report versions (Harrison & Oakland, 2015). In addition, daily living skills were assessed by the DLQ Part 1, which also significantly differentiated those with ASD and their neurotypical peers. This result, along with DLQ Part 1's robust correlation with the measure of adaptive behavior (ABAS-3), provides support for the use of this occupation-based assessment of activity restrictions and participation in daily living skills with young adults with ASD. This expands the body of evidence of the utility of this assessment beyond populations of individuals with acquired injuries that affect higher-level cognitive performance, including stroke, brain tumor, traumatic brain injury, multiple sclerosis, and Parkinson's disease (Rosenblum et al., 2017).

Anecdotally, use of the DLQ provided a clinically relevant, valuable opportunity for guiding conversation with the young adult with ASD to clarify the individual's thoughts and opinions about each question, as the young adults with ASD expressed frustration and provided examples from their own lives. Many participants struggled answering the questions and described them as "subjective" and "ambiguous." Examples include: "What do you mean: solving problems without difficulty. What kind of problem? Like finding the next level in a video game? Like re-writing a section of computer code? This is too ambiguous!" or "How do you quantify participating in group discussions? What is the discussion about? And do you have to talk to participate? How much? This is too subjective!"

Executive Functioning in ASD

Similar to independent living, executive functioning skills (on all measures) were significantly lower in young adults with ASD as compared to the neurotypical young adults.

Although not a surprising finding, these reiterate the impact of ASD on executive functions, across ages. Studies have consistently reported broad executive function deficits in children, adolescents, and adults with ASD (Brady et al., 2017; Demetriou et al., 2018; Johnston et al., 2019, Wallace et al., 2016). Furthermore, this study brings to light that though broad executive function deficits are seen in individuals with ASD, there is a heterogeneity of executive functions among the ASD population, which is consistent with measurement utilizing a variety of tools including neuropsychological testing, behavioral rating inventories, and performance-based activities (Pugliese et al., 2016; Toplak et al., 2013). Unique to this study is the use of the self-report version of the BRIEF-A, whose total scores indicate that executive functioning skills in individuals with ASD are on average approximately one standard deviation below their neurotypical peers. These significant differences are consistent with existing literature that show that neuropsychological tests and informant-report behavioral rating inventories have been able to differentiate between those with ASD and neurotypical peers across the lifespan (Brady et al., 2017; Demetriou et al., 2018; Johnston et al., 2019, Wallace et al., 2016). Results also show the self-report DLQ Part 2 (everyday cognitive abilities) correlated strongly with the BRIEF-A in this study and was able to significantly differentiate between individuals with ASD and healthy controls in areas of monitoring and executive functions.

Interestingly, the DLQ Part 2 found no significant difference between individuals with ASD and neurotypical controls in memory, indicating that long term memory skills are likely not a factor involved with differences in poor outcomes during the transition to adulthood. This is consistent with previous research that reports limited deficits in long term memory in individuals with ASD (Desaunay et al., 2020; Williams et al., 2006). The DLQ has been shown to be a valid tool to detect differences between healthy controls and participants demonstrating cognitive

impairments, including those with multiple sclerosis and Parkinson's disease (Rosenblum et al., 2017; Rosenblum et al., 2022). Current findings thus strengthen the sensitivity of the DLQ in discerning executive functioning deficits between ASD and neurotypical young adults and identifying challenges in daily living based on cognitive difficulty for young adults with ASD.

Performance-Based Functional Cognition

To build upon the evidence from previous research that found that self-report behavioral inventories, such as the BRIEF, were able to consistently differentiate individuals with ASD, this study aimed to explore the utility of using a performance-based test of executive function using an ecologically valid everyday task to provide insight into executive functioning deficits in young adults with ASD. A major finding in this study is that the WCPA was able to differentiate individuals with ASD in the number of rules followed, number of strategies used, and overall performance (accuracy) of the task. Interestingly, the total time to complete the task was not significantly different, in contrast to the literature describing performance in other neurological conditions that report slowed speed and increased time to complete the activity (Doherty et al., 2022; Foster et al., 2022). The accuracy sub-score approaches significant correlation with the BRIEF-A BRI score in the ASD group, which indicates that the accuracy score may be an indicator of executive functioning challenges in young adults with ASD. This is supported by a study in teens with ADHD that indicates a moderate significant correlation between WCPA accuracy and BRIEF self-report GEC and in a study with teens with epilepsy indicating a significant association between WCPA accuracy and BRIEF GEC score (Berger et al., 2019, Zlotnik et al., 2020). Other studies report WCPA accuracy is associated with better executive functioning as measured by neuropsychological assessments in persons with multiple sclerosis and in persons with Parkinson's disease (Foster et al., 2022; Goverover et al., 2020). These

findings support the potential use of the WCPA accuracy as a valid assessment of executive functioning deficits in young adults with ASD.

Direct observations are of clinical interest when administering the WCPA and provide information about how the individual goes about problem solving and completing a complex task. Observations during this study reinforced the executive dysfunction hypothesis, which depicts the broad executive function deficit patterns in ASD, with variability of performance across executive function domains. Each young adult with ASD displayed a different combination of challenges while performing this activity. While various common themes of problems related to executive dysfunction could be observed during this activity, each young adult displayed a unique combination of these varying skills that are required to complete the task. This unique variability was observed in many areas of the WCPA. Some young adults with ASD demonstrated low accuracy due to missing details in the appointment, such as scheduling an activity on Monday, Wednesday, and Friday, instead of just entering the appointment on one of the three possible days. Many other young adults with ASD demonstrated low accuracy due to difficulty with cognitive flexibility; an example of which is that the layout of the calendar ends at 9 pm. When encountering an appointment for a movie from 7-11 pm, many would become stuck, often asking for direction, and some eventually chose to cancel the movie, to schedule the movie for an earlier time, to end the movie at 9 pm when the printed calendar ended, or to not enter that appointment because “it didn’t fit.” Some participants became very frustrated when encountering a conflict; they tended to be very rigid with the rule to not cross out or move any appointment. Strategies to overcome this included: creating another earlier appointment to call to reschedule the appointment to another time, canceling the appointment, moving the appointment later and stating, “it is better late than never; people understand if you are running late,” or deciding to

leave an appointment in the middle to run out to meet another appointment obligation (walking the neighbor's dog) then returning to the interrupted appointment. In addition, many young adults with ASD demonstrated difficulty with adopting a simulated perspective; they would fit the WCPA activity into their own life. For example, one person grouped errands together based on them being conveniently located near each other in his hometown and another blocked time out on the calendar prior to scheduling any WCPA appointments based on their personal work hours, so that the entered appointments would not conflict with their personally important job. Another participant stated:

The biggest challenge was thinking about how they would fit into real life. You don't want the doctor right after the meeting with your cousin. You wouldn't do it that way in real life. Maybe I should have called the cousin to see if I could meet him early, to account for travel time. And is the cousin coming to see me? Am I going to see my cousin? This appointment doesn't have all the details.

Another unique strategy used by one participant with ASD was to "minimize people-ing" where he scheduled any meetings involving being around people to overlap (meet with cousin during his lunch with a friend) or scheduled at a strategic time (go to the gym very early before other customers).

Observations also provided valuable information on the pattern of strategy use. For example, a subset of young adults with ASD did not demonstrate any observable strategy use, but they would begin the activity by intently staring at the list of appointments, then proceed to write all of them down accurately. These young adults then described that they looked at the list and manipulated everything in their head before writing; they also described high levels of

fatigue after the task (“A lot of information overload, but I got through it”). These young adults also described fatigue and difficulty managing multiple responsibilities in daily life.

These findings provide support for the use of WCPA as a clinically relevant, performance-based assessment of executive functions in young adults with ASD and demonstrate that it contributes valuable information to the characterization of cognitive function and occupational performance in this population. Observations made during the completion of the WCPA aligned with previous research, including those identifying executive function characteristics of individuals with ASD and qualitative reports of daily life challenges related to cognitive inflexibility, generalization, working memory, planning, organization, and self-monitoring (Brady et al., 2017; Chai et al., 2018; Demetriou et al., 2019; Pugliese et al., 2016).

Interplay of Executive Functions and Independent Living

A second focus of this study was to explore the correlation between executive functioning factors and independent living skills in young adults with ASD. In line with our expectations, we found that measurement of the self-report BRIEF-A, as well as the DLQ Part 2, significantly correlated with adaptive behavior as measured by ABAS-3. These findings support previous studies that indicate a significant correlation between childhood, adolescent and adult executive functioning as measured by behavioral rating inventories (DEX; BRIEF-A) and adaptive behavior as measured by the adaptive behavior scales (VABS; ABAS-3; Alvares, 2020; Baker et al., 2021; Demetriou et al., 2018; Johnston et al., 2019; Pugliese et al., 2016; Roth & Gioia et al., 2005; Wallace et al., 2016).

In contrast, though the two measures of independent living (DLQ Part 1 and ABAS-3) significantly correlate, there is no significant correlation between the self-report BRIEF-A and daily living skills as measured by DLQ Part 1. This could indicate that the DLQ Part 1 measures

different but correlated constructs than the ABAS-3. While there is a discrepancy between these correlations, there is clinical utility in the information gleaned from DLQ Part 1 about activity restrictions and limitations in participation in everyday life. Further research is needed to fully understand this discrepancy.

In this study, it was hypothesized that executive functions as measured by the performance-based WCPA would significantly correlate with measures of independent living. Contrary to expectations, these findings showed no significant correlations between WCPA subscales and independent living measures. Interestingly, the accuracy sub score of the WCPA approached significant correlations with executive functioning measures (BRIEF-A BRI and DLQ Part 2), each of which do correlate significantly with independent living skills. In addition, the number of strategies used during the WCPA activity and self-awareness approached significance with daily living skills as measured by the DLQ Part 1. Although no significant relationships were found between WCPA sub-scores and adaptive behavior, the WCPA does differentiate between individuals with ASD and neurotypical peers and shows promise at providing a window into how the integration of multiple executive functions impacts their challenges with everyday living skills. These results provide preliminary information that indicate further study is needed in the use of occupation-based performance measures of executive functioning in adults with ASD.

Overall, this study highlights the differences between young adults with ASD and their neurotypical peers in the areas of independent living skills and executive functions. This gives insight to understand poor outcomes that are reported by epidemiological studies and by qualitative reports from parents and young adults with ASD about challenges with the transition to adult living. In line with previous studies, the participants with ASD in this study discussed

their challenges with the transition to adulthood and how they are unsure how to gain independence in living and job skills. Consistent with other reports, participants in this study reported continued reliance on their parents for managing their chores, schedules, their activities, and appointments.

Clinical Implications

Transitions of any kind require both intrinsic factors that support the transition, and external supports that facilitate learning and growing new skills. Not only are intrinsic executive function deficits that limit the ability to navigate the transition to independent living evident in young adults with ASD, as highlighted in this study, but these challenges are magnified by the societal expectations for successfully taking on adult roles independently and by the lack of adults supports available, as described by the “service cliff.” This lack of support and guidance during this crucial time of transition creates a perfect storm that helps explain the poor outcomes following high school when services fall away. These findings emphasize the importance of ongoing coordinated therapeutic supports to address essential executive functioning challenges and to facilitate the transition to adulthood for young adults with ASD and to guide their families with successfully scaffolding this development.

Though occupational therapy is one of the most common interventions for children with ASD with 75% of children receiving occupational therapy services, less than 15% of adults with ASD receive occupational therapy services (Ohl et al., 2020; Turcotte et al., 2016). Adolescents with ASD without intellectual disability are less likely to receive occupational therapy services in the school setting, especially during transition years and those students with ASD without intellectual disability are less likely to receive services that address independent living skills (Duncan et al., 2018). Occupational therapists’ role in the treatment of the ASD population is

typically seen as addressing sensory motor and sensory processing challenges, primarily in the pediatric population, with limited occupational therapy services being utilized in the adolescent or adult ASD population to address independent living skills (Wilson et al., 2018).

Although addressing sensory and motor challenges are important areas for occupational therapists to address, it is also important to address functional cognition and its impact on independence skills, particularly during critical periods of transition. Occupational therapists have the opportunity to impact the population of young adults with ASD that are transitioning to adulthood by:

- Screening for specific challenges in independent living and executive functioning skills
- Assessing executive functions with an occupation-based, performance-based assessment of executive function
- Providing intervention focused on developing independent living skills through cognitive habilitation that targets the development of executive functioning skills, as well as activity modification and accommodation strategies to use in everyday living skills.
- Continued followup for consistency with strategy use and generalization to new areas of living skills.
- Educating families, teachers, therapists, and others to support the young adults by using effective scaffolding based on principles of functional cognition to support the young adult's development of independence skills.
- Advocating for policy change to improve access to evidence-based services for young adults with ASD during this critical transition in their lives.

This research adds to the existing body of evidence in the occupational therapy literature and informs occupational therapists of the importance of assessment and intervention of

executive functions in the clinical setting when addressing independent living skills and the transition to adulthood for young adults with ASD.

This research adds to the existing body of evidence in the occupational therapy literature related to the importance of executive functioning skills in gaining the young adult's goals for autonomy and independence during the transition to adulthood. There has been a need for an ecologically valid, performance-based assessment of executive function that is relevant to a young adult population and is able to measure mild executive functioning deficits. The use of the WCPA as a performance-based measure of executive function is clinically convenient and provides a wealth of information about the client's integration of multiple executive functions, while observing and interviewing the client as they complete the activity. This study was the first to demonstrate use of the WCPA in young adults with ASD and determine its ability to effectively characterize executive functioning through a task that required complex integration of these skills. This information is valuable in determining the extent of executive functioning challenges and characterizing components that are most important for intervention focus. For example, observations would note levels of impulsivity, cognitive flexibility, generativity, self-awareness, types of strategies used and efficiency, planning, and organization that would provide a window into understanding underlying problems with developing new independent living skills.

The transition to adulthood is complex. Not only are internal higher order cognitive skills required for developing independence, but external supports need to be coordinated during this critical time of great transition. Intervention for the young adult with ASD needs to focus on a multitude of factors, including cognitive rehabilitation to address executive functioning deficits, scaffolding learning new skills through doing and practicing, required for a successful transition

to adulthood, and providing education and training in scaffolding activities for parents and others involved the young adult's life.

Limitations

The current findings, although promising, need further validation to address a larger, more varied sample of young adults with ASD. The researcher identified four significant limitations that could benefit from further examination. First, the participants in this group were primarily recruited through ASD day programs that work with a similar demographic of young adults with ASD on higher-level job skills. A larger, more representative sample of young adults with ASD could provide information to better describe this heterogeneous population.

Secondly, assessments in this study were all self-report assessments, which could affect the accuracy of information and create a wider distribution based on self-awareness deficits, as indicated by the WCPA, in the ASD group. Other cited research studies utilized informant-report versions of adaptive behavior assessments, which could impact the initial effect size utilized for the power analysis to determine needed sample size. Though this study was able to differentiate between young adults with ASD and neurotypical peers, a larger, more varied sample of young adults with ASD would improve statistical power and provide more nuanced information characterizing executive functioning deficits.

The DLQ assessment is designed to quantify daily living skills in populations with acquired cognitive deficits, who have the perspective of answering the items with the perspective of "before the injury," which contrasts with individuals with ASD having a developmental disability without the perspective of "before the injury." This was anecdotally observed as a limitation in this assessment, with examples of ASD participants expressing frustration with the

perceived “subjective” and “ambiguous” nature of the items on the DLQ. Improvements could be made in this novel assessment to have more face validity for young adults with ASD.

Thirdly, participation in this study required approximately two hours of time to complete the whole assessment battery, and many participants in the ASD group required two or more sessions to complete the assessments. Though they were eager to participate and expressed excitement to add their perspective as an adult with ASD, many became overwhelmed and needed multiple breaks. Each participant completed the assessments in the same order, and fatigue by the time they completed the 239-item ABAS-3 could have contributed to rushing and inaccurate completion. In addition, observations indicate a wide range of over- and under-estimation of abilities with some participants verbalizing a very negative self-view of abilities, and some an inflated view of self-abilities. Lastly, comorbid anxiety and depression could also affect self-report scores; utilizing anxiety and depression scales could have added additional insights into this data, however additional assessments would have increased the burden and fatigue for participants.

Future Directions

The WCPA is an occupation-based assessment of executive functioning, and this study is the first to explore its use in the ASD population. There are multiple opportunities to explore its use to inform occupational therapy practice. There is a wealth of qualitative information that has been collected during the post-activity interview in this study, and secondary analysis of the current data could provide insightful information that will inform further exploration of the use of the WCPA in the adult ASD population. There is also opportunity to explore the differences in WCPA accuracy and number of strategies used across the lifespan of childhood, adolescents, and adults with different versions of the WCPA.

Further research into occupation-based assessment and intervention for executive functions and independent living with larger and more representative samples would provide a more robust evidence base to advocate for improved occupational therapy services provision for young adults with ASD. Poor outcomes during the transition to adulthood for young adults with ASD is a public policy crisis. Improved evidence for efficacy of occupational therapy assessment and intervention for young adults with ASD can lead to policy changes aimed at improving access to coordinated services post-high school, during this critical time of transition to adulthood.

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APPENDIX A

ADAPTIVE BEHAVIOR ASSESSMENT SYSTEM, 3rd EDITION: ADULT SELF-REPORT FORM

AGES
16-89

Adult Form



ABAS[®]-3

Adaptive Behavior Assessment System Third Edition

Patti L. Harrison, PhD Thomas Oakland, PhD

Adult Information

Name of adult being evaluated (first, middle, last)		Sex
		☐ Female ☐ Male
Today's date	Date of birth	Age
Years of education	Occupation	
Race/Ethnicity	Job status	
	☐ No job ☐ Part time ☐ Full time ☐ Retired ☐ Other:	
Does the adult being evaluated have any disabilities or other limitations?		
☐ Yes ☐ No If yes, please describe:		

Rater Information

Rater's name (first, last)	Age	Occupation
Your relationship to the individual you are rating		
☐ Self ☐ Parent ☐ Spouse ☐ Partner ☐ Sibling ☐ Child		
☐ Other relative (describe):		
☐ Roommate ☐ Friend ☐ Teacher ☐ Supervisor ☐ Professional caregiver		
☐ Other (describe):		

Directions

The Adaptive Behavior Assessment System, Third Edition, measures important behaviors an individual displays at home, school, work, and in other settings. The behaviors included on this questionnaire range from those suitable for adolescents to those suitable for adults. Some items may seem too easy while others may seem too difficult. Therefore, the individual you are rating is likely to perform some but not all behaviors included on this questionnaire.

Please read and answer all items.

Please read each item carefully and rate the individual's performance of the behavior. Select only one response (0, 1, 2, or 3) according to the guidelines below. Please provide a response to every item, even if some items do not seem to apply to the individual's age group or are difficult to rate.

Record your answer by circling 0, 1, 2, or 3.

If you know that the individual is *unable* to perform the behavior, circle 0 on the rating scale.

0 Is not able to do this behavior

If you know that the individual is *able* to perform the behavior, rate how often he or she performs the behavior when needed without reminders and without help.

1 Never (or almost never)

2 Sometimes

3 Always (or almost always)

Please circle only one rating of 0, 1, 2, or 3 for each item.

Indicate when your answer is a guess or estimate.

You may not have seen the individual perform the specific behavior described in an item. If this is the case, you may guess if you know how the individual performs similar behaviors. If your rating is based on a guess, first circle 0, 1, 2, or 3, then check the box in the "Check only if you guessed" column.

Check the box in this column *only if your rating is based on a guess or estimate.*

The ABAS-3 is available online at platform.wpspublish.com.

Additional copies of this form (W-623A) may be purchased from WPS. Please contact us at **800.648.8857** or wpspublish.com.

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The following examples show how to complete the questionnaire.

	BEHAVIOR RATINGS				Check ONLY if you GUESSED
	Ability	Frequency			
	Is not able	Never (or almost never) when needed	Sometimes when needed	Always (or almost always) when needed	
4. Uses sentences with a noun and verb.	0	1	2	3	☐
5. Names 20 or more familiar objects.	0	1	2	3	☒
6. States his or her home address, including zip code.	0	1	2	3	☐
7. Gives verbal instructions to others that involve two or more steps or activities.	0	1	2	3	☐

- Item 4 is rated 3 because this individual always (or almost always) uses sentences with a noun and verb, when needed, without reminders and without help.
- Item 5 is rated 2 because this individual sometimes names 20 or more familiar objects. In this case, the rater also checked the box in the "Check only if you guessed" column because their response was a guess or estimate.
- Item 6 is rated 1 because, although this individual is able to state his or her home address, including zip code, he or she never (or almost never) does so when needed.
- Item 7 is rated 0 because this individual is not able to give verbal instructions that involve two or more steps or activities.

The following table is provided to further assist you in filling out this questionnaire.

Rating	The individual:
0 Is not able	- cannot perform the behavior; - is too young to have tried the behavior; - does not have the skill to perform the behavior; - has not been taught to perform the behavior; or - has some limitation that prevents performing the behavior.
1 Never (or almost never) when needed	is able to perform the behavior, but - never or almost never does it when needed; - never or almost never does it without being reminded; - another person does it for the individual instead of the individual doing it; or - refuses to perform the behavior.
2 Sometimes when needed	is able to perform the behavior, but - only does it sometimes when needed; - sometimes does it without help, but sometimes needs help; or - sometimes does it on his or her own, but sometimes needs to be reminded.
3 Always (or almost always) when needed	is able to perform the behavior, and - does it most or all of the time without help and without being reminded; or - displayed the behavior at a younger age but has now outgrown it.
Check ONLY if you GUESSED	After you rate an item 0, 1, 2, or 3, fill in the square in this column if: - your rating was a guess or estimate; - you have not had the opportunity to see the individual perform this behavior; or - you have seen the individual perform similar behaviors, but not this one.
☒	

Communication

BEHAVIOR RATINGS					
Ability	Frequency			Check ONLY if you GUESSED	
	Is not able	Never (or almost never) when needed	Sometimes when needed		Always (or almost always) when needed
1. Says the names of other people (for example, "Mama," "Daddy," or names of friends).	0	1	2	3	☐
2. Says "Hello" and "Good-bye" to others.	0	1	2	3	☐
3. Answers the telephone by saying "Hello."	0	1	2	3	☐
4. Uses sentences with a noun and verb.	0	1	2	3	☐
5. Names 20 or more familiar objects.	0	1	2	3	☐
6. States his or her home address, including zip code.	0	1	2	3	☐
7. Gives verbal instructions to others that involve two or more steps or activities.	0	1	2	3	☐
8. Speaks clearly and distinctly.	0	1	2	3	☐
9. States his or her telephone number.	0	1	2	3	☐
10. Shakes head or says "Yes" or "No" in response to a simple question (for example, "Do you want something to drink?").	0	1	2	3	☐
11. Looks at other people's faces when they are talking to him or her.	0	1	2	3	☐
12. Says irregular plural nouns correctly (for example, says "feet" instead of "foots" and "men" instead of "mans").	0	1	2	3	☐
13. Nods or smiles to encourage others when they are talking.	0	1	2	3	☐
14. Tells family, friends, or others about his or her favorite activities.	0	1	2	3	☐
15. Listens closely for at least 5 minutes when people talk.	0	1	2	3	☐
16. Uses up-to-date information to discuss current events.	0	1	2	3	☐
17. Starts conversations on topics of interest to others.	0	1	2	3	☐
18. Answers complex questions that require careful thought and opinion (for example, questions about politics or current events).	0	1	2	3	☐
19. Distinguishes truthful from exaggerated claims by friends, advertisers, or others.	0	1	2	3	☐
20. Repeats stories or jokes correctly after hearing them from others.	0	1	2	3	☐
21. Talks with others about complex topics for at least 10 minutes (for example, about politics or current events).	0	1	2	3	☐
22. Waits for others to finish what they are saying, without interrupting.	0	1	2	3	☐
23. Participates in conversations without talking too much or too little.	0	1	2	3	☐
24. Talks about realistic future educational or career goals.	0	1	2	3	☐
25. Explains the terms of a legal document to others (for example, a contract to buy a house or rent a car).	0	1	2	3	☐
FOR EXAMINER USE ONLY		Raw total			75
		Total guessed			

Community Use

	BEHAVIOR RATINGS					Check ONLY if you GUESSED
	Ability	Frequency				
	Is not able	Never (or almost never) when needed	Sometimes when needed	Always (or almost always) when needed		
1. Finds the restroom in public places.	0	1	2	3		☐
2. Finds a specific area in a store or business (for example, dairy aisle in a store or customer service department in a bank).	0	1	2	3		☐
3. Looks both ways before crossing a street or parking lot.	0	1	2	3		☐
4. Orders own meals when eating out.	0	1	2	3		☐
5. Carries personal identification when traveling to nearby places in the community.	0	1	2	3		☐
6. Relies on himself or herself for travel in the community (for example, walks or uses public transportation, a bicycle, or a car).	0	1	2	3		☐
7. Carries enough money to make small purchases (for example, a soft drink).	0	1	2	3		☐
8. States the general address of a travel destination (for example, "On Washington Avenue, near Lake Street").	0	1	2	3		☐
9. Recognizes when a store item is poorly made or too expensive.	0	1	2	3		☐
10. Asks a store clerk for help if an item cannot be found.	0	1	2	3		☐
11. Tells others about a store's hours of operation (for example, "10 a.m. to 9 p.m.>").	0	1	2	3		☐
12. Follows another person's directions to nearby places.	0	1	2	3		☐
13. Uses a credit or debit card for making purchases.	0	1	2	3		☐
14. Makes appointments by telephone, mobile device, or Internet.	0	1	2	3		☐
15. Uses paper or digital maps to find his or her way to desired locations.	0	1	2	3		☐
16. Obtains money from an ATM.	0	1	2	3		☐
17. Before buying an item in a store, gives careful thought to the need for it and its cost.	0	1	2	3		☐
18. Calls a repairperson when needed (for example, if the air conditioner or heater stops working).	0	1	2	3		☐
19. Is responsible for his or her personal finances, such as bank account, credit card, or utility bill.	0	1	2	3		☐
20. Asks other people's advice on where to shop.	0	1	2	3		☐
21. Uses the school library, public library, or Internet to get books or reference materials.	0	1	2	3		☐
22. Shops for friends or family who may be unable to shop.	0	1	2	3		☐
23. Uses printed or Internet resources to obtain information before making major purchases (for example, cars, appliances, computers).	0	1	2	3		☐
24. Walks or rides bike alone to locations within a 1-mile or 5-block radius of home or work.	0	1	2	3		☐
FOR EXAMINER USE ONLY	Raw total				72	
		Total guessed				

Functional Academics

	BEHAVIOR RATINGS				Check ONLY if you GUESSED
	Ability	Frequency			
	Is not able	Never (or almost never) when needed	Sometimes when needed	Always (or almost always) when needed	
1. Writes or prints his or her first and last name.	0	1	2	3	☐
2. States the days of the week in order.	0	1	2	3	☐
3. Reads his or her name when printed.	0	1	2	3	☐
4. Writes his or her address, including zip code.	0	1	2	3	☐
5. Reads menus at restaurants.	0	1	2	3	☐
6. Gives a clerk the necessary amount of money when buying items.	0	1	2	3	☐
7. Reads and obeys common signs (for example, Do Not Enter, Exit, Stop).	0	1	2	3	☐
8. Locates telephone numbers using a phone book or the Internet.	0	1	2	3	☐
9. Locates important dates on a calendar (for example, birthdays or holidays).	0	1	2	3	☐
10. Weighs self or objects correctly using a scale.	0	1	2	3	☐
11. Finds names and telephone numbers for repair services or businesses using a phone book or the Internet.	0	1	2	3	☐
12. Reads and follows a daily classroom or work schedule, without needing to be reminded by another person.	0	1	2	3	☐
13. Records dates and times for appointments and deadlines.	0	1	2	3	☐
14. Measures length and height.	0	1	2	3	☐
15. Writes and sends letters, personal notes, or emails.	0	1	2	3	☐
16. Checks for correct change after buying an item.	0	1	2	3	☐
17. Uses lists and reminders to remember important things.	0	1	2	3	☐
18. Completes written forms to apply for jobs.	0	1	2	3	☐
19. Completes forms for businesses or services (for example, to obtain a lease).	0	1	2	3	☐
20. Checks the accuracy of charges before paying a bill.	0	1	2	3	☐
21. Reads important documents (for example, credit card applications or rental agreements).	0	1	2	3	☐
22. Budgets money to cover expenses for at least 1 week.	0	1	2	3	☐
23. Reads labels before purchasing products for important information about size, weight, and directions for use.	0	1	2	3	☐
24. Checks bank or other financial statements at least monthly to be sure they are correct.	0	1	2	3	☐
FOR EXAMINER USE ONLY		Raw total	72		
		Total guessed			

Home Living

	BEHAVIOR RATINGS					Check ONLY if you GUESSED
	Ability is not able	Frequency				
		Never (or almost never) when needed	Sometimes when needed	Always (or almost always) when needed		
1. Operates a microwave oven.	0	1	2	3		☐
2. Uses small electrical appliances (for example, a can opener or blender).	0	1	2	3		☐
3. Makes simple meals that require no cooking (for example, sandwiches or salads).	0	1	2	3		☐
4. Cooks simple foods on a stove (for example, eggs or canned soup).	0	1	2	3		☐
5. Wipes up spills at home.	0	1	2	3		☐
6. Shows respect when using others' possessions (for example, by keeping them clean and returning them undamaged when requested).	0	1	2	3		☐
7. Uses a clothes dryer.	0	1	2	3		☐
8. Uses a washing machine to wash clothes.	0	1	2	3		☐
9. Washes dishes either by hand or with a dishwasher.	0	1	2	3		☐
10. Places dirty clothes in the proper place (for example, a hamper or clothes basket).	0	1	2	3		☐
11. Folds clean clothes.	0	1	2	3		☐
12. Assists in big cleanup projects at home or work (for example, spring cleaning or cleaning storage rooms).	0	1	2	3		☐
13. Keeps working on important tasks at home, even when it is noisy.	0	1	2	3		☐
14. Takes out trash when can is full.	0	1	2	3		☐
15. Clears the table completely after a meal.	0	1	2	3		☐
16. Puts things in their proper place when finished using them.	0	1	2	3		☐
17. Cleans his or her room or living quarters regularly.	0	1	2	3		☐
18. Cleans bathroom with proper cleaning supplies.	0	1	2	3		☐
19. Makes his or her bed.	0	1	2	3		☐
20. Pays bills on time (for example, electricity or telephone bills).	0	1	2	3		☐
21. Dusts furniture until it is clean.	0	1	2	3		☐
22. Follows a maintenance schedule for car or home (for example, changes the car engine oil or the home furnace filter).	0	1	2	3		☐
23. Obtains home, rental, or car insurance for himself or herself.	0	1	2	3		☐
24. Performs minor household repairs (for example, fixes a clogged drain or leaky faucet).	0	1	2	3		☐
FOR EXAMINER USE ONLY	Raw total	/ 72				
		Total guessed				

Health and Safety

	BEHAVIOR RATINGS				
	Ability is not able	Frequency			Check ONLY if you GUESSED
		Never (or almost never) when needed	Sometimes when needed	Always (or almost always) when needed	
1. Uses electrical outlets or sockets safely.	0	1	2	3	☐
2. Shows caution around hot or dangerous items.	0	1	2	3	☐
3. Carries breakable objects safely and carefully.	0	1	2	3	☐
4. Displays safe behaviors at work or other public places.	0	1	2	3	☐
5. Buckles own seat belt in a car.	0	1	2	3	☐
6. Cares for own minor injuries (for example, paper cuts, knee scrapes, nosebleeds).	0	1	2	3	☐
7. Swallows liquid medicines as needed.	0	1	2	3	☐
8. Carries scissors safely.	0	1	2	3	☐
9. Follows general safety rules at home.	0	1	2	3	☐
10. Uses tools and equipment safely.	0	1	2	3	☐
11. Refuses gifts and rides from strangers.	0	1	2	3	☐
12. Obeys requests from other people only if he or she knows and trusts them.	0	1	2	3	☐
13. Avoids people who might take advantage of him or her (for example, for money or sex).	0	1	2	3	☐
14. Takes medications without supervision on days and at times prescribed.	0	1	2	3	☐
15. Buys over-the-counter medications when needed for illness.	0	1	2	3	☐
16. Reads labels on his or her medications to make sure they have not expired.	0	1	2	3	☐
17. Takes temperature with a thermometer when feeling sick.	0	1	2	3	☐
18. Inspects contents of refrigerator and removes food that is spoiled or whose expiration date has passed.	0	1	2	3	☐
19. Makes his or her own appointments to see a physician for annual checkups.	0	1	2	3	☐
20. Plans meals in order to get necessary nutrition.	0	1	2	3	☐
FOR EXAMINER USE ONLY	Raw total	/ 60			
		Total guessed			

Leisure

	BEHAVIOR RATINGS					Check ONLY if you GUESSED
	Ability Is not able	Frequency				
		Never (or almost never) when needed	Sometimes when needed	Always (or almost always) when needed		
1. Waits for his or her turn in games and other fun activities.	0	1	2	3		☐
2. Follows the rules in games and other fun activities.	0	1	2	3		☐
3. Selects television programs or uses the Internet to keep up with an area of interest (for example, sports, music, nature).	0	1	2	3		☐
4. Listens to music for fun and relaxation.	0	1	2	3		☐
5. Plays with games or other fun items with others.	0	1	2	3		☐
6. Invites others to join him or her in playing games and other fun activities.	0	1	2	3		☐
7. Engages in a variety of fun activities instead of only one or two.	0	1	2	3		☐
8. Attends fun community activities with others (for example, a movie or concert).	0	1	2	3		☐
9. Attends fun activities at another's home.	0	1	2	3		☐
10. Tells others when he or she needs free time to relax alone.	0	1	2	3		☐
11. Plays alone with games or does other fun activities.	0	1	2	3		☐
12. Initiates games or selects television programs liked by friends or family members.	0	1	2	3		☐
13. Plans ahead for fun activities on free days or afternoons.	0	1	2	3		☐
14. Plans ahead for extended leisure activities during breaks or vacations.	0	1	2	3		☐
15. Tries a new activity to learn about something new.	0	1	2	3		☐
16. Organizes a game or other fun activity for a group of friends without help from others.	0	1	2	3		☐
17. Invites others home for a fun activity.	0	1	2	3		☐
18. Makes travel arrangements for self and others.	0	1	2	3		☐
19. Reserves tickets in advance for activities such as concerts or sports events.	0	1	2	3		☐
20. Has a hobby or creative activity that requires making or building something (for example, sewing, carpentry, gardening).	0	1	2	3		☐
21. Joins an organized group without help from another person (for example, a club, sports team, or musical group).	0	1	2	3		☐
22. Participates in an organized program for a sport or hobby (for example, practices basketball or takes a music class).	0	1	2	3		☐
FOR EXAMINER USE ONLY	Raw total				66	
					Total guessed	

Self-Care

	BEHAVIOR RATINGS					Check ONLY if you GUESSED
	Ability (is not able)	Frequency				
		Never (or almost never) when needed	Sometimes when needed	Always (or almost always) when needed		
1. Puts shoes on the correct feet.	0	1	2	3	☐	
2. Buttons own clothing.	0	1	2	3	☐	
3. Uses a fork to eat solid food.	0	1	2	3	☐	
4. Uses restroom at home without help.	0	1	2	3	☐	
5. Closes and locks the door before using public restrooms.	0	1	2	3	☐	
6. Fastens and straightens clothing before leaving restroom.	0	1	2	3	☐	
7. Dresses himself or herself.	0	1	2	3	☐	
8. Washes hands with both soap and water.	0	1	2	3	☐	
9. Uses public restroom alone.	0	1	2	3	☐	
10. Blows and wipes nose with tissue or handkerchief.	0	1	2	3	☐	
11. Combines hot and cold water for a shower or bath.	0	1	2	3	☐	
12. Ties his or her own shoes.	0	1	2	3	☐	
13. Selects correct clothes for cold or warm days.	0	1	2	3	☐	
14. Brushes teeth before leaving for work or appointments.	0	1	2	3	☐	
15. Cuts or files his or her own fingernails and toenails regularly.	0	1	2	3	☐	
16. Selects appropriate clothes for different occasions (for example, casual activities or formal events).	0	1	2	3	☐	
17. Bathes daily.	0	1	2	3	☐	
18. Keeps hair neat during the day by brushing or combing.	0	1	2	3	☐	
19. Cuts meats or other foods into bite-size pieces with a knife.	0	1	2	3	☐	
20. Eats a variety of foods instead of preferring only one or two.	0	1	2	3	☐	
21. Gets out of bed on time by himself or herself.	0	1	2	3	☐	
22. Wears a variety of clothes, instead of the same or similar clothes most days.	0	1	2	3	☐	
23. Obtains haircuts regularly on his or her own.	0	1	2	3	☐	
24. Washes and rinses sink after brushing teeth.	0	1	2	3	☐	
25. Avoids unhealthy foods and drinks.	0	1	2	3	☐	
26. Exercises or works out at least 2 hours weekly.	0	1	2	3	☐	
FOR EXAMINER USE ONLY	Raw total	/ 78				
	Total guessed					

Self-Direction

	BEHAVIOR RATINGS					Check ONLY if you GUESSED
	Ability Is not able	Frequency				
		Never (or almost never) when needed	Sometimes when needed	Always (or almost always) when needed		
1. Works on one home or school activity for at least 15 minutes without reminders.	0	1	2	3		☐
2. Works independently and asks for help only when necessary.	0	1	2	3		☐
3. Personally calls work or other places if absent.	0	1	2	3		☐
4. Avoids situations at home or in the neighborhood that are likely to result in trouble.	0	1	2	3		☐
5. Resists pressure from others to do things that could endanger him or her.	0	1	2	3		☐
6. Stops a fun activity, without complaining, when time is up.	0	1	2	3		☐
7. Stands still when needed, without fidgeting or moving around.	0	1	2	3		☐
8. Controls disappointment when a favorite activity is canceled.	0	1	2	3		☐
9. Controls anger when another person breaks the rules in games and other fun activities.	0	1	2	3		☐
10. Completes routine household tasks within a reasonable amount of time.	0	1	2	3		☐
11. Returns on time when asked to be back in 1 hour.	0	1	2	3		☐
12. Saves money to buy something special (for example, a birthday present or special clothes).	0	1	2	3		☐
13. Refuses when another person asks him or her to do something foolish.	0	1	2	3		☐
14. Routinely arrives at places on time.	0	1	2	3		☐
15. Keeps working on hard tasks without becoming discouraged, quitting, or needing reminders.	0	1	2	3		☐
16. Controls temper when disagreeing with friends.	0	1	2	3		☐
17. Avoids behavior that could embarrass or bring shame to self or family.	0	1	2	3		☐
18. When leaving home, informs others of destination and return time.	0	1	2	3		☐
19. Controls feelings when not getting his or her own way.	0	1	2	3		☐
20. Plans home projects in logical steps.	0	1	2	3		☐
21. Makes important decisions only after careful consideration, without rushing.	0	1	2	3		☐
22. Calls family or others when he or she will be late (for example, in returning home, attending a social event, or arriving for an appointment).	0	1	2	3		☐
23. Plans ahead to allow enough time to complete big projects.	0	1	2	3		☐
24. Limits time playing computer games or other nonproductive activities.	0	1	2	3		☐
25. Completes large home projects on time.	0	1	2	3		☐
FOR EXAMINER USE ONLY	Raw total				75	
		Total guessed				

Social

	BEHAVIOR RATINGS					Check ONLY if you GUESSED
	Ability (0 = not able)	Frequency				
		Never (or almost never) when needed	Sometimes when needed	Always (or almost always) when needed		
1. Says "Thank you" when given a gift.	0	1	2	3	☐	
2. Has one or more friends.	0	1	2	3	☐	
3. Stands a comfortable distance from others during conversations (not too close).	0	1	2	3	☐	
4. Laughs in response to funny comments or jokes.	0	1	2	3	☐	
5. Moves out of the way of other people as needed on sidewalks, in store aisles, or in hallways.	0	1	2	3	☐	
6. Congratulates others when something good happens to them.	0	1	2	3	☐	
7. Shows respect for persons in authority by following their rules and directions (for example, parents, teachers, police officers).	0	1	2	3	☐	
8. Shows sympathy for others when they are sad or upset.	0	1	2	3	☐	
9. Listens to friends or family members who need to talk about problems.	0	1	2	3	☐	
10. Recognizes when someone is making an unreasonable request.	0	1	2	3	☐	
11. Places reasonable demands on friends (for example, does not become upset when a friend goes out with another friend).	0	1	2	3	☐	
12. Keeps a stable group of friends.	0	1	2	3	☐	
13. Says "Please" when asking for something.	0	1	2	3	☐	
14. Has good relationships with family members.	0	1	2	3	☐	
15. Avoids friends and social settings that may be harmful or dangerous.	0	1	2	3	☐	
16. Offers guests food or beverages.	0	1	2	3	☐	
17. Shows good judgment in selecting friends.	0	1	2	3	☐	
18. Seeks friendships with others in his or her age group.	0	1	2	3	☐	
19. States when others seem happy, sad, scared, or angry.	0	1	2	3	☐	
20. Refrains from saying or doing things that might embarrass or hurt others.	0	1	2	3	☐	
21. Personally makes or buys gifts for family members on birthdays or major holidays.	0	1	2	3	☐	
22. Tries to please others by doing something special or giving them a surprise.	0	1	2	3	☐	
23. Selects specific locations for social activities with friends (for example, restaurants or movie theaters).	0	1	2	3	☐	
24. Says when he or she feels happy, sad, scared, or angry.	0	1	2	3	☐	
25. Sends thank-you notes or emails after receiving a gift or help with an important task.	0	1	2	3	☐	
FOR EXAMINER USE ONLY	Raw total	75				
	Total guessed					

Work

Complete this skill area if the individual being rated holds a part-time or full-time job.

	BEHAVIOR RATINGS				
	Ability	Frequency			Check ONLY if you GUESSED
	is not able	Never (or almost never) when needed	Sometimes when needed	Always (or almost always) when needed	
1. Behaves safely at work so that no one will be harmed.	0	1	2	3	☐
2. Cares properly for work supplies and equipment.	0	1	2	3	☐
3. Follows daily work schedule without reminders from supervisor.	0	1	2	3	☐
4. Returns to work willingly after taking a break or lunch.	0	1	2	3	☐
5. Performs tasks at work neatly.	0	1	2	3	☐
6. Follows supervisor's instructions when completing tasks or activities.	0	1	2	3	☐
7. Refuses when a coworker encourages him or her to do shoddy or unsafe work.	0	1	2	3	☐
8. Cleans up area after completing work.	0	1	2	3	☐
9. Is productive and cooperative as part of groups or teams.	0	1	2	3	☐
10. Completes work assignments within required time limits.	0	1	2	3	☐
11. Works quietly, without disturbing coworkers.	0	1	2	3	☐
12. Asks for directions, as needed, before beginning work tasks.	0	1	2	3	☐
13. Finds full-time or part-time jobs for himself or herself.	0	1	2	3	☐
14. Organizes tasks at work so that the most important are completed first.	0	1	2	3	☐
15. Takes the time needed to do a task well, without rushing.	0	1	2	3	☐
16. Checks own work to determine if improvements are needed.	0	1	2	3	☐
17. Keeps working efficiently and accurately, even with loud noises or distractions.	0	1	2	3	☐
18. Performs extra work on the job willingly.	0	1	2	3	☐
19. Seeks help from supervisor, as needed, when work-related problems or questions arise.	0	1	2	3	☐
20. Shows a positive attitude toward job.	0	1	2	3	☐
21. Keeps a stable part-time or full-time job for at least 1 year.	0	1	2	3	☐
22. Verifies wages to ensure that he or she is receiving the proper amount.	0	1	2	3	☐
23. Makes suggestions to supervisors (for example, how to have a safer or more productive workplace).	0	1	2	3	☐
24. Trains and supervises others in the workplace.	0	1	2	3	☐
FOR EXAMINER USE ONLY	Raw total				72
	Total guessed				

Adult Form
Ages 16–89



ABAS[®]-3

Adaptive Behavior Assessment System, Third Edition

Patti L. Harrison, PhD Thomas Oakland, PhD

Score Summary

Name of adult being evaluated (first, middle, last)

ID

Rater's name (first, last) ☐ Check if self-report

Examiner

	Year	Month	Day
Today's date			
Date of birth			
Age			

Raw Score to Scaled Score Conversions			
See Appendix A, Table A.13 (Self-Report) or Table A.15 (Rated by Others)			
Adaptive skill area	Raw score	Scaled scores	
Communication		1	
Community Use		2	
Functional Academics		3	
Home Living		4	
Health and Safety		5	
Leisure		6	
Self-Care		7	
Self-Direction		8	
Social		9	
(Work)		10	
Sum of scaled scores			
		GAC	Conceptual Social Practical

Sum of Scaled Scores to General Adaptive Composite (GAC) and Adaptive Domain Score Conversions				
See Appendix A, Table A.14 (Self-Report) or Table A.16 (Rated by Others)				
	Sum of scaled scores	Standard score	Percentile rank	Confidence interval ☐ 90% ☐ 95%
General Adaptive Composite (GAC)				—
Conceptual				—
Social				—
Practical				—

Optional Analyses

Adaptive Domain Comparisons						
See Appendix B, Tables B.25 and B.26 (Self-Report) or Tables B.32 and B.33 (Rated by Others)						
Domain comparison	Standard score 1	Standard score 2	Difference	Significance		Base rate in standardization sample
				Critical value	.05 level	
Conceptual–Social	C	S			☐	☐ ≤15% ☐ ≤5%
Conceptual–Practical	C	P			☐	☐ ≤15% ☐ ≤5%
Social–Practical	S	P			☐	☐ ≤15% ☐ ≤5%

Scatter in Adaptive Skill Area Scaled Scores								
See Appendix B, Tables B.27 and B.28 (Self-Report) or Tables B.34 and B.35 (Rated by Others)								
Comparison used ☐ General Adaptive Composite (GAC) (all skill areas) ☐ Adaptive domains								
GAC/Domain	Highest skill area		Lowest skill area		Difference between scaled scores	Significance		Base rate in standardization sample
	Name	Scaled score	Name	Scaled score		Critical value	.05 level	
GAC: All skill areas							☐	☐ ≤15% ☐ ≤5%
Conceptual skill areas							☐	☐ ≤15% ☐ ≤5%
Social skill areas							☐	☐ ≤15% ☐ ≤5%
Practical skill areas							☐	☐ ≤15% ☐ ≤5%

Strengths and Weaknesses in Adaptive Skill Areas						
Comparison used ☐ General Adaptive Composite (GAC) (all skill areas) ☐ Adaptive domains						
Calculate the mean scaled scores for adaptive skill areas						
	GAC		Adaptive domain			
	9 skill areas without Work	10 skill areas with Work	Conceptual	Social	Practical without Work	Practical with Work
Sum of scaled scores						
Number of skill areas	+9	+10	+3	+2	+4	+5
Mean scaled score						
Determine strengths and weaknesses in adaptive skill areas						
See Appendix B, Table B.29 (Self-Report) or Table B.36 (Rated by Others)						
Skill area	Skill area scaled score	Mean scaled score from above	Difference from mean	Significance		Base rate in standardization sample
				Critical value	.05 level	
Conceptual	Communication	1			☐	☐ ≤15% ☐ ≤5%
	Functional Academics	3			☐	☐ ≤15% ☐ ≤5%
	Self-Direction	8			☐	☐ ≤15% ☐ ≤5%
Social	Leisure	6			☐	☐ ≤15% ☐ ≤5%
	Social	9			☐	☐ ≤15% ☐ ≤5%
Practical	Community Use	2			☐	☐ ≤15% ☐ ≤5%
	Home Living	4			☐	☐ ≤15% ☐ ≤5%
	Health and Safety	3			☐	☐ ≤15% ☐ ≤5%
	Self-Care	7			☐	☐ ≤15% ☐ ≤5%
	Work	() 10			☐	☐ ≤15% ☐ ≤5%

APPENDIX B

BEHAVIOR RATING INVENTORY OF EXECUTIVE FUNCTION - ADULT

BRIEF-A
Behavior Rating
Inventory of
Executive Function-
Adult Version

SELF-REPORT FORM

Robert M. Roth, PhD, Peter K. Isquith, PhD, and Gerard A. Gioia, PhD

Instructions

On the following pages is a list of statements. We would like to know if you have had problems with these behaviors over the past month. Please answer all the items the best that you can. Please DO NOT SKIP ANY ITEMS. Indicate your response by circling

- | | | |
|----------|--------------------|----------------------------|
| N | if the behavior is | Never a problem |
| S | if the behavior is | Sometimes a problem |
| O | if the behavior is | Often a problem |

For example, if you **never** have trouble making decisions, you would circle **N** for this item:

I have trouble making decisions ☒ **N** ☐ **S** ☐ **O**

If you make a mistake or want to change your answer, DO NOT ERASE. Draw an "X" through the answer you want to change, and then circle the correct answer:

I have trouble making decisions ☒ **N** ☒ **S** ☐ **O**

Before you begin answering the items, please fill in the name, gender, age, date of birth, today's date, and years and level of education in the spaces provided at the top of the next page.

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WARNING! PHOTOCOPYING OR DUPLICATION OF THIS FORM WITHOUT PERMISSION IS A VIOLATION OF COPYRIGHT LAWS.

Your Name _____ Today's Date ____/____/____
 Gender ☐ Male ☐ Female Age _____ Date of Birth ____/____/____
 Years of Education: _____ Level of Education: ☐ Less than High School ☐ High School ☐ College
☐ Master's degree ☐ Doctorate ☐ Other

During the past month, how often has each of the following behaviors been a *problem*?

N = Never S = Sometimes O = Often

1. I have angry outbursts	N	S	O
2. I make careless errors when completing tasks	N	S	O
3. I am disorganized	N	S	O
4. I have trouble concentrating on tasks (such as chores, reading, or work)	N	S	O
5. I tap my fingers or bounce my legs	N	S	O
6. I need to be reminded to begin a task even when I am willing	N	S	O
7. I have a messy closet	N	S	O
8. I have trouble changing from one activity or task to another	N	S	O
9. I get overwhelmed by large tasks	N	S	O
10. I forget my name	N	S	O
11. I have trouble with jobs or tasks that have more than one step	N	S	O
12. I overreact emotionally	N	S	O
13. I don't notice when I cause others to feel bad or get mad until it is too late	N	S	O
14. I have trouble getting ready for the day	N	S	O
15. I have trouble prioritizing activities	N	S	O
16. I have trouble sitting still	N	S	O
17. I forget what I am doing in the middle of things	N	S	O
18. I don't check my work for mistakes	N	S	O
19. I have emotional outbursts for little reason	N	S	O
20. I lie around the house a lot	N	S	O
21. I start tasks (such as cooking, projects) without the right materials	N	S	O
22. I have trouble accepting different ways to solve problems with work, friends, or tasks	N	S	O
23. I talk at the wrong time	N	S	O
24. I misjudge how difficult or easy tasks will be	N	S	O
25. I have problems getting started on my own	N	S	O
26. I have trouble staying on the same topic when talking	N	S	O
27. I get tired	N	S	O
28. I react more emotionally to situations than my friends	N	S	O
29. I have problems waiting my turn	N	S	O
30. People say that I am disorganized	N	S	O
31. I lose things (such as keys, money, wallet, homework, etc.)	N	S	O
32. I have trouble thinking of a different way to solve a problem when stuck	N	S	O
33. I overreact to small problems	N	S	O
34. I don't plan ahead for future activities	N	S	O
35. I have a short attention span	N	S	O
36. I make inappropriate sexual comments	N	S	O
37. When people seem upset with me, I don't understand why	N	S	O
38. I have trouble counting to three	N	S	O

During the past month, how often has each of the following behaviors been a *problem*?

N = Never S = Sometimes O = Often

39. I have unrealistic goals	N	S	O
40. I leave the bathroom a mess	N	S	O
41. I make careless mistakes	N	S	O
42. I get emotionally upset easily	N	S	O
43. I make decisions that get me into trouble (legally, financially, socially)	N	S	O
44. I am bothered by having to deal with changes	N	S	O
45. I have difficulty getting excited about things	N	S	O
46. I forget instructions easily	N	S	O
47. I have good ideas but cannot get them on paper	N	S	O
48. I make mistakes	N	S	O
49. I have trouble getting started on tasks	N	S	O
50. I say things without thinking	N	S	O
51. My anger is intense but ends quickly	N	S	O
52. I have trouble finishing tasks (such as chores, work)	N	S	O
53. I start things at the last minute (such as assignments, chores, tasks)	N	S	O
54. I have difficulty finishing a task on my own	N	S	O
55. People say that I am easily distracted	N	S	O
56. I have trouble remembering things, even for a few minutes (such as directions, phone numbers)	N	S	O
57. People say that I am too emotional	N	S	O
58. I rush through things	N	S	O
59. I get annoyed	N	S	O
60. I leave my room or home a mess	N	S	O
61. I get disturbed by unexpected changes in my daily routine	N	S	O
62. I have trouble coming up with ideas for what to do with my free time	N	S	O
63. I don't plan ahead for tasks	N	S	O
64. People say that I don't think before acting	N	S	O
65. I have trouble finding things in my room, closet, or desk	N	S	O
66. I have problems organizing activities	N	S	O
67. After having a problem, I don't get over it easily	N	S	O
68. I have trouble doing more than one thing at a time	N	S	O
69. My mood changes frequently	N	S	O
70. I don't think about consequences before doing something	N	S	O
71. I have trouble organizing work	N	S	O
72. I get upset quickly or easily over little things	N	S	O
73. I am impulsive	N	S	O
74. I don't pick up after myself	N	S	O
75. I have problems completing my work	N	S	O

Scoring Summary Table

Scale/Index	Raw score	T score	%ile	90% CI
Inhibit				
Shift				
Emotional Control				
Self-Monitor				
BR				
Initiate				
Working Memory				
Plan/Organize				
Task Monitor				
Organization of Materials				
MI				
GEC (BR + MI)				

Scoring Instructions

1. Remove the perforated strips from the Self-Report Form and detach the top part of the carbonless answer sheet to reveal the scoring sheet.
2. Transfer the circled item score for each item to the box provided in that item row.
3. Sum the item scores in each column and enter the subtotal in the box at the bottom of the column.
4. Transfer the scale subtotals for items 1-38 to the appropriate box in the row titled Subtotals (items 1-38) at the bottom of the table page.
5. Sum the two subtotals for each scale and enter the total in the Total scale raw score box.
6. Transfer each scale raw score to the Raw score column in the Scoring Summary Table to the left of these instructions.
7. Sum the raw scores for the Inhibit, Shift, Emotional Control, and Self-Monitor scales to obtain the raw score for the Behavioral Regulation Index (BR).
8. Sum the raw scores for the Initiate, Working Memory, Plan/Organize, Task Monitor, and Organization of Materials scales to obtain the raw score for the Metacognition Index (MI).
9. Sum the raw scores for the BR and the MI to obtain the raw score for the Global Executive Composite (GEC).
10. Locate the appropriate age-normative comparison group in the appendix tables of the BRIEF-A Professional Manual. Find the raw score for each scale and index and the GEC in the Raw score column and read across the row to find the corresponding T score and percentile. Enter each T score and percentile in the appropriate boxes in the Scoring Summary Table.
11. Locate the 90% confidence interval (CI) value for each scale and index and the GEC at the bottom of the appropriate column; calculate the low and (subtract the CI value from the T score) and high end (add the CI value to the T score) of the interval, and enter those values in the appropriate boxes in the Scoring Summary Table.

Negativity Scale

1. Negativity items are indicated by **N** in the margin of the scoring sheet. For each Negativity item with a score of 3, circle that item number in the column to the right.
2. Count the number of circled item numbers to determine the **Negativity score**.
3. Using the Negativity score table below, circle the appropriate protocol classification corresponding to that score.

Negativity score	Cumulative %	Protocol classification
0-5	0-98.3	Acceptable
≥ 6	99.4-100	Elevated

Item no.

1.
8.
19.
21.
22.
23.
29.
36.
39.
40.

Negativity score

Infrequency Scale

1. Infrequency items are indicated by **F** in the margin of the scoring sheet. For each Infrequency item with a **bolded** score enclosed in a box, circle that item number in the column to the right.
2. Count the circled item numbers to determine the **Infrequency score**.
3. Using the Infrequency score table below, circle the appropriate protocol classification corresponding to that score.

Infrequency score	Cumulative %	Protocol classification
0-2	0-97.3	Acceptable
≥ 3	100	Infrequent

Item no.

10.
27.
38.
48.
59.

Infrequency score

Inconsistency Scale

For each item pair:

1. Transfer the item score for each item (marked **I** in the margin of the scoring sheet) to the appropriate item pairs boxes to the right. Be sure to review the item scores recorded.
2. Subtract the **lesser** number from the **greater** number and enter the result in the Difference column.
3. Sum the numbers in the Difference column to obtain the **Inconsistency score**. Circle the appropriate protocol classification corresponding to that score in the table below.

Inconsistency score	Cumulative %	Protocol classification
0-7	0-98.2	Acceptable
≥ 8	99.8-100	Inconsistent

Item no.	Score	Item no.	Score	Difference
2.		41.		→
25.		49.		→
28.		42.		→
33.		72.		→
34.		63.		→
44.		61.		→
46.		56.		→
52.		75.		→
60.		74.		→
64.		70.		→
				Inconsistency score

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APPENDIX C

DAILY LIVING QUESTIONNAIRE (DLQ)

Name:

Daily Living Questionnaire-R 1
Date:

Every day we perform many tasks that require mental effort, also known as cognition. During to course of our lives we may experience difficulties with these mental effort or cognitive tasks. The following is a list of activities that you may perform as part of your life.

Please **CIRCLE** the number which best describes how much mental or cognitive difficulty you generally have doing each of the following activities. If the activity does not apply to you (for example, you have never done this activity) please circle N/A.

Part 1: How much cognitive or mental difficulty do you have in doing the following tasks?	NO mental or cognitive difficulty	SOME mental or cognitive difficulty	MUCH mental or cognitive difficulty	UNABLE to do	Not Applicable (N/A)
1. Getting ready in the morning	1	2	3	4	9
2. Finding items on a crowded shelf or closet	1	2	3	4	9
3. Organizing closets / shelves / draws	1	2	3	4	9
4. Planning and preparing meals	1	2	3	4	9
5. Household tasks (organizing laundry)	1	2	3	4	9
6. Shopping (buying what you need, making decisions, finding items)	1	2	3	4	9
7. Organizing and scheduling own daily activities and errands	1	2	3	4	9
8. Planning / choosing what to wear	1	2	3	4	9
9. Reading newspapers / magazines	1	2	3	4	9
10. Reading books	1	2	3	4	9
11. Searching for information (on internet, library, etc)	1	2	3	4	9
12. Expressing your thoughts	1	2	3	4	9
13. Following a conversation	1	2	3	4	9
14. Participating in group discussions	1	2	3	4	9

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Daily Living Questionnaire-R

2

How much mental or cognitive difficulty do you have in doing the following tasks?	NO mental or cognitive difficulty	SOME mental or cognitive difficulty	MUCH mental or cognitive difficulty	UNABLE to do	Not Applicable (N/A)
15. Composing a letter or report	1	2	3	4	9
16. Planning social arrangements with family, friends or for children					
17. Participating in social activities with others	1	2	3	4	9
18. Participating in recreational activities, leisure, hobbies	1	2	3	4	9
19. Crossing a busy street	1	2	3	4	9
20. Driving a car	1	2	3	4	9
21. Operating a bank machine	1	2	3	4	9
22. Completing applications and forms	1	2	3	4	9
23. Fixing / Repairing things	1	2	3	4	9
24. Finding your way in unfamiliar environments	1	2	3	4	9
25. Math / calculations	1	2	3	4	9
26. Organizing and managing finances	1	2	3	4	9
27. Paying bills	1	2	3	4	9
28. Following written directions	1	2	3	4	9

Part 2: How much difficulty do you have with the following ?	NO difficulty	SOME difficulty	MUCH difficulty	UNABLE to do	Not Applicable
29. Remembering things you need to do during the day	1	2	3	4	9
30. Keeping track of appointments	1	2	3	4	9
31. Keeping track of where things are	1	2	3	4	9
32. Keeping track of time	1	2	3	4	9
33. Screening out irrelevant background noises or thoughts while engaging in a task	1	2	3	4	9
34. Resuming an activity without difficulty after being interrupted	1	2	3	4	9
35. Prioritizing tasks	1	2	3	4	9
36. Maintaining focus on a task	1	2	3	4	9
37. Switching easily from one task to another	1	2	3	4	9
38. Accomplishing tasks within a reasonable time frame	1	2	3	4	9
39. Responding quickly to situations when necessary	1	2	3	4	9
40. Stopping and starting activities without difficulty	1	2	3	4	9
41. Performing daily activities at a normal speed	1	2	3	4	9
42. Understanding new information	1	2	3	4	9
43. Attending to all aspects of a task or situation without missing information	1	2	3	4	9
44. Handling complex tasks that include keeping track of a lot of information at once	1	2	3	4	9
45. Approaching tasks in an organized and efficient way	1	2	3	4	9

How much difficulty do you have with the following ?	NO difficulty	SOME difficulty	MUCH difficulty	UNABLE to do	Not Applicable (N/A)
46. Planning and thinking ahead	1	2	3	4	9
47. Seeking out and investigating information when needed	1	2	3	4	9
48. Solving problems without difficulty	1	2	3	4	9
49. Managing multiple step tasks	1	2	3	4	9
50. Adjusting easily to unexpected changes	1	2	3	4	9
51. Taking initiative to start a new activity or project	1	2	3	4	9
52. Learning new factual information	1	2	3	4	9

As you look over the Part 1 and Part 2 above, Please place an * next to the 5 activities or areas that are most important to you or that you are most concerned about.

If you wish to tell us any more about any of the above tasks or areas, please do so in the space below.
(NOT REQUIRED)

Scoring for Part I and 2

Part 1 - Activity Limitations and Participation Restrictions: 4 Subscales

1. Household Tasks: Items 1 to 8
2. Activities involving language/comprehension/ expression: Items - 9 to 15
3. Community/ Participation: Items - 16 to 21
4. Complex Tasks: Items 22-28

Part 2 Everyday Cognitive Symptoms: 2 Subscales

1. Memory: Items 29 to 32
2. EF Monitoring: Items 33 -41
3. EF (working memory, multi-tasking, organization): Items 42-52

Total the number of items answered within each subscale separately (do not include any NA items). Divide by the number of items that were answered within each subscale to obtain the average rating for each subscale.

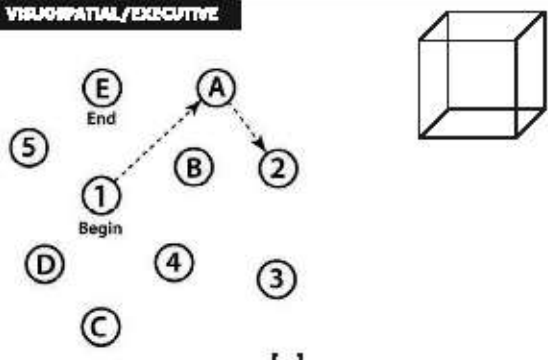
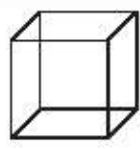
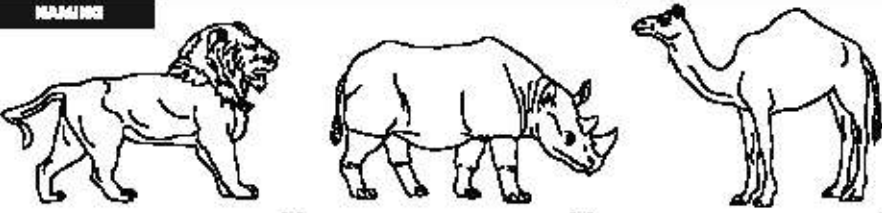
Rosenblum, Sara; Josman, Naomi; and Toglia, Joan (2017). Development of the Daily Living Questionnaire (DLQ): A Factor Analysis Study, *The Open Journal of Occupational Therapy*, Vol. 5; Iss. 4, Article 4. Available at: <http://doi.org/10.15453/2158-6408.1326>

May not be changed or modified without permission Joan Toglia e-mail info@multicontext.net.

Additional Research on the DLQ across different populations is encouraged

APPENDIX D

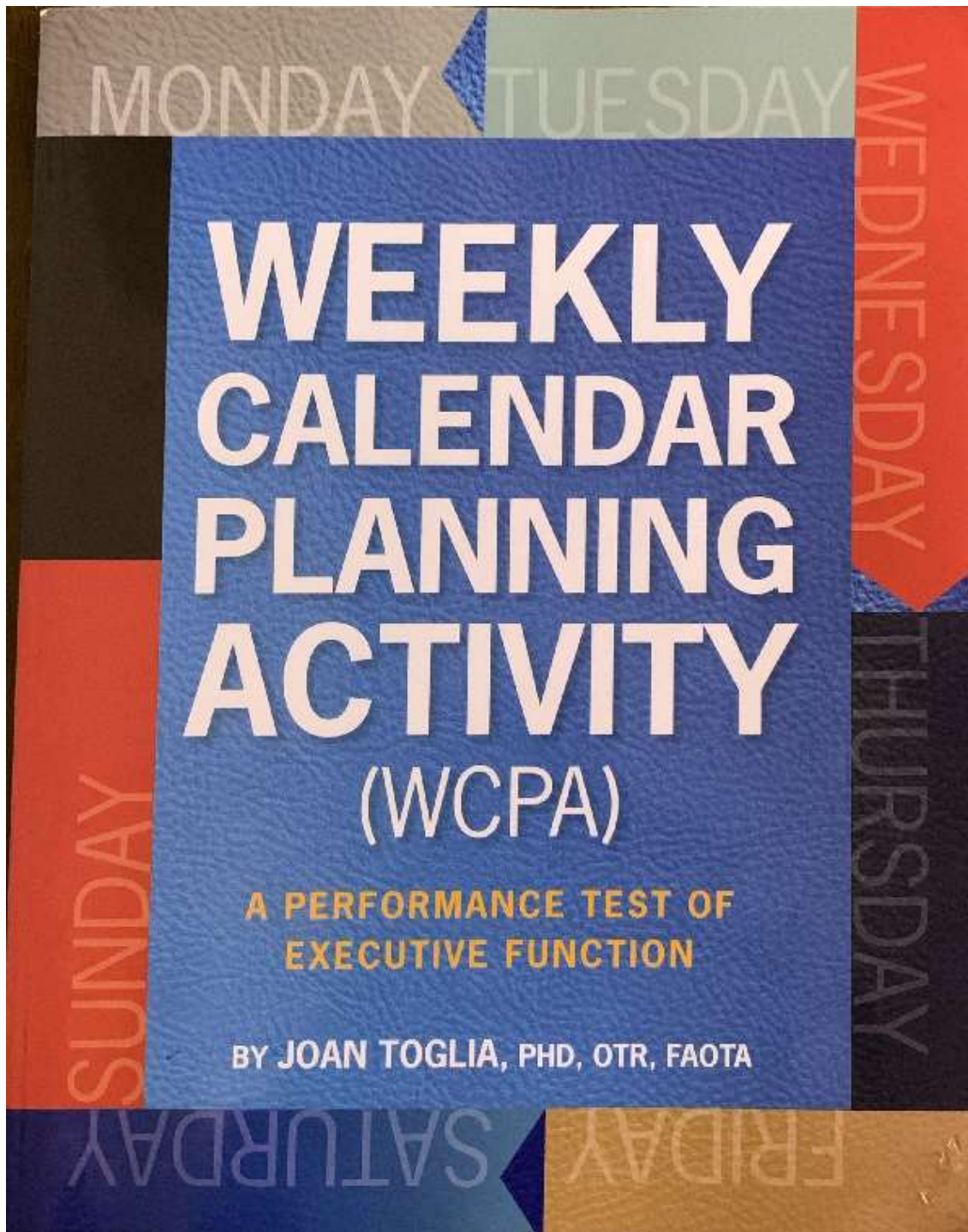
MONTREAL COGNITIVE ASSESSMENT (MoCA)

MoCA		Version 8.1 English		Name: _____ Education: _____ Sex: _____		Date of birth: _____ DATE	
VISUOSPATIAL/EXECUTIVE 				Copy cube 		Draw CLOCK (Ten past eleven) (3 points) [] [] [] Contour Numbers Hands	
						_____/5	
NAMING 							
				_____/3			
MEMORY Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.		FACE VELVET CHURCH DAISY RED 1 st TRIAL 2 nd TRIAL				NO POINTS	
ATTENTION Read list of digits (1 digit/sec.). Subject has to repeat them in the forward order. [] 2 1 8 5 4 Subject has to repeat them in the backward order. [] 7 4 2						_____/2	
Read list of letters. The subject must tap with his hand at each letter A. No points if = 2 errors [] F B A C M N A A J K L B A F A K B E A A A J A M O F A A B						_____/1	
Serial 7 subtraction starting at 100. [] 93 [] 86 [] 79 [] 72 [] 65 4 or 5 correct subtractions = 2 pts, 2 or 3 correct = 1 pt, 1 correct = 1 pt, 0 correct = 0						_____/3	
LANGUAGE Repeat: I only know that John is the one to help today. [] The cat always hid under the couch when dogs were in the room. []						_____/2	
Fluency: Name as many number of words in one minute that begin with the letter F. [] _____ (N=11 words)						_____/1	
ABSTRACTION Similarity between e.g. orange - banana = fruit [] train - bicycle [] watch - ruler						_____/2	
DELAYED RECALL (9/10) First to recall words WITH NO CLUE Memory Index Score (MIS) MIS = _____/15		FACE VELVET CHURCH DAISY RED [] [] [] [] []				_____/5	
ORIENTATION [] Date [] Month [] Year [] Day [] Place [] City						_____/6	
© Z. Nasreddine MD Training and Certification are required to ensure accuracy.		www.mocatest.org		MIS: /11 (Normal is 26/30) Add 1 point if at 55 yrs and older		TOTAL _____/30	

ADMINISTERED BY Sullivan, Anne MOCA CERTIFIED RATER ID USSULAN710007567-01

APPENDIX E

WEEKLY CALENDAR PLANNING ACTIVITY (WCPA)



Weekly Calendar Planning Activity Instruction Sheet

Directions

1. Enter the appointments in any order in the weekly schedule.
2. Enter the entire or complete appointment or errand.
3. Mark the exact time needed on the weekly schedule (when it is indicated).
4. It is more important to be accurate than to go too fast.
5. Remember to follow the rules.

Rules to Remember

- Once you have entered an appointment into the calendar, you cannot cross it out.
- Tell me when it is _____.
- Leave _____ free. (Do not schedule any appointments or errands on this day.)
- Do not answer questions from the examiner during this activity.
- Tell the examiner when you are finished.

Note. Choose appointment list from Appendixes A, B, C, or D.

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Appointments and Errands to Be Scheduled: Adult/Older Adult Level II (Version A)

Dentist on Thursday at 3:00 p.m. (1 hour)

One-hour visit with cousin who is only available on Thursday between 2:30 and 4:00 p.m. or on Monday or Tuesday between 1:00 and 2:30 p.m.

Carpool: One morning at 9:00 a.m. and one afternoon at 3:00 p.m. (45 minutes)

Phone conference on Tuesday before 2:00 p.m. (half hour)

Doctor appointment Monday or Friday afternoon at 2:00 p.m. (90 minutes)

Volunteer at People to People on Friday from 9:00–10:30 a.m.

Pick up pants from dry cleaners Monday, Wednesday, or Friday between 8:00 a.m. and 4:00 p.m. (half hour)

Lunch with a friend on Tuesday from 1:00–2:00 p.m.

Dinner with coworkers either Thursday or Friday evening. Start dinner any time between 6:30 and 8:00 p.m. (2 hours)

Go food shopping before Friday (1 hour)

45-minute exercise at the gym either Friday or Saturday morning

Pick up medication at pharmacy before it closes on Tuesday. Pharmacy is open from 9:00 a.m.–3:00 p.m. daily (half hour)

Movies with friends on Thursday from 7:00–11:00 p.m.

Haircut on Monday from 11:00 a.m.–12:00 p.m.

Walk neighbor's dog on Thursday morning before 11:00 a.m. (half hour)

Call to renew prescription any time before noon on Tuesday

Weekly Calendar Sample 2: How to Enter Appointments

Weekly Calendar

	Mon	Tues	Wed	Thur	Fri	Sun	Sat
7 am							
8 am	Meeting-Mary (1 hour)						
9 am		Mail package (45 minutes)		Call sister (half hour)			
10 am							
11 am					Movies with friends (90 minutes)		
12 pm							
1 pm							
2 pm							
3 pm							
4 pm							
5 pm							
6 pm							
7 pm							
8 pm							

Note. The length of time for the tasks is illustrated. In the actual task, there is no need to indicate the length of time for each task if the appointment is marked or outlined.

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Weekly Calendar

Weekly Calendar

	Mon	Tues	Wed	Thur	Fri	Sun	Sat
7 am :15 :30 :45							
8 am :15 :30 :45							
9 am :15 :30 :45							
10 am :15 :30 :45							
11 am :15 :30 :45							
12 pm :15 :30 :45							
1 pm :15 :30 :45							
2 pm :15 :30 :45							
3 pm :15 :30 :45							
4 pm :15 :30 :45							
5 pm :15 :30 :45							
6 pm :30							
7 pm :30							
8 pm :30							

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WCPA Recording Form

Level: ____ Version: ____

Client: _____ Date: _____ Examiner: _____

Planning time: From "Let's begin" to entering of

1st appointment: ____ min ____ sec 2nd appointment: ____ min ____ sec (optional)

Total time: Time from "Let's begin" to completion: ____ min ____ sec

Rules

1. Questions answered (Y = yes; N = no) 1. ____ 2. ____ 3. ____
2. States time at 7 min (± 5 minutes) ____ States time too late ____ Forgets time completely ____
3. States when finished: ____ yes ____ no
4. Appointments scheduled on free day (Tues./Wed./Thurs.): ____ yes ____ no
5. No. of appointments crossed out ____

Total no. of rules followed ____/5

Observations

Refers to Instruction Sheet: ____ Never ____ 1-2 times ____ 3-5 times ____ >5 times

Calendar error management (Sat./Sun. reversal, evening appointment time format, time ending too early) ____ Did not affect performance ____ Interfered with performance

Note. This form applies to all versions of the WCPA.

(Continued)

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Strategies Observed (check off whether strategy is observed and how much it is used)

Strategies	Not Observed	Occasionally/ Partially Used	Frequently/ Consistently Used	Inefficient/ Counterproductive
Underlines, circles, or highlights key words or features				
Uses finger				
Verbal rehearsal: Repeats key words or instructions out loud				
Crosses off, checks off, or highlights appointments entered				
Rearrangement of materials				
Categorizes or organizes appointments before entering them (coding system, color codes, highlights, labels)				
Enters fixed appointments first, then flexible appointments				
Uses written plan: Makes a rough draft first or plans out calendar in writing before entering appointments				
Talks out loud about strategy, method, or plan				
Crosses off specified free day				
Self-checks				
Pauses and rereads				
Other:				
Other:				
Total observed strategies				
Strategies reported (not observed—reported in After-Task Interview) Specify and indicate total no. of strategies:				
Total no. of strategies used: total observed strategies (occasional + frequent) + total strategies reported				
Comments and other strategies observed (note any spontaneous statements regarding difficulty while completing task, comment on strategy inefficiencies, and expand on description of strategy use):				

After-Task Interview and Rating Scale

1. **Do you do tasks like this on a regular basis?** ___ Yes ___ No (*Optional: Do you use a weekly calendar or schedule? How do you go about keeping track of your own appointments or errands?*)
2. (a) **Tell me how you went about doing this task** (*Wait for response. If necessary, ask.*)
 (b) **Did you use any strategies or special methods?** (Did you have a plan or a special approach? How did you manage to keep track of everything or organize everything?) *If necessary, comment on observations regarding strategy use. (Note: If additional strategies are reported, check off reported strategies on the WCPA Recording Form and specify.)*
3. **Did you encounter (or experience) any challenges (or difficulties) while doing this task?**
Which parts of this activity were most challenging (hardest)? Which parts were easiest?
4. **Would you do anything differently next time?** (Would you change the way you went about the task in any way? Are there any other strategies or methods that you could use?)

5. Self-Ratings

Statement	Agree (1)	Somewhat Agree (2)	Somewhat Disagree (3)	Disagree (4)
1. This task was easy for me.				
2. I used efficient methods to complete this task.				
3. I completed this task accurately.				
4. I kept track of everything I needed to do.				
Totals				
Average rating				

6. **How much time did it take you to complete this task?** (*Encourage the person to estimate or guess if he or she is not sure.*)
 ___ <10 min ___ 10–15 min ___ 16–20 min ___ 21–25 min ___ 26–35 min ___ >35 min
7. **17 or 18 appointments needed to be entered into the weekly calendar. Estimate the number of appointments that you entered accurately into the schedule:** _____

Calendar Scoring Worksheet: Adult/Older Adult Level II (Version A)

(Note. Wednesday is free in this version.)

Directions: Place a check mark in the Accurate column if an appointment is entered without errors and an "X" in the Missing column if an appointment is omitted. For quick scoring, place an "X" in the Error column. For detailed error scoring, use one of the following error codes to indicate which type of error was committed.

- R = Appointment is repeated or entered more than once, and repetition is not an attempt to self-correct a location error
- L = Appointment is placed in the wrong location, day, or time slot
- T = Appointment is in the right location, but the time allotted is incorrect by more than 15 minutes (7:00 a.m.–6:00 p.m.) or 30 minutes (6:00–9:00 p.m.)
- I = Appointment name is entered inaccurately or partially

Self-Recognition (SR) Column

Place a check mark in this column if the person acknowledges an appointment error or conflict verbally or non-verbally or if you observe the person trying to correct it (e.g., draw lines, cross out).

Entered	Missing	Error	Accurate	SR	Appointments
					Mon.: Haircut from 11:00 a.m.–12:00 p.m.
					Mon. or Tues.: Visit with cousin between 1:00 and 2:00 p.m. or 1:30 and 2:30 p.m. or on Thurs between 2:30 and 3:30 p.m. or 3:00 and 4:00 p.m.
					Mon. any time or Tues. a.m.: Call to renew prescription
					Tues.: Lunch with friend from 1:00–2:00 p.m.
					Tues.: Phone conference before 2:00 p.m. (30 minutes)
					Mon. or Tues.: Medication picked up between 9:00 a.m. and 3:00 p.m. (30 minutes). Must have previously called to renew prescription.
					Thurs.: Walk neighbor's dog before 11:00 a.m. (30 minutes)
					Thurs.: Dentist at 3:00 p.m. (1 hour)
					Thurs.: Movies with friends from 7:00–11:00 p.m.
					Fri.: Volunteer job from 9:00–10:30 a.m. (90 minutes)
					Thurs. or Fri.: Dinner, coworkers, starting between 6:30 and 8:00 p.m. (2 hours)
					Mon. or Fri.: Pick up dry cleaning between 8:00 a.m. and 4:00 p.m. (30 minutes)
					Fri., Sat., or Sun. morning: Exercise at the gym (45 minutes)
					Doctor: Mon. or Fri. afternoon at 2:00 p.m. (90 minutes)
					Food shopping before Fri. (1 hour)
					Carpool: One morning at 9:00 a.m. (45 minutes)
					Carpool: One afternoon at 3:00 p.m. (45 minutes)
					Total all columns
					The no. of appointments in the missing + accurate + error columns should equal 17

APPENDIX F

PARTICIPANT CONSENT FORM

TEXAS WOMAN'S UNIVERSITY (TWU) CONSENT TO PARTICIPATE IN RESEARCH

Title: Transition to adulthood: Executive functions and independent living skills in autism spectrum disorder

Principal Investigator: Anne Sullivan, MOT, OTR.....autismresearchot@gmail.com
Faculty Advisor: Asha Vas, PhD.....avas@twu.edu

Summary and Key Information about the Study

You are being asked to participate in a research study conducted by Anne Sullivan, a graduate student at Texas Woman's University, as a part of her dissertation in Occupational Therapy. The purpose of this research is to determine how executive functioning skills impact the development of independent living skills in adults with autism spectrum disorder. You have been invited to participate in this study because you are an adult age 18-30, either with autism or without. You will be asked to take part in a face-to-face meeting to determine eligibility with a 5-minute questionnaire to screen for cognitive ability to determine if you are eligible for this study.

If you are eligible, you will continue as a participant in the study. As a participant, you will complete 5 questionnaires regarding your independent living skills and ability to process information. The total time commitment for this study will be about two hours. Following the completion of the study you will receive \$35 for your participation. The greatest risks of this study include potential loss of confidentiality and emotional discomfort. We will discuss these risks and the rest of the study procedures in greater detail below.

Your participation in this study is completely voluntary. If you are interested in learning more about this study, please review this consent form carefully and take your time deciding whether or not you want to participate. Please feel free to ask the researcher any questions you have about the study at any time.

Description of Procedures

As a participant in this study, you will be asked to spend two hours of your time in a face-to-face session with the researcher. You and the researcher will decide together on a private location where and when the session will happen. You may ask a support person to be present during the session.

During this session, you will complete 3 questionnaires about your independent living skills, where you will answer questions about what skills you typically use and how difficult they are for you. You will also be asked to fill out a paper calendar with a list of appointments that are provided for you.

After all these assessments are completed, \$35 will be given to you in appreciation of your time.

In order to be a participant in this study, you must be between 18 -30 years of age. You will not be eligible if you have an intellectual disability (IQ < 70) or a history of schizophrenia, traumatic brain injury, stroke, or epilepsy.

Potential Risks

A possible risk in this study is discomfort with questions in the questionnaire about your independent living skills and frustration with the calendar activity. You may ask questions at any time. You may request to have a support person present for your session. If you become tired or upset, you may take breaks or request extended time as needed. You may also request the assessment time to be divided into two sessions. You may also stop answering questions at any time and end the session. If you feel



Initials
Page 1 of 2

you need to talk to a professional about your discomfort, the researcher has provided you with a list of resources. Another risk in this study is loss of confidentiality. Confidentiality will be protected to the extent that is allowed by law. The session will be held at a private location that you and the researcher have agreed upon. Your name will only be used to contact you about session scheduling. Following your session, your name and contact information will be removed from all information collected.

This written assessment information will be stored in a locked cabinet in the researcher's office. Only the researcher and her advisor will read your assessment responses. Information will be destroyed within three years after the study is finished. The signed consent form will be stored separately from all collected information and will be destroyed three years after the study is closed. The results of the study may be reported in scientific magazines or journals but your name or any other identifying information will not be included. There is a potential risk of loss of confidentiality in all email, downloading, electronic meetings and internet transactions.

The researchers will remove all of your personal or identifiable information (e.g. your name, date of birth, contact information) from any study information. After all identifiable information is removed, your assessment data that is collected for this study may be used for future research or be given to another researcher for future research without additional informed consent.

If you would like to participate in the current study but not allow your de-identified data to be used for future research, please initial here _____.

The researchers will try to prevent any problem that could happen because of this research. You should let the researchers know at once if there is a problem and they will try to help you. However, TWU does not provide medical services or financial assistance for injuries that might happen because you are taking part in this research.

Participation and Benefits

Your involvement in this study is completely voluntary and you may withdraw from the study at any time. Following the completion of the study you will receive \$35 for your participation. If you would like to know the results of this study we will email or mail them to you.*

Questions Regarding the Study

You will be given a copy of this signed and dated consent form to keep. If you have any questions about the research study you should ask the researchers; their contact information is at the top of this form. If you have questions about your rights as a participant in this research or the way this study has been conducted, you may contact the TWU Office of Research and Sponsored Programs at 940-898-3378 or via e-mail at IRB@twu.edu.

Signature of Participant

Date

*If you would like to know the results of this study tell us where you want them to be sent:

Email: _____ or Address: _____



Page 2 of 2

APPENDIX G

IRB ACCEPTANCE CONFIRMATION



Anne Sullivan <asullivan6@twu.edu>

IRB-FY2022-347 - Initial: Expedited Approval Letter

2 messages

do-not-reply@cayuse.com <do-not-reply@cayuse.com>
To: asullivan6@twu.edu, avas@twu.edu
Cc: irb@twu.edu

Wed, Jul 27, 2022 at 8:18 AM



Texas Woman's University
Institutional Review Board (IRB)

irb@twu.edu

<https://www.twu.edu/institutional-review-board-irb/>

July 27, 2022

Anne Sullivan
Occupational Therapy - Dallas

Re: Initial - IRB-FY2022-347 Transition to Adulthood: Executive functions and independent living skills in autism spectrum disorder

Dear Anne Sullivan,

The above referenced study has been reviewed and approved using expedited review procedures on July 26, 2022 by the TWU IRB - Dallas operating under FWA00000178. If you are using a signed informed consent form, the approved form has been stamped by the IRB and uploaded to the Attachments tab under the Study Details section. This stamped version of the consent must be used when enrolling subjects in your study.

Note that any modifications to this study must be submitted for IRB review prior to their implementation, including the submission of any agency approval letters, changes in research personnel, and any changes in study procedures or instruments. Additionally, the IRB must be notified immediately of any adverse events or unanticipated problems. All modification requests, incident reports, and requests to close the file must be submitted through Cayuse.

Approval for this study will expire on --. A reminder of the study expiration will be sent 45 days prior to the expiration. If the study is ongoing, you will be required to submit a renewal request. When the study is complete, a close request may be submitted to close the study file.

If you have any questions or need additional information, please email your IRB analyst at irb@twu.edu or refer to the IRB website.

Sincerely,

TWU IRB - Dallas

IRB <IRB@twu.edu>
To: "Sullivan, Anne" <ASullivan6@twu.edu>, "Vas, Asha" <AVas@twu.edu>

Wed, Jul 27, 2022 at 8:20 AM

Hi Anne!