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Building Executive Functioning to Facilitate Instrumental Activities of Daily Living for Emerging Adults with Autism Spectrum Disorder

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Abstract

Autism Spectrum Disorder (ASD) is a complex neurologically based developmental disorder that can affect an individual's thinking, feeling, language development and social interactions (American Psychiatric Association, 2017). These symptoms frequently limit independence in instrumental activities of daily living. There is growing evidence that executive dysfunction may contribute to these functional deficits. The prevalence of ASD continues to rise and today is identified in approximately 1 in 68 children. As a result, more and more occupational therapists are finding themselves working with individuals with ASD. Facilitation of cognitive processes (which includes executive function) through the use of occupations and activities, is within the scope of practice for occupational therapists (Giles et al., 2013); However, there is a significant lack of evidence-based interventions that address executive functioning for emerging adults with ASD. The program outlined was developed to address this identified need. It is a comprehensive program based on current research that facilitates instrumental activities of daily living by addressing underlying executive functioning skills. A thorough literature review, methods for program implementation, and program evaluation are described.

Keywords: Autism**,** Executive Dysfunction**,** Occupational Therapy**,** Instrumental Activities of Daily Living

Section 1

Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) is a complex neurologically based developmental disorder that can affect an individual's thinking, feeling, language development and social interactions. The clinical presentation of ASD is unique to the individual, with symptoms ranging from mild to severe (American Psychiatric Association, 2017). Instrumental Activities of Daily Living (IADL) are frequently impaired in individuals with ASD, which negatively impacts independence. As a result, many individuals with ASD remain dependent on their caregivers throughout their lives (Billstedt, Gillberg, & Gillberg, 2005, 2011; Smith, Maenner & Mailick Seltzer, 2012).

ASD occurs in all racial, ethnic and socioeconomic groups; however, it is 5 times more common in boys than girls. The prevalence of ASD in the United States has increased by 119.4 % between the years 2000 to 2010 and today is identified in approximately 1 in 68 children. The costs associated with the disability are astronomical, $11.5 – $60.9 billion dollars per year, and are considered a significant economic burden to US taxpayers. In addition to increased medical expenditures, intensive behavioral interventions cost between $40,000 – $60,000 per year, per child (Center for Disease Control, 2016). As the prevalence and costs associated with ASD continues to rise, more and more occupational therapists are finding themselves working with individuals with ASD across the lifespan and in a variety of settings. As a result, the need for evidence-based interventions is greater than ever.

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Section 2

Executive Function

Executive function (EF) can be conceptualized as a single function through which individuals gain knowledge and solve problems. This function involves nine different, but interconnected capacities: attention, emotion regulation, flexibility, planning, organization, initiation, inhibitory control, self-monitoring and working memory (Goldstein & Naglieri., 2014). The EF skills of typically developing individuals continues to develop well into a person's late 20s (DeLuca et al., 2003; Mahdavi, 2014); however, the developmental trajectory of EF for some individuals with ASD is atypical compared to their typically developing peers. Furthermore, the discrepancy between the populations appears to widen with age (O'Hearn, K., Asato, M., Ordaz, S. & Luna, B., 2008; Rosenthal et al., 2013; van den Berg, Scheeren, Begeer, Koot and Geurts, 2014). Executive dysfunction is often a contributing factor to the functional deficits associated with ASD.

Based on the evidence that individuals with ASD have difficulty achieving a level of independence in daily living skills that commensurate with their intellectual ability, and that the developmental trajectory of their EF skills may be altered, interventions targeting these deficits and the executive function variables that contribute to them, should be targeted during intervention to improve outcomes (Duncan & Bishop 2015; Pugliese et al., 2014).

The emerging adult phase of life is an optimal time to address IADL. It is a time when the expectations for independence increase and most remedial school-based support services, e.g. occupational therapy, speech therapy, psychology services, social skills groups, etc., end. Most typically developing peers are relying less on family and are assuming more responsibility for the management of their own IADL. Many are leaving home to go to college or starting careers and most are expected to live independently by their mid-20s. However, tasks such as shopping, meal preparation, financial management, heath management, safety and emergency maintenance, all rely heavily on planning, attention, time management, self-monitoring and self-regulation (Duncan & Bishop, 2015; Pugliese et al., 2014).

Section 3

The Role of Occupational Therapy

The American Occupational Therapy Association states that facilitation of cognitive processes (which includes executive function) through the use of occupations and activities, is within the scope of practice for occupational therapists (Giles et al., 2013); However, there is a significant lack of evidence-based interventions that address executive functioning for emerging adults with ASD. To further complicate matters, many occupational therapists feel ill equipped to address executive dysfunction within their therapy sessions (Cramm, Krupa, Missiuna, Lysaght, & Parker, 2005).

The National Professional Development Center on Autism Spectrum Disorder, (NPDC), (n.d.), did an extensive search of the literature and identified ten interventions that addressed cognitive outcomes, which included executive function. However, of the ten, five were utilized for children ages birth through five years, and five were utilized for children ages six through fourteen years. While these interventions may be appropriate for older populations, they have not been evaluated as such. The NPDC did not identify any evidence-based interventions to address executive functioning for the emerging adult population. This author also conducted a a thorough search of the literature for evidence of interventions utilized to facilitate executive functioning skills for emerging adults with ASD; however, no additional interventions were found. As a result, a gap in the research was identified.

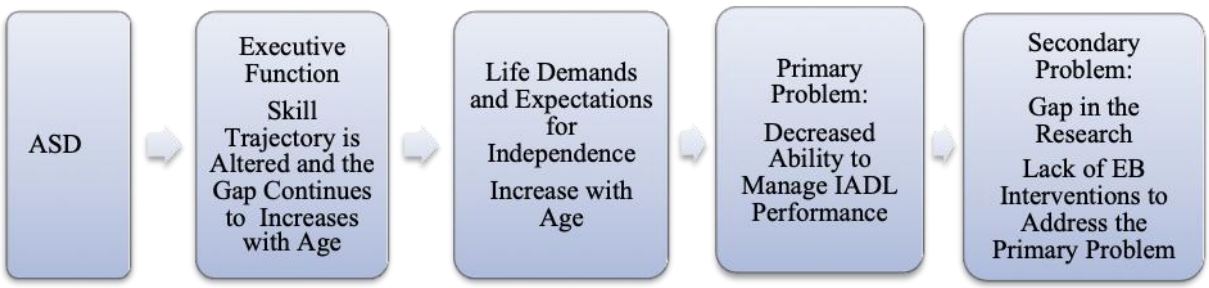

Figure 1.Explanatory Model. Primary and secondary problems.

Section 4

Proposed Intervention Program

The proposed intervention program is designed to address the identified gap in the research. It provides the framework for understanding EF and its contribution to occupational performance. It is a comprehensive program, which can be utilized in any type of setting; however, access to the client's natural context during individual sessions is extremely important. The program is intended for use by occupational therapists; however, graduate level occupational therapy students completing level 2 fieldwork can participate in its implementation under the direct supervision of their licensed clinical educator.

Within the program, EF is conceptualized as a dynamic whole rather than a set of discreet skills. Assessment and intervention to improve EF is done within the context of occupational performance. The program provides therapists with a step-by-step guide for assessment and intervention to improve executive dysfunction through occupation utilizing both compensatory and remedial approaches.

There are three main components of the program: weekly individualized occupational therapy sessions, biweekly group Goal Management Training (GMT), and daily low to moderate intensity movement activities. The program utilizes both compensatory and remediation strategies. The program focuses on improving IADL skills by addressing underlying executive functioning deficits. Activities are designed to develop self-awareness, practice skill sets, and facilitate use of efficient processing strategies to organize and structure incoming information and to apply knowledge and skills to a variety of situations. Independent problem solving is emphasized and all aspects of the environment, e.g. social, physical and cultural are considered throughout the program.

Section 5

Use of the Planning, Attention, Simultaneous, Successive (PASS) Theory to Explain Executive Function

The PASS theory can be applied to understand executive functioning. This model was chosen because it has factorial validity, it can be operationalized and provides a theoretical perspective that can be used to identify and understand clinical differences in individuals with ASD (Das, Naglieri & Kirby, 1994; Taddei & Contena, 2013).

According to the PASS theory when an individual receives information through the senses, four cognitive processes, e.g. planning, attention, simultaneous processing and successive processing, are activated to analyze the information within the context of the individual's knowledge base (Niglieri, 2012; Niglieri & Das, 2005).

Section 5.1

Planning is described as a neurocognitive ability that relies heavily on executive functioning skills and is associated with the prefrontal cortex. It includes generation of ideas, goal setting, anticipation of problems, retrieval of knowledge, impulse control, implementation of a plan and evaluation of actions. It is critical for all activities that require an individual to solve a problem. Planning, which will be the primary area targeted in the program, utilizes an individual's knowledge and skills and includes selective and successive processes, self-monitoring, and impulse control (Niglieri & Das, 2005; Niglieri, 2012;).

Section 5.2

Attention (selective) allows the individual to select and focus on specific stimuli over time while ignoring competing stimuli and maintaining vigilance (Niglieri & Das, 2005, Niglieri, 2012).

Section 5.3

Simultaneous processing is necessary to recognize patterns, organize information into groups and to understand information as a whole. Activities that require strong visual spatial understanding rely heavily on simultaneous processing as well as certain aspects of language (e.g., grammatical components, word relationships and inflections), (Das, 2002; Niglieri & Das, 2005; Niglieri, 2012).

Section 5.4

Successive processing involves the integration of stimuli into a specific serial order and is utilized when a task requires an individual to remember information or to follow instructions in a specific order. (Niglieri & Das, 2005; Niglieri, 2012).

Section 6

Use of the Dynamic Interactional Model of Cognition to Explain the Problem and Guide Intervention

The dynamic interactional model of cognition was utilized to identify how executive functioning skills affect occupation and daily activities and to guide the intervention model of the program. The theoretical concepts of the Dynamic Interactional Model are broad and can be applied to all populations of people. The model conceptualizes cognition as a process that involves information processing, learning and generalization. It postulates that cognition is modifiable and dynamic and is an ongoing product of the interactions between the person, activity and environment. According to the dynamic interactional approach to cognitive rehabilitation, change occurs through appropriate selection and modification of processing strategies. Desired outcomes include decreasing activity limitations and enhancing participation in everyday activities (Toglia, 2005). This conceptualization is consistent with the PASS theory.

Section 6.1

Program Objectives

Program Long Term Goals:

- Increase independence in performance of IADL

  Examples of Possible Program Intermediate Goals:
  - Complete and hand in homework/class assignments on time
  - Complete all phases of laundry
  - Develop and adhere to a weekly schedule

Program Short Term Goals:

Participants will:

- Identify personal goals
- Demonstrate improved self-awareness as evidenced by the ability to self-reflect and evaluate current performance

Section 6.2

Client Evaluation Process

- A comprehensive interview is conducted to gain insight into the client's values, history, routines, habits, personal goals and ability to self-reflect on and monitor his/her performance while completing IADL.
- Caregivers that are familiar with the client are interviewed (with permission from the client). The purpose of this interview is to compare the client's self-reflection with how he/she is viewed by others.
- The client is observed in his/her natural environment. A minimum of two observations in different contexts should be conducted.

Section 7

Goal Attainment Scaling

Goal Attainment Scaling (GAS), which is an individualized, criterion referenced, and client centered way to measure change, is utilized to monitor each client's progress toward goal achievement. Following the evaluation process, the occupational therapy practitioner works with each client to develop a set of unique goals (2 – 4 max.) and specifies a range of possible outcomes for each goal. These ranges are then plotted on a 5-point attainment scale. GAS goals should be monitored regularly and can plotted on a simple bar graph, which will provide a visual representation of the data. It is important that the GAS goals are relevant to the client, only measure one variable and a specific time frame for goal achievement is set (Turner-Stokes, 2009).

Example GAS goal

		By the end of 4 weeks, Bob will	By the end of 4 weeks, Bob will
Much more than expected	+2	Independently hand in homework on time 5 out of 5 trials	Independently complete 5 out of 5 steps of laundry (sort, wash, dry, fold, put away)
More than expected	+1	Independently hand in homework on time 4 out of 5 trials	Independently complete 4 out of 5 steps of laundry (sort, wash, dry, fold, put away)
Expected	0	Independently hand in homework on time 3 out of 5 trials	Independently complete 3 out of 5 steps of laundry (sort, wash, dry, fold, put away)
Less than expected	-1	Independently hand in homework on time 2 out of 5 trials	Independently complete 4 out of 5 steps of laundry (sort, wash, dry, fold, put away)
Much less than expected	-2	Independently hand in homework on time 1 out of 5 trials	Independently complete 4 out of 5 steps of laundry (sort, wash, dry, fold, put away)

Section 8

Individualized Therapy Sessions

Individual therapy sessions are based on the Dynamic Interactional Model (Toglia, 2005). The following key tenets are emphasized:

- Treatment activities are relevant to the client and not predetermined by the program
- A combination of simulated activities and real life activities are practiced across natural contexts
- Methods to enhance the client's self-awareness of abilities and self-monitoring of performance are embedded throughout each treatment session
- Multiple opportunities to practice targeted processing strategies that help the individual control symptoms, e.g. inattention, impulsivity, difficulty shifting sets, are provided throughout each session and across situations and contexts

Section 9

Goal Management Training

One of the key tenets of Toglia's Multicontext Treatment Approach is that individual treatment sessions are combined with group treatment activities that focus on problem solving and role-playing. This principle will be carried out during the Goal Management Training (GMT) sessions.

GMT is an intervention that addresses executive dysfunction, concentration, impulse control, planning and use of feedback through education, task and mindfulness practice. It is structured into nine modules, homework assignments and a wrap up session. Throughout the participants are taught problem solving techniques, how to define a goal, how to make a plan and how to self-monitor progress (Goal Management Training, 2015). GMT has proven to be an effective intervention to address executive dysfunction for individuals with varying diagnoses, e.g. polysubstance users (Valls-Serrano, Caracuel, & Verdejo 2016), acquired brain injury (Tornas, Lovstad, Solbakk, Schanke, Stubberud, 2016; Bertens, Kessels, Boelen & Fasotti, 2016) and frontal lobe brain damage (Levine et al., 2011); however, it has not been investigated for use with individuals with ASD.

Section 10

Low Intensity Movement Activities

Many studies support the use of exercise to improve certain aspects of executive functioning, e.g. working memory and attention; however, individuals with ASD are generally less active than typically developing peers (Pan and Frey, 2006). In addition, poor motor coordination is common in ASD, which may in turn contribute to this decreased participation in movement based activities. As a result, the final component of the program is participation in daily low to moderate intensity walking. The American Heart Association (2015) recommends that individuals should walk 10,000 steps per day. As a result, this is the benchmark used for the program; however, this standard may be difficult to reach for certain individuals. As a result, client health and current physical conditioning should be used to set individualized movement goals. A simple movement tracker will be utilized to track and record daily movement activities.

Section 11

Program Evaluation

This paper is the first step in the development of an intervention program to address executive dysfunction for individuals with ASD; however, a pilot study, which will be conducted at a Comprehensive Transition and Post-Secondary Program for emerging adults, is scheduled for the near future. Due to the lack of evidence available on interventions such as the one outlined, a thorough program evaluation, using both formative and summative evaluation methods, is essential and will be conducted throughout the pilot study.

The purpose of the formative evaluation will be to identify potential barriers to the program implementation, identify ways to improve program performance, and continuously monitor the program's fidelity, e.g. Is the program being implemented as intended? Can we make it better?

The purpose of the summative evaluation will be to examine the internal validity of the program, e.g. is there a change in participants' performance of IADL tasks following participation of the program?

The program evaluation will occur prior to, during and after completion of the pilot study. Key stakeholders e.g. facility administrators and staff, staff and participants of the program will be included in this evaluation. Hopefully, future researchers will find the knowledge gained from this program and its evaluation useful and will be able to use and build upon it. Disseminating findings from the program evaluation to the identified stakeholders will be crucial to the program's future success.

Section 12

Potential Barriers to Program Implementation

There are several potential barriers to implementing the Program. First and foremost, use of the two components of the program - individualized occupational therapy and weekly GMT together to facilitate executive functioning skills has not been evaluated empirically. Second, the program is time consuming for both the participants and the staff. Third, low motivation, poor self-awareness, and inaccurate assessment of current functioning on the part of potential participants may hinder their desire to change and to participate in a program that requires so much time. The program's formative evaluation will be utilized to evaluate the extent to which these potential barriers impact the program and to develop a plan so that the actual barriers can be reduced as much as possible.

Section 13

Discussion

50,000 Americans with Autism Spectrum Disorder (ASD) turn 18 years of age each year. For many, daily living skills are impaired which negatively impacts their independence. The majority of emerging adults with ASD will remain dependent on caregivers in the areas of education, habituation, and recreation (Billstedt, Gillberg, & Gillberg, 2005 & 2011). This prolonged dependence not only affects the individual with ASD, but also places a huge burden on their caregivers and costs U.S. taxpayers billions of dollars each year. Yet, evidence based (EB) interventions are lacking for this population.

Therefore, the aim of this project was to understand the nature and cause of decreased daily living skills for emerging adults with ASD and to develop an intervention program that addresses the identified problem areas and facilitates independence in instrumental activities of daily living (IADL).

Section 14

Implications for Practice

In addition to supporting emerging adults with ASD, the program will contribute to the profession of occupational therapy by providing clinicians with an approach to cognitive rehabilitation that is in line with occupational therapy theory and is based on current available research.

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