

2024

Build your executive functions: an intervention program combining cognitive training, physical activity, and family education for children with ADHD

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BOSTON UNIVERSITY
SARGENT COLLEGE OF HEALTH AND REHABILITATION SCIENCES

Doctoral Project

**BUILD YOUR EXECUTIVE FUNCTIONS:
AN INTERVENTION PROGRAM COMBINING COGNITIVE TRAINING,
PHYSICAL ACTIVITY, AND FAMILY EDUCATION FOR
CHILDREN WITH ADHD**

by

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Submitted in partial fulfillment of the
requirements for the degree of
Doctor of Occupational Therapy

2024

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DEDICATION

To my parents, F and Ces, thank you for your support throughout my academic journey.

At a young age, you have taught me the value of resilience and hard work, but more importantly, I appreciate how you have taught me to help others, especially as I achieve my goals. This one's for you, Dad and Mom!

ACKNOWLEDGMENTS

I thank my academic mentor, Nancy Doyle, for all her support and patience throughout this journey. She helped me believe in my abilities when I was doubtful of myself. Her dedication and countless efforts always inspired me to get my work well done and aspire for higher goals. I am beyond grateful to have her as my mentor and role model.

I thank my fiancé, Don Bugayong, for being with me throughout this journey. He has supported me throughout the rollercoaster of emotions and challenges that I had to navigate as I get closer to reaching my dreams. Here's to achieving more goals together. I love you!

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ABSTRACT

The *Build Your EF* Program is a novel occupational therapy (OT) intervention program that combines multiple theoretically-guided and evidence-based techniques that help develop executive functions for children with attention deficit hyperactivity disorder (ADHD). This program is the first to combine cognitive training, physical activity, and family education to build EF skills using an occupation-based and evidence-based approach. Cognitive training will focus on providing activities that target response inhibition, cognitive flexibility, working memory, emotional regulation, organization, and planning and prioritization. Physical activity will target the basic sensory systems necessary to achieve higher cognitive functions, including executive functions. Family education will instruct on the importance of having a sleep routine and reducing screen time to develop EF skills and emphasizes the family's involvement in the therapeutic process. This doctoral project (1) summarizes the theories and evidence-based practice used to develop the *Build Your EF* Program (2) lists specific interventions and activities that help develop EF skills for children with ADHD (3) defines the next steps to be taken

by the author upon program development and implementation, including program evaluation, dissemination, and funding. The *Build Your EF* Program helps the OT profession take a step forward in developing novel intervention programs for specific populations. It showcases the need for continuous innovative practices in OT.

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LIST OF ABBREVIATIONS

ADHD	Attention Deficit Hyperactivity Disorder
ASD	Autism Spectrum Disorder
AX-CPT	AX Continuous Performance Test
BARAN	Balance-based Attentive Rehabilitation of Attention Networks
BRIEF	Behavior Rating Inventory of Executive Functioning
BU	Boston University
COPM	Canadian Occupational Performance Measure
EF	Executive Functions
ERC	Emotional Regulation Checklist
EYT	Early Years Toolbox
IR Model	Iterative Reprocessing Model
IRB	Internal Review Board
MEFS	Minnesota executive function scale
OT	Occupational Therapist
SI Theory	Sensory Integration Theory
TV	Television
WISC-V	Wechsler Intelligence Scale for Children, 5 th edition

CHAPTER ONE – Introduction

Problem to be Addressed and Expected Outcomes

Executive functions (EFs) are higher cognitive processes that play an important role in directing thoughts and behaviors towards a functional goal (Ambrosini et al., 2019). There are certain medical diagnoses that relate to deficits in executive functions. In this doctoral project, the focus will primarily be on the diagnosis of Attention Deficit and Hyperactivity Disorder or ADHD. Schwörer et al. (2020) report associated deficits in executive functions of children with ADHD. These deficits include difficulty in working memory, response inhibition, and cognitive flexibility. These problem areas could cause occupational dysfunction such as difficulty meeting academic demands in school, struggling in following a routine at home, and troubles when engaging in the community, among many other individual challenges.

Treatments and interventions currently available for children with ADHD include occupational therapy, and if prescribed by the physician, pharmacological treatment is also provided. However, these medications can have adverse side effects such as non-response, drowsiness, loss of appetite, and loss of sleep (Hoekstra et al., 2021). Providing occupational therapy intervention could decrease the reliance on medications and provide a safer treatment.

Another problem reported by Cramm et al. (2013) is a lack of intervention provided for school-aged children and youth with occupational performance issues that are associated with deficits in executive functions. Occupational therapists who move to increase awareness of executive functions in their practice face both systematic and

professional barriers such as difficulty navigating practice contexts, inflexible service mandates, and professional pressures that limit OT services to traditional roles including the development of gross motor, fine motor, and sensory impairments; and having only a few OT resources that support knowledge and skills in addressing executive function deficits in children (Cramm et al., 2013). The echoing problem is the lack of an intervention approach that guides OTs in addressing EF challenges in children with ADHD.

Through this project, the author plans to fill the service gap by providing an intervention approach that combines the use of cognitive training and physical activity, together with family intervention, to develop executive functions of school-aged children with ADHD. The integration of these three approaches can help reduce barriers and help build a systematic approach for occupational therapists who work with this population.

Consequences of the Problem

For children with ADHD, occupational performance at home and in school is affected because of deficits in executive functions which could, later on, affect other stages in life development including training, employment, and social life (Pascual et al., 2019). The lack of an intervention approach limits the potential of these children.

Therefore, the author of this project designed an intervention for children with difficulty in attention functions and hyperactivity with impaired executive functions. However, it does not aim to address symptoms related to other psychological or neurodevelopmental childhood disorders nor will it replace other medical and therapeutic interventions prescribed for children with ADHD. The population in this doctoral project will include

primary school-aged children, ages 6-9 years old. Adults and children not within the primary school age with difficulties in executive functions are not under the scope of this project.

Causes and Contributors in Executive Function Deficits

In designing the intervention program, the author considered the causes and contributors of EF deficits. The following are the key factors that could give rise to executive dysfunction for children with ADHD.

1. Lack of engagement in physical activity: Executive functions such as inhibitory control and working memory were positively linked with physical fitness (Veraska et al., 2021). Therefore, having limited opportunities for engagement in physical activity could affect the development of the child's executive functions.
2. Lack of cognitive stimulation in early childhood: Limited access to learning materials, parental involvement in learning, and language exposure has a direct effect on a child's executive functions (Rosen et al., 2020).
3. Relationship between sleep and ADHD: Chronic sleep deprivation in children with ADHD, in turn, could affect the cognitive functioning of children with ADHD (Scarpelli, et.al., 2019). Since executive functions are a higher cognitive function, having sleep deprivation directly affects executive functions which are necessary for optimal occupational performance. Once a sleep routine is incorporated in the family intervention, this could facilitate the development of executive functions, leading to optimal occupational performance.

4. Increased screen time: Children exposed to more screen time were significantly more likely to display difficulty in emotional regulation, task completion, among other skills (Twenge et al., 2018). Excessive media in early childhood may cause cognitive and behavioral problems in the child (Christakis et al., 2018). A large-scale study by Kerai et al. (2022), of early childhood participants showed the negative association of longer screentime with young children's developmental health in the physical, social, emotional, and cognitive domains. These could therefore make executive functions more difficult to acquire. Moreover, parents have reported difficulties in managing their children as they compete with the increased screen time (Twenge et al., 2018). They reported improvements with providing a clear schedule of when gadgets at home can be used (Twenge et al., 2018).

Proposition to Address this Problem

In this doctoral project, the author aimed to address the problem by developing an intervention program for primary school children with ADHD, ages 6-9 years old. The *Build Your EF* program intervention includes cognitive training, physical activity, and family education for the child. The following are the core elements of the proposed intervention:

1. Cognitive training: This can be an effective intervention for children and adolescents with ADHD and might be considered a complement of psychostimulant medication (Veloso et al., 2020). A clinician-delivered cognitive training intervention suggests that human delivery enhances motivation and

promotes social cognition and self-efficacy while strengthening weak cognitive skills associated with ADHD (Moore et al., 2019).

2. Physical activity: Particularly moderate-to-intense aerobic exercise is a beneficial and well-tolerated intervention for children and adolescents with ADHD. Physical activity have clinical benefits for individuals with ADHD (Ng et al., 2017). Many positive effects of yoga, Tai Chi, physical activity, and meditation may significantly improve symptoms of ADHD among children (Hembert et al., 2017).
3. Family education: The home environment has a prominent role in development of executive functions in early childhood (Rosen et al., 2020) This includes both clients and family members in the treatment process. Parent participation is important in the effectiveness of the intervention. The parental motivation was considered influential about both accessing and engaging with parenting programs and treatment effectiveness. This may be an area of particular importance for families of children with ADHD (Smith et al., 2014). In a program developed for parent education, children of those parents who improved after the educational program showed enhanced attentional control and executive functioning performance (Spruijt et al., 2020). A family systems perspective can help support the development of executive functions (Altenburger et al., 2021). In this intervention, parents will be educated about the associated causes of deficits in EF such as long hours of screen time, the importance of following a daily schedule

and managing the home environment, and problems that can arise from the lack of adequate sleep routine for children with ADHD.

CHAPTER TWO – Project Theoretical and Evidence Base

Theoretical and Evidence Base to Support the Proposed Project

This chapter is composed of two main sections. The first section describes the theoretical frameworks informing the development and purpose of the *Build Your EF* Program. The second section searches the literature about the factors contributing to the problem, as well as the problem itself.

Guiding Theoretical Frameworks

The three models or theories included in this doctoral project to address difficulty developing executive function skills for children with ADHD are the Iterative Reprocessing (IR) Model, Sensory Integration (SI) Theory, and Occupational Therapy for Children with ADHD: A delineation model of practice.

The IR model views the person's processing of information as a complex system. This information processing changes over time as more stimulus is received. With this, the interaction within the environment and the reflective functions of the person have a more dynamic and complex interaction. In addition, the IR model highlights that the person is capable of reflective processes that influence his actions. Here, the prefrontal cortex helps the person consciously reflect on the stimuli the brain receives. The preschool period is when the child develops reflective skills which are related to the growth of EF skills and theory of mind (Zelazo et al., 2015). Moreover, the IR model contributes to the body of knowledge regarding the nature of a person's interaction between automatic responses and reflective processes that he is capable of (Cunningham et al., 2007). Though similar stimuli may be presented, each person has a unique capacity

for reflecting on events of external stimulus. For the behavior change of a person, attention and behaviors are influenced by the child's ability to reflect on the information his neurological system receives. If a child is able to reflect, these reflective skills build on executive functions that improve the child's external behavior.

The Sensory Integration (SI) Theory was selected because of Ayres' schematic representation of the SI theory wherein the vestibular, proprioceptive, tactile, auditory, and visual systems contribute to learning (Bundy et al., 2019). These first-level senses are the foundations for learning, which eventually progress to the integration of their inputs, resulting in their end products, including the abilities to concentrate and organize, self-esteem, self-control, self-confidence, academic learning ability, capacity for abstract thought, and reasoning; and specialization of each side of the body and the brain. This model was selected since if the child has difficulty regulating sensory systems, he will be unable to progress and develop higher cognitive skills as seen in the learning pyramid (Vives-Villarraig et al., 2022). This inability to progress from the foundational skills to more complex learning skills leads to difficulty in developing executive functions.

The Occupational Therapy for Children with ADHD: a Delineation Model of Practice is based on the theoretical concepts relating to the child, the environment, and the task (Chu & Reynolds, 2007). Here, the importance of appropriate parent education is highlighted so that they can interact with and support the child in an appropriate manner, achieving better long-term outcomes. The application of the model is a multi-faceted intervention for children with ADHD (Chu & Reynolds, 2007). A family-centered care approach, involving education and training in environmental adaptation, task selection,

and child factors is directed to education and training for parents and teachers and eventually leads to successful participation in different occupations (Chu & Reynolds, 2007). This model was selected as the family's lack of awareness of the negative effects of increased screen time and poor sleep hygiene leads to an inability to address these issues.

Literature Review

To develop an understanding of the explanatory model of the problem, the following literature search questions were formulated: (1) Is there evidence that poor sleep hygiene affects the development of EF skills? (2) Is there evidence that increased screen time affects the development of EF skills? (3) Is there evidence that difficulty labeling perspectives affects the development of EF skills? (4) Is there evidence that difficulty with reflection and rule use affects the development of EF skills? (5) Is there evidence that difficulty with sensory processing affects the development of EF skills?

A literature search was performed for all questions using the databases of PubMed, CINAHL, and ScienceDirect. However, when limited or no articles were found, a direct search to the Boston University (BU) Library was made. Key words included the following: 1) executive functions, cognitive functions, cognitive control 2) ADHD 3) sleep 4) screentime 5) labeling 6) reflection 7) sensory integration, sensory processing 8) children, school-aged children, preschoolers. A preference was made for articles that were published within the last five years, but when there was a limited number of articles found, the publishing date was set to up to 10 years search.

Research Findings

Sleep and Executive Functions

The research shows that there are strong links between poor sleep and executive function (Holingue et al., 2021). Reduced total sleep time was associated with increased problems in executive functioning as reported by the parents on the Behavior Rating Inventory of Executive Function or BRIEF (Holingue et al., 2021; Moreau et al., 2013). Interestingly, sleep quantity, rather than sleep continuity, is a more important correlate of executive functioning in children with ADHD (Moreau et al., 2013). Moreover, in a behavioral sleep intervention, at six months, improvements in children's working memory and fewer days late for school were reported (Hiscock et al., 2015).

Screen Time and Executive Functions

For children ages 2-5 years old, excessive screen time could negatively affect emotional regulation skills and inhibitory control (Martins et al., 2020; Olfu et al., 2021). This could be due to excessive screen time leading to long-term changes in the reward circuitry of dopamine, a hormone related to the ability to pay attention, that resembles the effects of substance dependence (Martins et al., 2020). However, in a longitudinal study by McHarg et al. (2020), contrary to expectations, screen time was no longer associated with executive functions when children were 36 months of age. This may be because the child views more child-directed content when they are older as opposed to screen time in infancy and toddlerhood (McHarg et al., 2020).

Labeling and Executive Functions

Labeling allows the child to reflect and is useful for the development of executive

functions such as emotional regulation and cognitive flexibility (Low & Simpson, 2012; Kray et al., 2015). At four years of age, a child learns how to label to reflect on different perspectives so that thought becomes less rigid and more flexible (Low & Simpson, 2012). Moreover, a causal role for linguistic processes in proactive control, which maintains goal-relevant information, explains why language supports a variety of executive functions (Doebel et al., 2018). With this, labels, which help attract attention to task-relevant information, can be used to support longer-lasting change in executive functions (Doebel et al., 2018; Kray et al., 2015).

Reflection and Executive Functions

Reflection plays an important role in the development of executive functions (Blankenship et al., 2018; Espinet et al. 2013; Zelazo et al., 2018). For preschool children, anticipating events and reflecting on them builds EF skills (Blankenship et al., 2018; Espinet et al., 2013; Zelazo et al., 2018). Encouraging children to reflect on rule representations in the context of goal-directed problem-solving improves EF skills in a top-down manner, wherein inconsistencies in representations are more readily detected and resolved (Espinete et al. 2013; Zelazo et al., 2018).

Sensory Processing and Executive Functions

Difficulties with sensory processing negatively impact the development of executive functions in a broad range of children with different diagnoses and conditions such as ADHD, ASD, and preterm preschoolers (Adams et al., 2015; Faramarzi et al., 2016; Pastor-Cerezuela et al., 2020). Sensory integration training for children with ADHD includes activities for balance skills and spatial awareness, balancing activities,

tactile activities, atrial activities, activities to promote the sense of depth, activities to promote planning of movements, bilateral motor coordination, strengthening auditory and visual attention, strengthening auditory memory, strengthening visual memory, and eye-hand coordination (Faramarzi et al., 2016).

Proposed Explanatory Model of the Problem

The diagram on the next page illustrates the visual model of the problem. This model discusses possible causes of the difficulty in developing executive function skills for children with ADHD. Here, the family's lack of awareness of the importance of having a regular sleep routine and the lack of awareness of the effects of increased screen time leads to the family not addressing underlying difficulties in sleep routine and screen time, which translates to the child developing poor sleep routine and increased screen time that contribute to the problem. Furthermore, when the child has difficulty labeling his perspective in different situations which leads to difficulty reflecting on that perspective; and when the child has difficulty with reflection and repeated practice of this reflective skill that leads to the child having difficulty reflecting before responding, the difficulty in development of executive functions occurs. Finally, when the child has difficulty regulating his basic sensory systems, this causes the inability to progress and develop higher cognitive skills in the learning pyramid developed by Lázaro and Berruezo (Vives-Villarraig et al., 2022). This model proposes to view human development as a pyramid wherein the base includes processing of tactile, vestibular and proprioceptive systems while the top is adaptive development which includes higher cognitive processes such as executive functions (Vives-Villarraig et al., 2022).

EXPLANATORY VISUAL MODEL OF THE PROBLEM

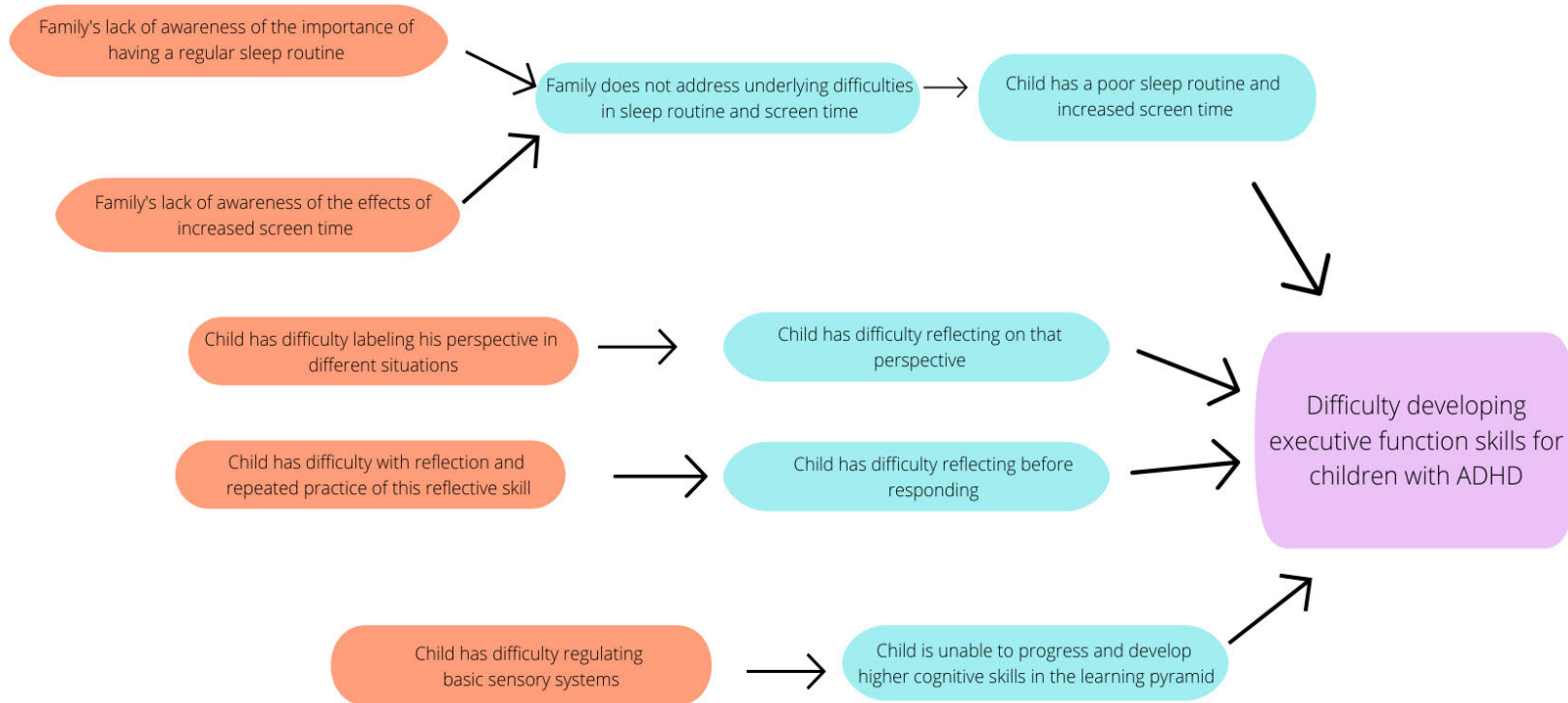


Figure 2.1

Explanatory Model of the Identified Problem

Summary

Deficits in executive functions lead to difficulties in occupational performance across all occupations (Adams et al., 2015; Blankenship et al., 2018; Cramm et al., 2013; Doebel et al., 2018; Espinet et al., 2013; Faramarzi et al., 2016; Holingue et al., 2021; Low & Simpson, 2012; Martins et al., 2020; Olfu et al., 2021; Pastor-Cerezuela et al., 2020; Zelazo et al., 2018). To understand the underlying causes of difficulty developing executive functions for children with ADHD, contributing factors were investigated. These factors include increased screen time, lack of sleep, difficulty labeling perspectives, difficulty with reflection, and difficulty modulating the sensory needs of children with ADHD.

Conclusion

This chapter dissected the causes of the problem to be able to create a program (described in Module 4) that targets the underlying factors affecting the child with executive dysfunction. The guiding theoretical frameworks, literature review, and research findings were discussed. The following chapter takes into consideration each factor that contributes to the problem and summarizes evidence about what program features or approaches are effective.

CHAPTER THREE – Overview of Current Approaches and Methods

This chapter attempts to address the problem in executive dysfunction by summarizing the evidence of the program features or approaches that were effective for developing EF skills of children with ADHD. Five main questions regarding sleep, screen time, labelling perspectives, reflection and rule use, and modulating sensory needs were developed to guide the literature search.

Evidence Summary

The five main questions that guided the literature search for evidence on interventions that develop executive functions of children diagnosed with ADHD include: (1) What interventions exist for improving sleep for children with ADHD and what is the evidence of their effectiveness? (2) What interventions exist for addressing excessive screen time for children with ADHD and what is their effectiveness? (3) What interventions are available for labeling perspectives and what are the effects of the said interventions in relation to executive functions? (4) What interventions are available for reflection and rule use and what are the effects of the said interventions in relation to executive functions? (5) What interventions are available for modulating sensory needs of children with ADHD and what are the effects in relation to executive functions?

Sleep Interventions and Executive Functions

To explore existing interventions for improving sleep for children in relation to executive functions for children with ADHD, the following search words were used: Sleep, executive function*, cognitive function*, ADHD. The databases used include the following: CINAHL, PubMed, and Science Direct. Searches were limited to the past 5

years. However, when searches were limited, this was adjusted to the past 10 years.

Databases were first searched. However, when none was found, the BU library was used to gather more articles.

According to Zhu and colleagues (2022), technology-based interventions such as using web-based platforms, smartphone apps, Facebook, emails, phone calls, and text messages can be used to improve sleep in children instead of providing face-to-face interventions. These interventions do not imply additional costs to the parents or to the health system since they basically consist of recommendations that can be placed in writing in brochures and newsletters (Halal & Nunes, 2014). Another intervention that showed positive results in increasing the sleep of children that includes using sleep diaries to assess 24-hour sleep duration (Fangupo et al., 2021). Other effective methods that can be used to improve sleep include extinction, gradual extinction, minimal checking with systematic extinction, positive routines, programmed awakening, and sleep remodeling (Halal & Nunes, 2014).

These technology-based interventions can be used for this doctoral project since it is cost-efficient and convenient. Sleep diaries are also feasible for parents to be able to track the number of hours the children sleep throughout the day.

Interventions Addressing Excessive Screentime and Executive Functions

To explore existing interventions for addressing excessive screentime in relation to executive functions for children with ADHD, the following search words were used: Screentime, gadgets, TV, tablet, executive function*, cognitive function*, ADHD, Attention Deficit and Hyperactivity Disorder. The databases used include the following:

CINAHL, PubMed, and Science Direct. Searches were limited to the past 5 years. The articles found discussed limiting screentime, acquiring healthy habits, and addressing the sedentary lifestyle of children. However, this doctoral project will only focus on the screentime component of the interventions.

“Movie Models” is an intervention that provides parenting videos on decreasing children’s screentime that was proven to be effective, low cost, and easily distributed (De Lepeleere et al., 2017). Videos with significant effects include the following: following through with rules concerning TV-time, giving an explanation concerning TV, giving an explanation concerning gaming, parental self-efficacy concerning having children ask for permission to play games, limiting parents’ own gaming (modeling), self-efficacy for limiting parents’ own gaming, rules concerning TV time, rules concerning gaming, limiting parents’ own TV time, and monitoring gaming (De Lepeleere et al., 2017). This is supported by Pearson et al. (2020) as they reported that changes in self-efficacy for reducing TV viewing and computer use are likely to require clear parental input through modeling of appropriate screentime and personal encouragement for alternative behaviors. Furthermore, according to Jones et al. (2021), highly tailored behavioral strategies may benefit individuals while social support and role modeling may be used for larger populations.

Though addressing excessive screen time to develop executive functions in children is particularly effective for children ages 2-5 years old, the population of this doctoral project, who are school-aged children, may still benefit from this as excessive screentime still affects the child’s ability to pay attention (Martins et al., 2020).

Labelling Perspectives Interventions and Executive Functions

To explore existing interventions for labeling perspectives in relation to executive functions for children with ADHD, the following search words were used: labeling, labels*, naming, names*, executive function*, cognitive function*, ADHD, Attention Deficit and Hyperactivity Disorder. The databases used include the following: CINAHL, PubMed, and Science Direct. The BU library was also used for a more generalized search. Searches were limited to the past 5 years. This was extended to the past 10 years when limited articles were gathered.

According to Lowery et al. (2022), associating visual features with labels changes dimensional attention, a mechanism of executive function, by influencing object representations and guiding goal-directed behavior. Moreover, according to Low and Simpson (2012), labeling leads to reflection of a child at about 4 years old so that the child's thought becomes more flexible. In a study by Doebel and Zelazo (2013), children performed better in tasks that included labels in the stimulus to cue children to attend to stimuli. In the interventions provided, children performed better when the experimenter included labels in the stimulus; labels cue children to attend to stimuli that are relevant to the sorting rules; relevant labels were used instead of opposite labels or both (Doebel & Zelazo, 2013).

This is useful for the intervention of this doctoral project as labeling develops reflection skills of a child, which is important for developing executive functions. This can be done by adding select visual cues such as pictures, words, objects, and a combination of words or pictures throughout the intervention.

Reflection Interventions and Executive Functions

To explore existing interventions for reflection in relation to executive functions for children with ADHD, the following search words were used: reflection, reflective skills, meditation, meditate, mindfulness, executive function*, cognitive function*, ADHD, Attention Deficit and Hyperactivity Disorder. The databases used include the following: CINAHL, PubMed, and Science Direct. When only a limited number of articles were gathered, the BU library was used to gather more articles. Searches were first limited to the past 5 years. This was extended to the past 10 years when limited articles were gathered.

According to Espinet et al. (2013), a single brief, 15-minute session of reflection training led to substantial improvements in Dimensional Change Card Sort performance. Effective strategies that were used for inducing flexible, adaptive behavior, as well as transfer, include encouraging children to reflect on their rule representations, rather than simply telling them when behavior is incorrect or inappropriate (Espinete et al., 2013). Moreover, together with reflection interventions, mindfulness-based interventions for preschoolers that are enjoyable promote early development of EF skills can also be used (Wood et al., 2018). Mindfulness could be used to reduce stress and increase sustained attention while reflection could be used to increase meta-cognition and verbal self-regulation in the context of goal-directed problem-solving (Zelazo et al., 2018). Finally, mindfulness activities improve EF skills by helping the children focus attention and inhibit information, depending on the situation (Milaré et al., 2021).

This intervention component would work well for the doctoral project since there

is direct evidence that reflection and mindfulness strategies develop executive functions. Moreover, it is also enjoyable for the children who participated in the programs. Having the participants have fun and appreciate the value of the tasks in the intervention helps in its effectiveness.

Sensory Processing Interventions and Executive Functions

To explore existing interventions modulating sensory needs in relation to executive functions for children with ADHD, the following search words were used: sensory integration, sensory systems, movement activities, physical activities, physical exercise, exercise, executive function*, cognitive function*, ADHD, Attention Deficit and Hyperactivity Disorder. The databases used include the following: CINAHL, PubMed, and Science Direct. Searches were limited to the past 5 years. This was extended to the past 10 years when limited articles were gathered.

According to Ziereis and Jansen (2015), a 12-week physical activity intervention program has positive effects on the executive functions of children with ADHD, regardless of what type of physical activity. To further support this, Álvarez-Bueno et al. (2017) report that physical activity interventions are useful strategies to foster the development of children's cognition, including core executive functions and higher-level executive functions; curricular exercise and programs that increased time of physical activity are more likely to have effect on executive functions. On the other hand, a study by Nejati (2021) shows evidence that a Balance-based Attentive Rehabilitation of Attention Networks (BARAN) improves working memory, cognitive flexibility, and inhibitory control. Overall, physical activity has a positive effect on executive functions

(Álvarez-Bueno et al., 2017; Nejati, 2021; Ziereis & Jansen, 2015).

This intervention component could fit into this doctoral project as physical activity targets the basic sensory systems including the vestibular, proprioceptive, and tactile senses that are important to address to be able to develop higher goals including higher-level cognitive skills, which include executive functions.

Conclusion

This chapter explored interventions that were found effective for developing executive functions. These are essential to be able to create a novel program, as described in Module 4, to innovate practices in EF development. The following chapter draws conclusions from the evidence to create a program, and identify how existing literature contributes to its design, ensuring feasibility, relevance, and scientific soundness.

CHAPTER FOUR – Description of the Proposed Program

Program Description

Build Your EF program promotes occupational engagement by encouraging children with attention deficit hyperactivity disorder (ADHD) and their families to engage in activities that include family education, cognitive training, and increased physical activity, which lead to increased participation and satisfaction in meaningful occupations. The author's proposed program is a 24-week intervention that has the following objectives: (1) children diagnosed with ADHD will be able to report increased performance and satisfaction in occupations at home and in school, (2) children diagnosed with ADHD will attain increased performance in standardized assessments that measure EF skills, and (3) parents of children diagnosed with ADHD will be able to report improvements in daily occupations of their children who participated in the *Build Your EF* program.

The Problem the Program Aims to Address

ADHD is regarded as a neurodevelopmental disorder associated with deficits in executive functions (Schwörer et al., 2020). These executive function (EF) deficits directly affect a child's occupational performance and future learning outcomes. Despite this, there is still a lack of intervention to address deficits in executive functions for school-aged children and youth with occupational dysfunction (Cramm et al., 2013). To address this problem, the author developed a program that combines cognitive training, physical activity, and family education as discussed in the explanatory model below.

Explanatory Model and Overview of the Program

An explanatory model is a visual representation that illustrates how the author's proposed program will work. As seen in Figure 4.1, children diagnosed with ADHD with executive dysfunction will either receive intervention in *Build Your EF* in an individual room in private therapy centers or if unable to attend face-to-face sessions due to difficult circumstances, they can receive intervention using telehealth services via Zoom. The (1) Iterative Reprocessing Model, (2) Sensory Integration Theory, and (3) OT Delineation Model for Children with ADHD guide the program interventions and activities including (a) cognitive training that uses worksheets and games for inhibitory control, working memory, cognitive flexibility, planning and prioritizing, organization, and emotional regulation; (b) physical activity that includes activities for balance skills and spatial awareness, balancing activities, tactile activities, atrial activities, activities to promote the sense of depth, activities to promote planning of movements, bilateral motor coordination, strengthening auditory memory, strengthening visual memory, and eye-hand coordination; and (c) family education that focuses on parent discussion on how to carry over home instructions and the importance of a consistent sleep routine and reduced screen time.

To measure the success of the program, program outputs will be monitored including the number of participants, the number of therapists who study and train to conduct the program, the number of participants completing the surveyed questionnaire, and the net income received. After the program is implemented, outcomes will be assessed. Short-term outcomes immediately post-program include participants'

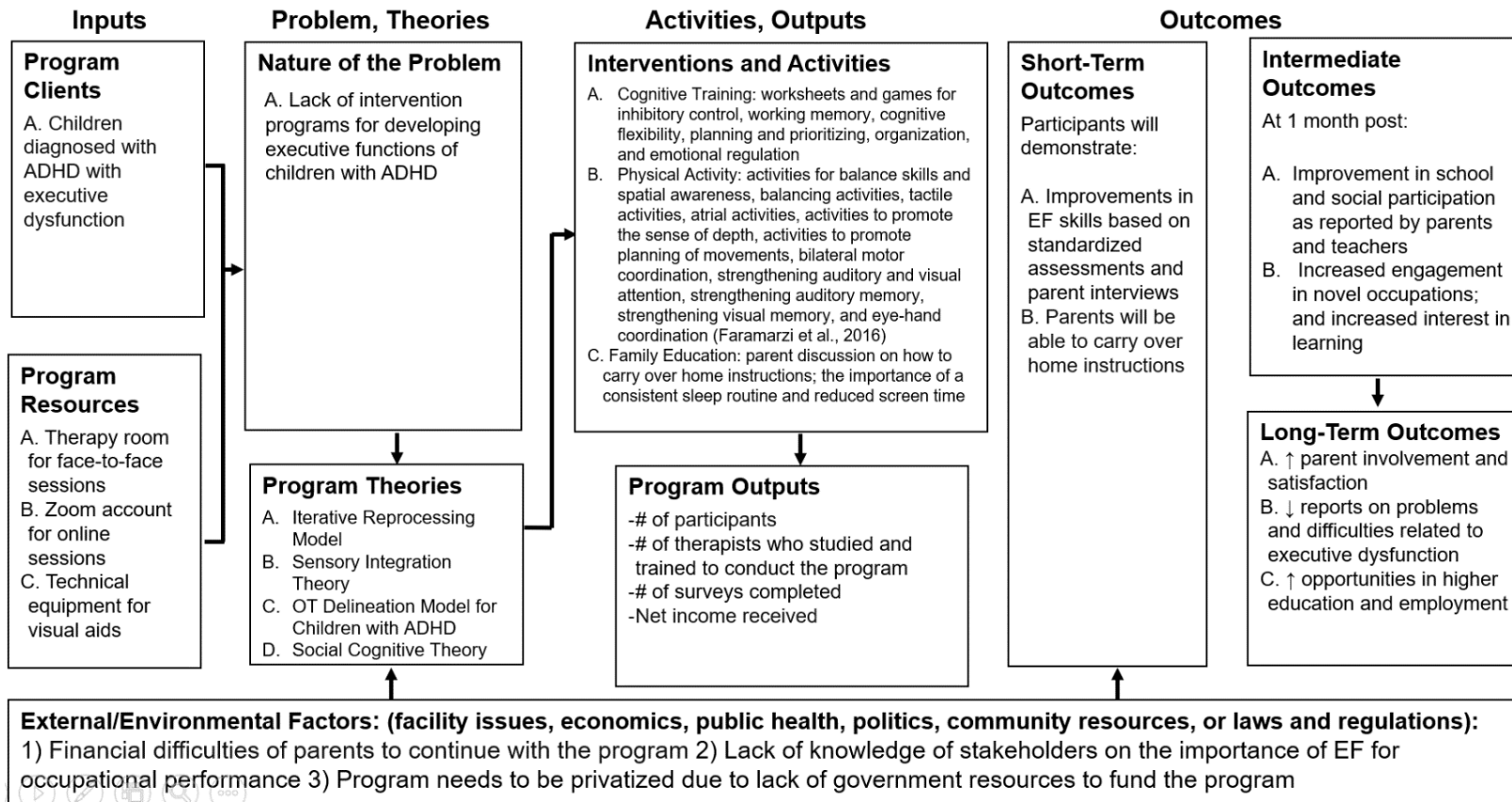
improvements in EF skills based on standardized assessments and parent interviews, and parents' ability to carry over home instructions. Intermediate outcomes one month after the program include improvement in school and social participation as reported by parents and teachers, increased engagement in novel occupations, and increased interest in learning. Long-term outcomes six months after the program include increased parent involvement and satisfaction, decreased reports on problems and difficulties related to executive dysfunction, and increased opportunities in higher education and employment. All these interventions and targeted outcomes can be influenced by external or environmental factors including financial difficulties of parents to pay for program continuation, lack of knowledge of stakeholders on the importance of EF for occupational performance, and the privatization of the program due to lack of government resources to fund the program.

Stakeholders of the Program

The primary stakeholders of *Build Your EF* are children with ADHD with executive dysfunction and their families. They will directly benefit from the program: as EF skills improve, occupational participation and satisfaction may improve as well. Additional stakeholders include the occupational therapists who will run the program, management and administration of private clinics and schools, developmental pediatricians, other allied health professionals, and teachers. Occupational therapists can benefit from the program as they gain additional knowledge and skills in conducting an intervention that focuses on executive functions. Meanwhile, management and administration of private clinics and schools can benefit as this program brings more

Figure 4.1

Build Your EF: A program designed to develop executive functions using cognitive training, physical activity, and family education for children diagnosed with ADHD



income to their business. Moreover, it is an additional service that they can offer. Developmental pediatricians and other allied health professionals can benefit from this as they can refer their clients who they think need an intervention to develop executive functions. Finally, teachers can also use this program to assist them with their students who are having difficulties in the classroom due to poor EF skills.

Full Program Description

This program aims to develop the executive functions of school-aged children diagnosed with ADHD. A manual will be provided for occupational therapists who aim to learn and conduct the program. The manual provided in Appendix A will ensure the fidelity of the treatment program.

Program Participants

Program participants include children diagnosed with ADHD who experience difficulties in occupations because of executive dysfunction. This population has a prevalence of 2.4 million (9.6%) school-aged children aged 6-11 years. ADHD is one of the most common neurodevelopmental disorders of childhood; most experience EF dysfunction as part of their diagnosis. Moreover, according to Scahill and Schwab-Stone (2000), the best estimate of prevalence is 5% to 10% in school-aged children. Those at risk for missing opportunities and experiencing occupational injustice and constraint include all children diagnosed with ADHD. No specific data was gathered regarding how many children with ADHD experience these issues. However, it can be inferred from the data gathered that a high prevalence of school-aged children with ADHD experience these injustices which is a significant public concern.

In order to start the program, participants will first be gathered through referrals from developmental pediatricians, school teachers, therapists, and other professionals who are looking for an intervention to address the problems and difficulties of school-aged children diagnosed with ADHD. Once referred to occupational therapy, these potential participants will undergo a formal assessment including standardized tests and interviews to determine whether they can benefit from the program.

Roles of Personnel

As more children undergo the program, the demand for trained therapists who can implement the program will increase. With this, the author will have to conduct seminars and workshops to train these therapists. At the end of these seminars and workshops, trained therapists will receive a certificate that signifies that they have learned all the steps and rationales behind the interventions provided in the program to ensure fidelity of the treatment.

Trained occupational therapists will conduct the assessment of the participants from baseline, provide the intervention, and conduct another assessment at the end of the intervention. The same therapist will conduct a formative and summative evaluation of the intervention process. Meanwhile, administrative staff will market the program, identify children who can benefit from the program, and take care of budgeting and collection of fees.

Theories and Frameworks to Guide the Program

The models and theories being utilized in the development of this initiative include the Iterative Reprocessing (IR) Model, the Sensory Integration (SI) Theory, and

the Occupational Therapy for Children with ADHD: a Delineation Model of Practice. The Iterative Reprocessing (IR) model allows for a dynamic, complex interaction within the environment and the automatic and reflective functions of a person. This model highlights that the person is capable of reflective processes that influence his actions (Cunningham et al., 2007). The IR model supports the cognitive training component of the intervention program which involves labeling and reflection of the child. Next, the Sensory Integration (SI) theory views the person in Ayres' schematic representation wherein the vestibular, proprioceptive, tactile, auditory, and visual systems contribute to learning (Bundy, et al., 2019). These first-level senses are the foundations for learning and providing an environment that will enhance and develop the basic sensory systems is important to enabling the child to progress in higher cognitive skills, including executive functions (Bundy, et al., 2019). This SI theory supports the physical activity component of the intervention program. The third model used is the Occupational Therapy for Children with ADHD: a Delineation Model of Practice. This model targets the dynamic interplay of factors relating to the child, the environment, and the task (Chu & Reynolds, 2007). Here, the importance of appropriate parent education is highlighted so interaction and child support can bring about better long-term outcomes. This model supports the family education component of the intervention.

Interventions and Activities of the Program

Through the use of the theories provided above, interventions and activities develop EF skills in children diagnosed with ADHD. This program can be delivered individually in a face-to-face setting in a private therapy center. For those participants

who have difficulty accessing transportation to reach the private therapy center, this program can also be conducted online via Zoom, with the presence of a caregiver throughout the session. Before conducting the program, the author will meet with the administrative staff of the private therapy center and the other therapists who plan to conduct the program to ensure the fidelity and quality implementation of the program. Supportive materials for caregiver education will be sent online via email. These materials will include handouts on the importance of establishing a sleep routine and decreasing screen time; and a manual for the set activities that will be provided on a weekly basis.

For the first week of the program, the child's executive functions will be addressed through the use of questionnaires and standardized assessments. These assessments include:

- To assess inhibitory control including attentional inhibition and response inhibition, the Stroop task, the Modified Flanker task, and the Go-No Go task will be used. For the Stroop task, the child will be asked to scan word colors from left to right, rather than reading it. Meanwhile for the Modified Flanker task, the child will be asked to attend to the centrally presented stimulus and ignore the flanking stimuli surrounding it. He will be asked to read the letter positioned in the middle of a row of letters (A and B). If the letter in the middle is A, he will be asked to raise his right hand; if the letter in the middle is B, he will be asked to raise his left hand.

For the Go-No Go task, the child will be asked to clap his hand when he sees the green light and not do anything when he sees the red light.

- To assess working memory, the backward-digit span task, repeating items back reordered by characteristics task, and the Corsi block test will be used. For the Backward-digit span task, the child will be given 5 single-digit numbers to remember and then say backward. After, he will be given 5 double-digit numbers to remember and say backward. For the tasks wherein child has to repeat items back reordered by characteristics, the child will be asked to remember and reorder animals according to size, from largest to smallest, and vice versa. For the Corsi block test, a set of blocks with numbers will be placed in front of the child. He will then be asked to remember the blocks that were tapped by the therapist. Then, he was asked to arrange the numbers either from greatest to least or from least to greatest.
- To assess cognitive flexibility, Design Fluency and Wisconsin Card Sorting tasks will be used. For Design Fluency, the child will be asked to give three uses for a paper, a tin can, and a cord or string. For the Wisconsin Card Sorting task, the child will be asked to shift from sorting cards according to number, color, size, and shape.
- To assess planning skills, the child will be asked how to get from his classroom to the bathroom in school, and how to get from his bedroom to the kitchen at home.

- To assess problem-solving skills, the child will be asked to solve the following problems: a.) What will you do when you are lost? b.) What will you do if you forgot your pencil at home and you have an exam? c.) What will you do if you forgot your assignment notebook in school and you are already at home when you realize it?
- To assess other executive functions such as organization skills, time management, goal-directed persistence, task initiation, and emotional regulation, an interview with the parents and skilled clinical observation will be utilized.

For the second week, family education on screentime and sleep routine will be conducted through a talk on the importance and techniques to reduce screentime and develop a good sleep routine for school-aged children diagnosed with ADHD. During the talk, PowerPoints, infographics, and fact sheets will be presented.

For weeks 3–21, the session flow will include 30-minute cognitive training, 20-minute physical activity, and a 10-minute feedback to the family. For weeks 3–5, activities that target inhibitory control such as Stop Dance, Simon Says, Red Light-Green Light, Sit and wait for instructions, and following instruction worksheets will be conducted. For weeks 6-8, activities that target cognitive flexibility such as word games, and games that switch up rules will be conducted. For weeks 9-12, activities that target working memory such as visualization games, shadow games, memory games and sequencing stories will be conducted. For weeks 13-15, activities that target planning and prioritization such as calendar and schedule making, drawing plans, and a mind map will

be conducted. For weeks 16-18, activities that target organization such as school work folder system, picture symbols to organize an environment, checklist making, set your things, and monthly clean-up will be conducted. For weeks 19-21, activities that target emotional regulation such as behavior bingo, emotions scavenger hunt checklist, and discussion of appropriate and inappropriate behaviors will be conducted. Next, after all executive functions have been individually targeted, weeks 22-23 will be an integration of all executive functions skills learned. This will include activities such as games with rules, and discussion and processing of what was learned. Finally, for the last week, week 24, the child's executive functions will be reassessed through the use of questionnaires, standardized tests, and an interview with the parents.

Program Outputs and Outcomes

To measure successful outputs, the number of participants, the number of therapists who will study and train to conduct the program, the number of surveys completed, and the net income received will be calculated. Meanwhile, for the program outcomes, this includes short-term, intermediate, and long-term outcomes. For the short-term outcomes, participants will be able to demonstrate improvements in executive function skills based on standardized assessments and parent interviews, and parents will be able to carry over home instructions. For intermediate outcomes, 1 month after the program was conducted, improvement in school and social participation as reported by parents and teachers, increased engagement in novel occupations; and increased interest in learning are expected. For the long-term outcomes, this includes an increase in parent involvement and satisfaction, a decrease in reports on problems and difficulties related to

executive dysfunction, and increased opportunities in higher education and employment.

Resources Critical to the Success of Implementing the Program

Time frame, budget, personnel, and marketing are requisite resources important to ensure the success of the program. For the time frame, this helps organize the events and makes it easy to determine when and what motion or event occurred. For this project, a time frame of 24 weeks with 1-hour sessions per week will be provided. Meanwhile, the budget ensures the author that the money spent is not more than the money earned. This allows the author to plan short- and long-term expenses. For this project, fees will be collected at the initial evaluation, the first half of the intervention program, and the latter half of the intervention program. For the personnel, this includes those who will help run the initiative such as the occupational therapists and administrative staff. Personnel help create and maintain a good relationship and harmonious environment among the children and their families, colleagues, and potential stakeholders. Finally, for marketing, this will include reaching out to other professionals for referrals, advertising the program on social media, and making posters, brochures, and flyers to make the program known to the general population.

Critical Review

Strengths and Limitations of the Program's Evidence Base

This program has a number of strengths including the following: interventions used for cognitive training (Doebel & Zelazo, 2013; Espinet, Anderson & Zelazo, 2013; Low & Simpson, 2012; Lowery, Nikam & Buss, 2022; Zelazo, Forston, Masten, & Carlson, 2018); interventions used for physical activity (Álvarez-Bueno, Caver-

Redondo, Martínez-Hortelano, Martínez-Vizcaíno, Pesce & Sánchez-López, 2017; Nejati, 2021; Ziereis & Jansen, 2015). These interventions are proven to be effective in developing EF skills. Moreover, parent education on reducing screen time (Armstrong et al., 2021; Biddle et al., 2020) and developing a good sleep routine (Camp et al., 2021; Halal & Nunes, 2014;) also had supporting evidence on developing EF skills of school-aged children.

Strengths and Limitations of the Program's Theoretical Grounding

This program's strength in theoretical grounding is that each component of the intervention program is based on either a theory, model, or framework. This helps give a rationale and support for the design of each component. Moreover, this initiative combined a number of theories, models, and frameworks, taking in the relevant assumptions to formulate evidence-based interventions. However, despite these strengths, there are still a few weaknesses including the Iterative Reprocessing Model's lack of evidence of transfer of skill in the natural environment, and the oversimplification of the OT Delineation Model of Practice for Children with ADHD to provide a solution to a problem with multiple layers (Chu & Reynolds, 2007; Cunningham et al., 2013).

Potential Barriers and Challenges to Implementation of the Initiative

There are a few limitations that must be considered including limitations on time components and budget to sustain the program. In a 24-week program, possible inconsistent attendance or absences of the children due to unforeseen circumstances such as illness or emergencies may affect the development of skills and improvements of the child. In a 24-week program, it may be difficult to predict these absences. Moreover,

since this program will run in a private therapy center, failure to pay for the service will equate to termination of the program implementation. Another challenge could be training the OTs to implement the program consistently to ensure the fidelity of the intervention. Due to changing conditions and different environmental settings, OTs may improvise or modify the program. Implementing follow-up of home instructions can also be challenging, as this will require time, dedication, and effort on the side of the families to incorporate techniques learned in therapy in the home environment. Finally, the long-term effects of the interventions still need further research.

Conclusion

The *Build Your EF* occupational therapy program aims to develop the executive functions of school-aged children diagnosed with ADHD through the use of physical activity, cognitive training, and family education. This multifaceted approach comprehensively addresses the need to develop EF skills in children with ADHD to be able to improve participation and satisfaction in occupations. Here, a set of interventions and activities are completed in 24 weeks to give the children enough time to develop targeted skills and transfer learning to their natural environments. With the active participation of the family and consistent attendance to therapy, this program aims to reach the maximum potential of each child.

CHAPTER FIVE – Program Evaluation Research Plan

Introduction to the Program

Build Your EF is an occupational therapy intervention program that consists of cognitive training, physical activity, and family education for children with ADHD. This program aims to develop executive functions in children with ADHD by increasing occupational participation and life satisfaction. This intervention can be delivered in person or virtually via Zoom platform. For the physical activity component, this could be done in a group session; while for the cognitive training and family education components, schedules will be coordinated to have one-on-one training with the child and feedback for home instructions for the family.

The stakeholder for this program is any individual or group that has an interest in the proposed change and can influence or impact the sources of that change. For this program, change refers to the development of EF skills in children with ADHD. Primary stakeholders include children with ADHD with executive dysfunction and their families. Additional stakeholders include the occupational therapists who will run the program, the management and administration of private clinics and hospitals, developmental pediatricians, other allied health professionals, and teachers.

Vision for the Program

The short-term goals of this program include participants demonstrating improvements in EF skills based on standardized assessments and parent interviews, increased satisfaction of parents in the program in a surveyed questionnaire, and the ability of the parents to carry over home instructions. Deficits in executive functions lead

to difficulties in occupational performance across all occupations (Adams et al., 2015; Blankenship et al., 2018; Cramm et al., 2013; Doebel et al., 2018; Espinet et al., 2013; Faramarzi et al., 2016; Holingue et al., 2021; Low & Simpson, 2012; Martins et al., 2020; Olfu et al., 2021; Pastor-Cerezuela et al., 2020; Zelazo et al., 2018). Therefore, to understand the problem of difficulty developing executive functions for children with ADHD, contributing factors are investigated. These include increased screen time, lack of sleep, difficulty labeling perspectives, difficulty with reflection, and difficulty modulating sensory needs of children with ADHD. The components of the program aim to address these contributing factors. Figure 5.1 describes a case scenario that utilizes the program.

For long-term goals of the program, aside from using and developing strategies to develop executive functions and facilitating performance in occupations, this program will include filling the gap in the OT practice by providing an executive lens that focus on addressing problems related to EF deficits. This aims to increase parent involvement and satisfaction, decrease reports on problems and difficulties related to executive dysfunction, and increase opportunities in higher education and employment of children with ADHD when they reach adulthood.

Figure 5.1

Case Scenario for Build Your EF

Aidan is a 7-year-old boy, diagnosed with ADHD when he was 5 years old. He is currently living with his mother, who complained that he often forgets instructions, needs constant reminders to do his homework and other chores, and often has outbursts when he is feeling disappointed. Moreover, his mother reported that he is behind in

school compared to his peers but he still makes a lot of friends because of his animated personality. Aidan has been receiving OT intervention since he was first diagnosed. However, as he is now in 1st grade, there are increased demands in school and he has difficulty keeping up. Upon returning to the developmental pediatrician for consult, the developmental pediatrician recommended Aidan to join an OT program, focusing on development of EF skills. The doctor had several children referred to the author of the program and was aware of her new program, focusing on executive functions. She then made a referral. Aidan was seen for 12 sessions and learned strategies through the use of cognitive training and physical activity. His mother was also involved in providing the carryover of home instructions. After program completion, mother reported increased independence in home and school tasks; and teachers observed improvements in behavior and academic outputs in school since he started the program.

Program Stakeholders

The primary stakeholders of *Build Your EF* include children with ADHD with executive dysfunction and their families. Additional stakeholders include the occupational therapists who will run the program, management and administration of private clinics and hospitals, developmental pediatricians, other allied health professionals, and teachers.

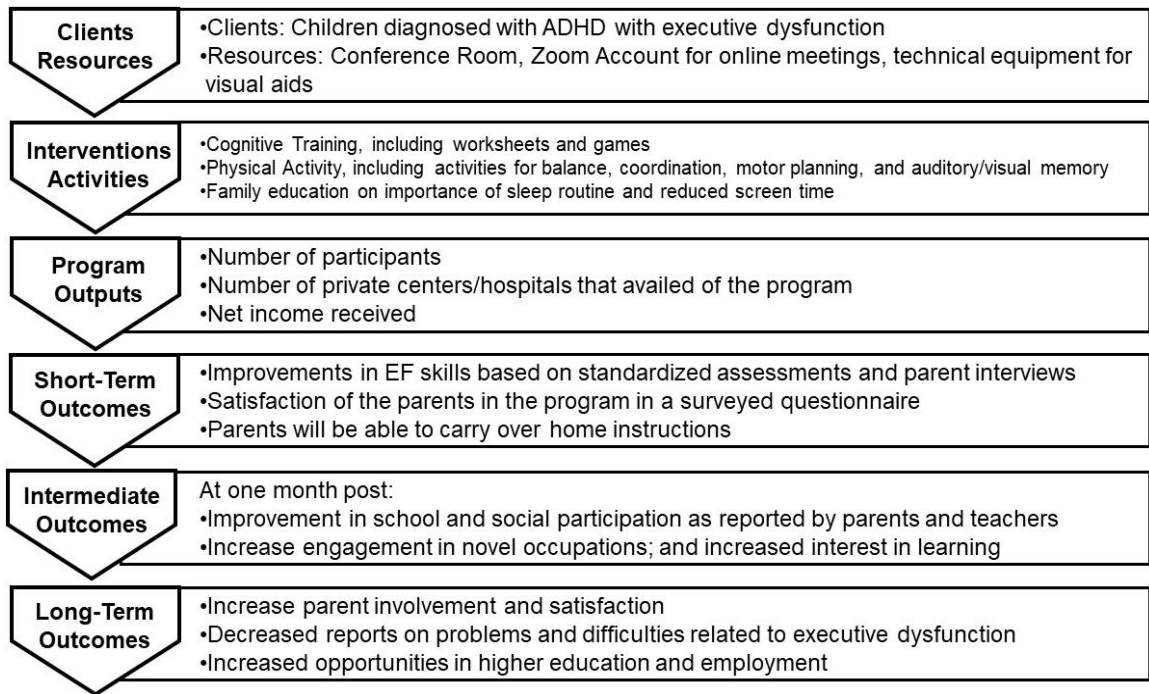
Simplified Logic Model for Use with Stakeholders

Below is a simplified model that can be presented to the stakeholders. This will facilitate their understanding and potential impact of the program. Moreover, this model

includes client resources, interventions and activities, program outputs, short-term, immediate, and long-term outcomes.

Figure 5.2

Simplified Logic Model for the Build Your EF Program’s Stakeholders



Engagement of Stakeholders in the Program Evaluation Research

Stakeholder’s interests and needs will be evaluated and taken into consideration throughout the program and program evaluation research. The key stakeholders in the program make the program available and sustainable. To make the program available, this will include occupational therapists, management, and administration of private clinics and hospitals. Occupational therapists will be conducting the program; the management and administration will work on the scheduling and patient load. Meanwhile, to keep the program running, having a number of clients that will avail of it

will make the program sustainable. To make this happen, the program must be important to participants and relevant to referral sources such as developmental pediatricians, other allied medical practitioners, and teachers. The author of the program will connect with doctors and other professionals to introduce my program. Talks will also be given in institutions to attract potential stakeholders.

In order to evaluate the program, the program evaluation research plan will be submitted to the Internal Review Board (IRB) for their approval of the formative and summative evaluation plans that will be implemented to determine the effectiveness of the program. Formative and summative evaluations of the program will be conducted to gain parents' perception and satisfaction with the program in terms of improvements in their children's executive functions, higher scores for EF development, and overall performance across all occupations. Summative evaluation will take place before and after the program through the use of checklists, standardized assessments, and interviews while formative evaluation will take place throughout the program through the use of formal and informal conversations.

Table 5.1*Matrix for Organizing Stakeholder Involvement*

Stakeholder or Stakeholder Group	Type of Involvement (Planning, Implementing, Reflecting)	Possible Role(s)	Specific Interests
Researcher	Planning, Implementing, Reflecting	Overseeing and coordinating logistics of program implementation and evaluation	Successful implementation, usable data.
Primary intended users: children and their families	Reflecting, Feedback	Participating in program activities; answering evaluation tools and standardized assessments	Increased performance and satisfaction
Persons actively involved in program delivery: occupational therapists,	Implementing, Reflecting, Feedback	Administering program activities and data collection	Successful implementation, increased performance of the participants, satisfaction
Management, and administration of clinics and hospitals	Implementing, Reflecting, Feedback	Consultation on program evaluation methodology, analysis, logistics	Design rigor and robust outcomes
Developmental pediatricians, allied medical practitioners, teachers	Reflecting, Feedback, Recruitment	Referring services, consulting on the program	Research quality stands up to scrutiny
Funding agencies, advocacy organizations, including AOTA, PAOT, and other policymakers	Reflecting, Feedback, Recruitment	Consultation on possible dissemination of program evaluation results; referrals to program.	Research quality stands up to scrutiny and can be used to inform policymaking

Eliciting Stakeholder Involvement and Ensuring that Evaluation Results will be Used

For the success of the program, the author will arrange meetings that will take place prior to the program launch and continue through program implementation, evaluation, and dissemination of program evaluation results. To arrange these meetings, email invitations will be sent on a set date. Confirmation of attendance will be asked 10 days before the meeting. If stakeholders do not reply to the email within 10 days, a phone call will be made to their office to verify their attendance at the set date. Upon confirmation, meetings will be set per group. Quarterly meetings will be for occupational therapists and the administration and management staff of the private clinics and hospitals to review the program and program evaluation progress. A separate meeting will be set for doctors, other medical professionals, and teachers to be able to disseminate information about the program and potentially recruit participants through their referrals. Finally, another separate meeting will be for the parents of the potential participants of this program to explain the program process. If stakeholders wish to meet individually, a set time will be arranged to conduct this meeting.

Before the meeting, background information on the program will be provided including information on what the program consists of including cognitive training, physical activity, and family education. Moreover, the logic model and handouts on the program flow will be given to the stakeholders before the meeting to enable the stakeholders to so they can prepare any questions or raise concerns they have in mind.

During the meetings, the *Build Your EF Program* structure will be presented

which includes 30 minutes of cognitive training and family education, and 20 minutes of physical activity on a weekly basis. The structure of the evaluation research will be presented as follows: for cognitive training, worksheets and cognitive exercises will be presented in the meeting; for physical activity, sensory integration activities will be provided; for family education, emphasis on parent participation in the carryover of home instructions from the intervention program will be made (Smith et al., 2014). The presentation will also contain research-based information that shows both the short-term and the long-term impact of executive function training on the child. Here, it is important to acknowledge and honor the perspective and values that the stakeholders have. To do this, language that is accessible to the stakeholders per group will be used. For example, in the group where parents are present, layman's terms will be used to avoid confusion or intimidation. Furthermore, the facilitator of the meeting will take note of the suggestions, comments, and concerns of the participants to see how this could be utilized in the project. Rather than imposing, a reflective tone will be used during meetings. To further explain the components of the program, evidence in the literature review of the author that was used to determine the specific components of the program will be given to the stakeholders upon request through the use of a Google Drive.

To draw out stakeholder input on program evaluation research questions, design, and other insights on how the evaluation findings will be used, a small group discussion will enable them to freely ask questions and provide valuable insights and suggestions to the program. If the stakeholder is not comfortable sharing with the group, they may send an email to the author or request an individual meeting. Finally, to achieve consensus

regarding the research plan, the author will be willing to adjust and adapt the program as long as it will not affect the implementation and achievement of the program's short and long-term goals.

Program Evaluation Research Questions by Stakeholder Group

Once stakeholders have an understanding of the program and how its process is laid out in the logic model, the next step would be to generate evaluation questions that are important to each stakeholder group. Questions may include formative evaluation questions, regarding the process of implementing the program and any needed improvements, and summative evaluation questions, regarding the outcomes and impacts of the children and families' participation in the program. Table 5.2 contains a list of potential research questions posed by stakeholders that could be answered through the research findings. A finalized list of a manageable number of research questions that are the best fit for stakeholder goals will be made.

Table 5.2*Stakeholder Program Evaluation Research Questions*

Stakeholder or Stakeholder Group	Types of Program Evaluation Research Questions
The researcher	<p>Formative:</p> <ul style="list-style-type: none"> ● Was the program content and delivery sufficient for the participating children and families to begin using the skills that were taught? ● Was the program feasible to run in the given time frame? ● Was each component of the program conducted smoothly? ● What are the challenges faced in conducting the program in terms of technicalities and flow? <p>Summative:</p> <ul style="list-style-type: none"> ● Will the program participants have higher scores in standardized assessments, signifying improvements in executive functions? ● Will parents of the children report increased satisfaction with the results of the program?
Primary intended users: children and their families	<p>Formative:</p> <ul style="list-style-type: none"> ● Was the program efficient and easy to follow? ● Was the time too long or too short to follow the program with the child? ● What are the challenges in participating or continuing with the program? ● Are there any aspects of the program that needs more improvement? <p>Summative:</p> <ul style="list-style-type: none"> ● Did the program contribute to the overall development of executive functions and occupational participation of your child?
Persons actively involved in program delivery: occupational therapists	<p>Formative:</p> <ul style="list-style-type: none"> ● Was the evidence presented relevant? ● Was the information on the intervention presented too easy or too complicated? ● Was the instruction sufficient for the participants to begin using it with clients? ● Was the program duration adequate, or should it be shorter or longer? ● Is there anything that should be changed to improve program content or delivery?

	<ul style="list-style-type: none"> ● What other key issues or problems faced by participants were not addressed in the program? <p>Summative:</p> <ul style="list-style-type: none"> ● Did participants gain needed knowledge and skills consistent with program goals? ● Did participants gain increased satisfaction with the results of the intervention program? ● Did participants gain perceived competence with regard to conducting cognitive training, physical activity, and family education? ● Did recipients of the intervention improve in terms of desired performance consistent with program goals? ● Did executive dysfunction in recipients of the intervention decrease consistent with program goals?
Facilities including administration or management of private hospitals and clinics	<p>Formative:</p> <ul style="list-style-type: none"> ● Does the content of the program match organizational goals? ● Does each component of the program align with the needs of children diagnosed with ADHD with executive dysfunction? ● Did recipients of the intervention and family members report a favorable experience with the care received? ● Were any problems or issues reported? ● Did external factors impede the execution of the research methodology? <p>Summative:</p> <ul style="list-style-type: none"> ● Will the research data show that the intervention led to the desired change in dependent variables of interest? ● Can the research data be used to demonstrate improved quality of care provided to recipients of the intervention? ● Has the program positively impacted executive functions of children with ADHD? ● Are outcomes consistent with the proposed theoretical justification? ● Is delivery of the program more costly than other means of delivery? ● What were the rates of program withdrawal? ● Were there dropouts? If so, what were the reasons for dropping out of the program?
Developmental pediatricians, allied medical practitioners, teachers	<p>Formative:</p> <ul style="list-style-type: none"> ● Was the information presented relevant? ● Was the evidence on the effectiveness of each component used? ● Did the intervention justify the effectiveness and duration of the program?

	<p>Summative:</p> <ul style="list-style-type: none"> ● Can I refer children with executive dysfunction to this program?
<p>Funding agencies, advocacy organizations, including AOTA, WFOT, and policymakers.</p>	<p>Formative:</p> <ul style="list-style-type: none"> ● Do participants report an increased understanding of the distinctive role of occupational therapy in providing intervention to develop EF skills? ● Are the long-term goals of the project realistic and achievable? ● Will the project increase awareness of the role of OT in developing EF skills? <p>Summative:</p> <ul style="list-style-type: none"> ● Can the research data be used to demonstrate desired change in recipients of OT intervention as the result of the project? ● Will the research data demonstrate the importance of the role of OT in providing services relevant to the project? ● In light of the health care system in the Philippines, is the program justified based on study findings? ● Will findings demonstrate that the intervention matches the knowledge needed to close the clinical gap the project is addressing?

Program Evaluation Research Design

The program will include a formative evaluation wherein the program will be evaluated in terms of its implementation, and a summative evaluation wherein the program will be evaluated in terms of its outcomes and impact. Designs for both types of evaluation are described next.

Formative Evaluation

Semi-structured interviews of parents of the children will be conducted at the end of the program; parents will be asked about their children's and their own experiences and challenges that they encountered during the program. Additionally, at the end of each session, parents will be asked to answer surveys on a Likert scale with a few open-ended questions via Google Forms, which may be submitted within the week so as not to rush

them to provide answers on the spot. Participant responses to the interview and survey questions will provide a basis for describing and understanding the stakeholders' perceptions and experiences of participating in the program.

Summative Evaluation

The evaluation research will follow a one-group pretest and posttest nonexperimental design. The independent variable is the *Build Your EF* program, and the dependent variables are executive functions, attendance to therapy sessions, and parent rating of the child's performance. Assessment of the participants will be done before and after the program. This will allow the author to note associations between the components of the program with the observed outcomes.

Methods

At the start of this program, referrals will be used to recruit 8–10 participants from occupational therapists, developmental pediatricians, allied medical professionals, and teachers. The inclusion criteria will include a given or suspected diagnosis of ADHD, and reported deficits in executive functions that affect occupational participation. A diagnosis of intellectual disability or other learning disabilities that impairs understanding of the components and materials of the program will be excluded in the program.

Confidentiality

IRB's ethical research protocol will be followed to ensure the confidentiality of the participants. The participants' real names will be replaced with codes, and original data will be safely stored in a Google drive which only the author can access, and in a secured hard-drive locked in a secure location. Moreover, an informed parental consent

form will be required to be signed by the parents of the participants. They will be given the right to withdraw their children from the study at any given time in the program and also access information obtained from the evaluation research upon request.

Methods for Formative Data Collection

Formative data collection will include semi-structured one-on-one interviews and an online survey using Google Surveys. The semi-structured one-on-one interviews are with the parents, and will be conducted either in-person in the OT clinic or virtually via Zoom, depending on the situation or requests of the parents. These interviews will be recorded for documentation purposes at the start and at the end of the program. A set of predetermined open-ended questions will be asked, and follow-up questions will be used as verbal prompts to draw out further comments. The second formative component of the study will involve answering weekly Google surveys wherein the parents will be asked to rate their responses in a Likert scale.

Methods for Formative Data Management and Analysis

The semi-structured interviews in which parents share their experiences will be recorded and transcribed. A qualitative analysis approach will be used to review the interview transcripts and qualitative data gathered from the Google Form surveys. NVivo be used to analyze the text and identify themes. In order to enhance the rigor of the analysis at least one other occupational therapist or other health professionals in the clinic or hospital will be asked to review the findings and share their interpretation of the themes gathered from the interviews and surveys.

Methods for Summative Data Collection

Independent Variable. The independent variable is the *Build Your EF* program, which consists of cognitive training, physical activity, and family education wherein cognitive training and family education will be conducted individually for 30 minutes; and physical activity will be conducted in a group for 20 minutes, weekly in a span of 12 weeks.

Dependent Variables. 1) *Development in Executive Functions* is measured through the use of standardized assessments such as the Stroop task, the Modified Flanker task, and the Go-No Go task, to assess inhibitory control; backward-digit span task, repeating items back reordered by characteristics task, and the Corsi block test, to assess working memory; Design Fluency and Wisconsin Card Sorting tasks to assess cognitive flexibility. Measures will be provided pre and post-intervention. A higher score in the standardized assessments and improvements based on the interview will indicate improvement in EF skills. Clinical observation and parent interviews will also be used pre and post-intervention to assess development of other EF skills such as planning, problem solving, organization, time management, goal-directed persistence, task initiation, and emotional regulation.

2) *Parent rating on the child's performance* will be measured through a checklist provided to the parent. Here, they will also be able to rate their child's performance at home using pre- and post-online surveys on a Likert scale with the following rating
 5=completes tasks independently 4=completes tasks with minimal assistance
 3=completes tasks with moderate assistance 2=completes tasks with maximal assistance

and 1= does not complete task. A higher score will indicate the child's increased independence in tasks.

3) *Attendance to therapy sessions* will be taken note of. The administration of the clinic or hospital will list down the attendance of participants in all components of the intervention weekly. When a participant has 2 consecutive absences with no valid reason, such as an illness or death of an immediate family member, a warning will be provided for possible dropout. When this participant is still absent in the next session, making 3 consecutive absences, the participant will be dropped out of the program. Desired results at the end of the program can be correlated to regular attendance to therapy sessions.

Methods for Summative Data Management and Analysis

Google Forms will be used as a survey to gather quantitative, summative data. With an electronic device and a secure internet connection, participants will be able to access this data. Survey responses will be saved in a Google drive and a separate hard drive.

Quantitative data will be gathered with the use of surveys, questionnaires, attendance records, and standardized assessments. To manage the data for surveys and questionnaires, Google Forms will be used. With an electronic device and a secure internet connection, participants will be able to access this data. Responses will be saved in a Google drive and a separate hard drive. For the results of the standardized assessments, statistical analysis software can be used such as the Statistical Package for the Social Sciences (SPSS) which has built-in manipulation tools such as recoding and transforming variables. It can calculate data as per IBM guidelines.

For the one-group pre-post-test design wherein 8-10 participants will be evaluated before and after program completion, a paired t-test can be used to calculate differences before and after the intervention. A paired t-test will determine whether the mean change is significantly different from zero, which may indicate change as a result of involvement in *Build Your EF* program.

Disseminating the Findings of Program Evaluation Research

For good dissemination of information, engaging with the stakeholders early and following up throughout the project is important to keep them engaged and interested in the outputs and outcomes. It is also important to consider the format of how to present the information whether it be the OTs, patients, or management and administration. Moreover, partnerships may also help the author in building awareness of the program's development. Getting influential opinions and support from leaders such as managing directors and department heads, can also jumpstart the spread of knowledge of the program. The author may also share the work by presenting at conferences or submitting an article to an evaluation-related journal. Finally, to maximize the benefit of the research with no delay, evaluation results will be disseminated through the use of annual reports on the program, brochures, social media, and policy briefs.

Conclusion

This chapter describes the plan for conducting program evaluation research. Outcomes to be measured and the methods for obtaining data for the outcomes were clearly defined; data management and analysis plan were discussed. The following chapter discusses the dissemination plan which identifies audiences of this doctoral

project and appropriate mechanisms for dissemination to these audiences.

CHAPTER SIX – Dissemination Plan

Program Description

Build Your EF program promotes engagement, participation, and satisfaction in meaningful occupations by encouraging children with attention deficit hyperactivity disorder (ADHD) and their families to engage in activities that include family education, cognitive training, and increased physical activity to develop executive function (EF) skills. The author's proposed program is a 24-week intervention that has the following objectives: (1) children diagnosed with ADHD will report increased performance and satisfaction in occupations at home and in school, (2) children diagnosed with ADHD will attain increased performance in standardized assessments that measure executive function (EF) skills, and (3) parents of children diagnosed with ADHD will report improvements in daily occupations of their children who participated in the *Build your EF* program.

Dissemination Goals

To share information on EF skills in children with ADHD, the following dissemination goals will be set. Long-term goals include incorporating this program for children with ADHD not only in private therapy centers but also in public government hospitals and charitable organizations, in partnership with local government units. Short-term goals include the implementation of this program, starting with the author's partnership with private therapy centers; patenting the program; and applying for the program to qualify for continuing professional development course units to entice occupational therapists (OTs) to apply the program to their clients as well. This way, as

more OTs incorporate this program into their practice, the more it could be integrated into the Philippine healthcare environment. As the program's results have supposedly positive outcomes, the results and impact of the intervention program on the participants will also be shared through institutions such as local government units, private therapy centers, and public hospitals, and organizations such as the Philippine Academy of Occupational Therapists (PAOT) after one year of its implementation. Sharing the outcomes of the participants who underwent the program will encourage other families with children with ADHD to start the program as well.

Target Audiences

The primary audience for dissemination is licensed OTs in the Philippines. Secondary audiences include parents of children with ADHD, other healthcare professionals such as developmental pediatricians and other members of the rehabilitation team who can refer clients to OTs, and staff of local government units who can help share the program to the community.

Key messages

The following are the key messages for each audience previously described:

- Licensed OTs in the Philippines: This OT program combining cognitive training, physical activity, and family education can develop EF skills and increase occupational participation and life satisfaction for children with ADHD. This program is the first in the Philippines that specifically targets EF skills. Moreover, this program advances the competencies and techniques our profession has to offer.

- Parents of children with ADHD: Executive functions are higher-level cognitive skills needed to achieve increased participation and satisfaction in your child's life. This OT program could help your child develop the necessary executive function skills needed to participate in self-care, school, and socialization. Working in close collaboration with your family, the program's services aim to provide you and your child the best quality of life.
- Developmental pediatricians and other members of the healthcare team: This program was developed by an occupational therapist and combines cognitive training, physical activity, and family education to develop executive functions, or higher-level cognitive skills, of children with ADHD. These EF skills include inhibitory control, working memory, cognitive flexibility, emotional regulation, planning and prioritization, and organization. Working on these skills helps a child develop increased participation and satisfaction at home, in school, and in the community.
- Staff of local government units: This program was developed by an OT, who graduated from her post-professional doctorate program at Boston University. This program helps children with ADHD develop higher-level cognitive skills, specifically executive functions. Executive functions are a set of skills that are needed to achieve participation and life satisfaction of the children at home, in school, and in the community setting.

Sources/messengers

Influential spokespersons can spread the key messages of this project to different audiences. Below is a list of spokespersons for each corresponding audience:

- The president of the Philippine Association of Occupational Therapists, can be recruited to disseminate this new intervention to licensed OTs in the Philippines. The president can be asked to promote the intervention with a short message in a video clip after a meeting with the author to discuss the program in detail and answer any questions.
- The president of the ADHD Society of the Philippines, can be recruited for parents of children with ADHD. Being the president of the largest ADHD group in the Philippines can influence many parents to take on interventions he may recommend.
- Developmental pediatricians in the Philippines can be recruited to disseminate information to their colleagues. There are a small number of developmental pediatricians in the Philippines and most children with ADHD are referred to them. The author intends to first reach out to those whom she personally engages with and send electronic mails to others who can also refer clients to the program.

Dissemination activities, tools/techniques, timing, and responsibilities

To reach each target audience, specific activities will be utilized. The following will be used for each audience:

- Licensed occupational therapists in the Philippines: The author plans to collaborate with the Philippine Academy of Occupational Therapy (PAOT) to disseminate information on their social media pages. Digital posters will be made, providing the basic information. Then below each post shared is a link leading to the author's website where the details of the program will be further discussed. This author will be fully responsible for the information shared on the website. However, for the design and layout of the website, a web designer will be hired. Moreover, face-to-face contact will occur at conferences where the author can present or host workshops that have continuing professional development (CPD) units where the author can teach the program's techniques in detail. The author will be responsible for coordinating with organizations wherein conferences will be arranged and submitting requirements to the CPD Committee in the Philippines to approve workshops wherein CPD units can be applied for by the OTs.
- Parents of children with ADHD: First, electronic media will be used to spread information online via platforms such as Instagram, Facebook, LinkedIn and TikTok. Posters and infographics will be used to promote the program on Facebook while short videoclips will be used in both Instagram and TikTok. Videos will not be more than a minute long so that viewers can sustain attention to digest the information.
- Developmental pediatricians and other health care professionals: Personal electronic mails addressing identified professionals will be sent giving the basic

details of the program. A link to the author's website will be provided in the electronic mail sent. Moreover, personal face-to-face visits or meetings will be conducted by the author to discuss the program with these professionals and directly answer any questions they have.

- Staff of local government units: Letters that are addressed to the local government units will be printed and sent to their offices. Since these government units could be receiving hundreds of letters in a day, the author plans to connect and communicate with identified heads inside the department to acknowledge receiving the letters. Furthermore, the author plans to have face-to-face discussions with the identified staff who can help disseminate the project. Face-to-face discussions are important to clarify all information and assure the author that the steps taken for dissemination will be conducted.

Budget

For the dissemination of activities by audiences, a preliminary budget will be prepared. Table 6.1 lists the description of each expense and the cost.

Table 6.1.*Preliminary Budget for Dissemination of Activities*

Description of Expense	Cost
Web designer for the website of the program – a simple design will be used to help clients learn more information about the program in a simple and convenient way.	60,000 php/ 1080.53 usd
Travel expenses to conferences	2,000–5,000 php/ 36.02–90.04 usd
Conference registration	3,000–5,000 php/ 54.03–90.04 usd
Printing of brochures in physical locations- use of printer with unlimited ink	7,000 php/ 126.06 usd
Bond paper for printable materials	500 php/ 9 usd
Fees for approving the program for continuing professional development units	9,000 php/ 162.08 usd
Physical space and equipment for rent once program is used for continuing professional development	10,000 php/ 180.09 usd
TOTAL	91,500–96,500 php/ 1647.80–1737.85 usd

Evaluation

To monitor and evaluate the impact of the program dissemination strategies on the target audiences, the author needs to collect and analyze data regarding the audience.

These data will include how many people were reached and their responses to it. For the

posts on social media, indicators such as views, shares, comments, and reactions will be gathered. These will be further analyzed in an Excel file. Each media platform including Facebook, Instagram, LinkedIn, TikTok, and YouTube will be analyzed regarding their audience reach. If a specific platform gathers a significant number of audiences compared to the others, the author plans to concentrate information dissemination on this platform. Meanwhile, for person-to-person interactions such as conferences or workshops, feedback forms will be sent to the participants' emails. Feedback forms will be inputted into Google Forms to be able to easily collect and analyze data. To get complete information, all items in the Google Forms must be answered completely before submitting their responses. Finally, to ensure that the participants submit their feedback forms, certificates for completion of the conferences or workshops will only be provided upon completing their forms.

Conclusion

This chapter discussed the dissemination of the program. Long-term and short-term goals were listed; target audiences together with key messages were also discussed. Moreover, sources or key messengers were identified; dissemination activities, tools/techniques, timing, and responsibilities were covered as well. In addition, a preliminary budget for dissemination activities was presented; finally, an evaluation of the dissemination methods was discussed.

CHAPTER SEVEN – Funding Plan

Project Description

Build Your EF is an intervention program that combines cognitive training, physical activity, and family education to develop the executive functions (EF) of children with attention deficit hyperactivity disorder (ADHD). Cognitive training will consist of worksheets and cognitive exercises. Physical activity will consist of sensory integration activities, including: balance skills and spatial awareness, balancing activities, tactile activities, atrial activities, activities to promote the sense of depth, activities to promote planning of movements, bilateral motor coordination, strengthening auditory and visual attention, strengthening auditory memory, strengthening visual memory, and eye-hand coordination (Faramarzi et al., 2016). Family education will include parent education on the importance of limiting screen time and having a good sleep routine.

Available Local Resources

This doctoral project aims to help more children with ADHD who experience executive dysfunction. To be able to do this, the author will invite additional professionals to contribute to the development of interventions for children with ADHD.

These professionals and their potential contributions include:

- Developmental pediatricians and teachers in progressive and traditional schools, who can advise and refer to the program.
- The Philippine Academy of Occupational Therapists, which can help promote the program through the use of social media platforms and connecting with other therapists.

- Administrative staff of the private therapy centers, who can make posters and flyers to briefly describe and promote the program.

Furthermore, other in-kind local resources include:

- Free use of social media platforms to promote the program.
- Private therapy centers can provide full utilization of the physical space and equipment needed for the physical activity component of the intervention program. This equipment includes mats, swings, trampolines, balance toys, slides, cones, and other playground materials. Moreover, they can also provide full utilization of tables and chairs in a conducive environment for the cognitive training and family education component of the program. Worksheets and handouts that need to be printed can be provided by the private therapy centers.
- Internet and digital programs can be utilized from the author's home to design worksheets and handouts for the parents.

Needed Resources and Budget

This intervention program will require the use of the physical space, equipment, and resources of private therapy centers. Therefore, a percentage of the income earned by the author will go to these private therapy centers. In the Philippine setting, where the author is licensed, the current practice is that an occupational therapist may propose a program and partner with a private therapy center that can gather the clients and offer the use of their facilities and resources in exchange for a percentage of the earnings of the author. The table in Appendix B illustrates the 25% shares that the private therapy centers will receive upon implementation of the program, with the full use of their utilities and

resources. For the first year, five children with ADHD are aimed to receive the program. With 25% going to the private therapy centers for expenses, 63,750 php/ 1148.23 usd is the estimated cost for the first year. For the second year, the number of children with ADHD who are aimed to receive the program will increase to 7. With 25% going to the private therapy centers for expenses, 89,250 php/ 1607.65 usd is the estimated cost for the second year.

Potential Funding Sources

Parents of the children who will avail of the program will pay for the fees out of their pocket. Total program costs 29,000 php/ 523.83 usd. However, to support those who need financial assistance, the following organizations, listed in table 6.2, will be tapped to support at least 3 children annually.

Table 6.2.

Potential Funding Sources for Financial Assistance

The ADHD Society of the Philippines	This group was initially formed as a parent-based group but has evolved into a diverse and balanced collective of medical practitioners, academicians, special education professionals, and adults with ADHD (The AD/HD Society of the Philippines, 2023).
The University of Santo Tomas and other teaching hospitals	These institutions can provide an internship program wherein their OT interns can learn and observe the OT practitioner conduct this intervention in exchange for subsidizing a child's participation in the program
United States Embassy Club (USEC) Community Services Project Grant	USEC is a volunteer organization that engages in charitable giving. It is made up of U.S. Embassy Manila employees and their family members, USEC does not receive any government funding; funding comes from charitable giving and fundraisers. To be eligible for the grant, the author aims to partner with marginalized communities to give access to the program to the less fortunate in the Philippines.
Cardinal Health Foundation	This foundation partners with Save the Children Philippines to fund their projects for children in the Philippines, focusing on

	health and education in marginalized communities (Save the Children, 2023). To be eligible for the grant, the author plans to propose the program to Save the Children Philippines and work together with this foundation.
Japan's Grassroots Human Security Projects (GGP) in the Philippines	GGP was launched to support small-scale projects directly benefiting the grassroots level in the Philippines. To be eligible for the grant, the author aims to partner with the local government units.

Summary

This chapter discussed the available local resources, the budget, and potential funding sources of the *Build Your EF* program for its first two years. The funding plan for *Build Your EF* is built on the OT consultancy model used in the Philippines. Sources of funding include fee for service and grants to support those who are unable to pay for services. The primary cost will be a 25% charge by the clinics for use of their space and resources. The stated funding plan will allow the program to be sustainable and meet target goals and outcome measures.

CHAPTER EIGHT – Conclusion

The *Build Your EF Program: An intervention program combining cognitive training, physical activity, and family education for children with attention deficit hyperactivity disorder (ADHD)* was uniquely designed to develop executive functions (EF) from an occupational therapy (OT) perspective. With the lack of interventions to develop executive functions (Cramm et al., 2013), this program aims to fill in the gap in practice by providing a theory-based and evidence-driven approach that can be used by occupational therapists.

Build Your EF is the first program to combine three approaches to integrate EF skills including cognitive training, physical activity, and family education. Over a span of 24 weeks, this program employs occupation and play-based activities that target each executive function and enhance overall child development, engagement in occupations and life satisfaction. Each executive function will be (1) individually targeted using evidence and theory-based approaches and (2) integrated towards the end of the intervention program. The development of each child's EF skills upon receiving the intervention will be documented using pre- and post-assessments included in the program's sessions.

This doctoral project presents the theoretical guides, evidence base, and design of the *Build Your EF Program* (see Chapters 2–4). Additionally, it provides a planned program evaluation research plan that will be implemented alongside *Build your EF* to assess the program's effectiveness (see Chapter 5). The program evaluation also will include assessing resources, describing interventions and activities, and listing program

outputs, short-term outcomes, intermediate outcomes, and long-term outcomes. Moreover, stakeholder involvement will be assessed in formative and summative research questions.

A plan for funding the program, program evaluation, and dissemination of its program evaluation results is included. The program's and program evaluation's dissemination will include targeting specific audiences such as licensed occupational therapists in the Philippines, parents of children with ADHD, developmental pediatricians and other members of the healthcare team, and staff of local government units. Dissemination activities, tools, techniques, and timing are also planned, alongside the budget needed for these (see Chapters 6 and 7). Finally, funding for future developments will be discussed including collaborating with private therapy centers to gather clients who will avail of the program, and seeking financial assistance for clients who may have financial difficulties (Chapter 7).

The *Build Your EF* program takes a step further in providing a specialized intervention to develop executive functions that lead to increased occupational participation of the child and life satisfaction for their families. Through the activities given throughout the program, the child will gain skills that improves his quality of life and at the same time, fully engage families in the child's developmental process. Overall, the *Build Your EF* Program highlights the positive impact and potential of occupational therapy in developing EF skills in children with ADHD.

APPENDIX A – Program Manual

Leader's Manual

A GUIDE TO AN INTERVENTION DEVELOPING EXECUTIVE FUNCTIONS OF
SCHOOL-AGED CHILDREN DIAGNOSED WITH ADHD

Introduction

This manual is made for licensed occupational therapists who aim to learn and conduct an intervention program that develops executive functions of school-aged children diagnosed with ADHD in a clinical setting.

Occupational Constraints/Injustices and Health/Wellness Issues

“By looking at ADHD patterns only in terms of problems, not in terms of successes, we have missed an opportunity to learn how and under what circumstances families do well with ADHD” (Kendall, J., 2020). Because of this, children with ADHD are given limited opportunities to engage in various occupations at home, in school, and in the community.

OTs will have to explore how this health and wellness issue and occupational injustice can be remedied for children with ADHD and their families. Here, OTs will have to socially engage families to experience satisfaction, find meaning in their lives, adapt to different environments, and overcome stigma to live fulfilling lives despite their condition.

Population Served

Characteristics of the Priority Population

ADHD is one of the most common neurodevelopmental disorders of childhood, most experience EF dysfunction as part of their diagnosis. This population has a prevalence of 2.4 million (9.6%) of school-aged children aged 6-11 years. Moreover, according to Scahill & Schwab-Stone (2000), the best estimate of prevalence is 5% to 10% in school-aged children.

Those at risk for missing opportunities and experiencing occupational injustice and constraint include all children diagnosed with ADHD. No specific data was gathered regarding how many children with ADHD experience these issues. However, it can be inferred from the data gathered that a high prevalence of school-aged children with ADHD experience these injustices which is a significant public concern.

Context/ Environment of the Priority Population

The usual environment for school-aged children with ADHD includes the home, school, and community. For the purpose of this initiative, the setting will be done in a private therapy center with enclosed rooms for cognitive training, discussion with the families, and a wide mat area for physical activities.

The Desired/Intended Outcomes for Improved Occupational Engagement, Occupational Justice, Health, and/or Wellness.

The desired outcomes include promoting occupational engagement by encouraging children with ADHD and their families to engage in activities that include family education, cognitive training, and increased physical activity that leads to participation in meaningful occupations and eventually contributes to good health and well-being. Moreover, it also promotes occupational justice by giving the population served equal opportunities to succeed with their peers and maximize their own potential.

Objectives for the Initiative.

- In this health promotion initiative, children diagnosed with ADHD will be able to report increased performance and satisfaction in occupations at home, in school, and in the community
- In this health promotion initiative, children diagnosed with ADHD will attain increased performance in standardized assessments that measure EF skills; and
- In this health promotion initiative, parents of children diagnosed with ADHD will be able to report improvements in daily occupations of their children who joined the program through surveys and one-on-one interviews.

A rationale and description of the theories guiding the initiative.

The Models/Theories being utilized in the development of this initiative include the Iterative Reprocessing (IR) Model, the Sensory Integration (SI) Theory, the Occupational Therapy for Children with ADHD: a Delineation Model of Practice, and the Social Cognitive Theory.

The **Iterative Reprocessing (IR) model** allows for a dynamic, complex interaction within the environment and the automatic and reflective functions of a person. This model highlights that the person is capable of reflective processes that influence his actions (Cunningham et al., 2007). The IR model supports the cognitive training component of the intervention program which involves labeling and reflection of the child. On the other hand, the **Sensory Integration (SI) theory** views the person in Ayres' schematic representation wherein the vestibular, proprioceptive, tactile, auditory, and visual systems contribute to learning (Bundy, et al., 2019). These first-level senses are the foundations for learning and providing an environment that will enhance and develop the basic sensory systems important to enabling the child to progress in higher cognitive skills, including executive functions (Bundy, et al., 2019). This SI theory supports the physical activity component of the intervention program. Meanwhile, for the **Occupational Therapy for Children with ADHD: a Delineation Model of Practice**, this model targets the dynamic interplay of factors relating to the child, the environment, and the task (Chu & Reynolds, 2007). Here, the importance of appropriate parent education is highlighted so interaction and child support can bring about better long-term outcomes. This model supports the family education component of the intervention. Finally, the **Social Cognitive Theory** believes that learning occurs in a social context with a dynamic and reciprocal interaction of the person, environment, and behavior. This theory considers both the individual behavior and the social environment of the person which resonated with my initiative since the cognitive training and physical activity components aim to change individual behavior while the family education components aim to work on the child's social environment. Furthermore, according to Amado et al. (2016), there is a positive association between social cognition and executive functions. With this positive association, the assumptions and core beliefs of this theory, including goal setting, self-regulated

learning, and providing reinforcement, can help in developing activities that work on the child's EF skills.

Initiative Description

Roles of Personnel

Trained occupational therapists will conduct the assessment of the participants from baseline, provide the intervention, and conduct another assessment at the end of the intervention. The same therapist will conduct a formative and summative assessment of the intervention process. Meanwhile, administrative staff will market the program, identify children who can benefit from the program, and take care of budgeting and collection of fees.

Content and Principles of Selected Frameworks, Models, and Theories

Initiative Content/Component	Theoretical Grounding: framework/theory and specific principle(s)	Evidence Base: article citation and brief description of evidence
Cognitive Training, incorporating labeling, reflection, and rule use	<p>Iterative Reprocessing Model</p> <p>“The IR model views the person’s processing of information as a complex system. This information processing changes over time as more stimulus is received. With this, the interaction within the environment and the reflective functions of the person have a more dynamic and complex interaction. In addition, the IR model highlights that the person is capable of reflective processes that influence his actions.” (Zelazo et al., 2015)</p>	<p>Doebel, S. & Zelazo, P. D. (2013). Bottom-up and top-down dynamics in young children's executive function: Labels aid 3-year-olds' performance on the Dimensional Change Card Sort. <i>Cognitive Development</i>, 28(3), 222–232. https://doi.org/10.1016/j.cogdev.2012.12.001</p> <ul style="list-style-type: none"> • Children performed better in tasks that included labels in the stimulus to cue children to attend to stimuli <p>Lowery, K., Nikam, B., & Buss, A. (2022). Dimensional label learning contributes to the development of executive functions. <i>Scientific Reports</i>, 12(1), 1–12.</p> <ul style="list-style-type: none"> • Associating visual features with labels changes dimensional attention, a mechanism of executive function, by influencing object representations and guiding goal-directed behavior. <p>Espinet, S.D., Anderson, J. E., & Zelazo, P. D. (2013). Reflection training improves executive function in preschool-age children: Behavioral and neural effects. <i>Developmental Cognitive Neuroscience</i> (4) 3–15. https://doi.org/10.1016/j.dcn.2012.11.009</p> <ul style="list-style-type: none"> • According to Espinet, Anderson & Zelazo (2013), a single brief, 15-

		<p>minute session of reflection training led to substantial improvements in Dimensional Change Card Sort performance.</p> <ul style="list-style-type: none"> • Effective strategies that were used for inducing flexible, adaptive behavior, as well as transfer, include encouraging children to reflect on their rule representations, rather than simply telling them when behavior is incorrect or inappropriate
Physical Activity	<p>Sensory Integration Theory</p> <p>The SI theory targets first-level senses, including proprioceptive, vestibular, and tactile senses are the foundations for learning, which eventually progress to the integration of their inputs, resulting in their end products, including higher-level cognitive skills, the ability to concentrate and organize, self-esteem, self-control, self-confidence, academic learning ability, capacity for abstract thought, and reasoning (Vives-Vilarroig et al., 2022)</p>	<p>Ziereis, S. & Jansen, P. (2015). Effects of physical activity on executive function and motor performance in children with ADHD. <i>Research in Developmental Disabilities</i>, 38, 181–191. https://doi.org/10.1016/j.ridd.2014.12.005</p> <ul style="list-style-type: none"> • A 12-week physical activity intervention program has positive effects on the executive functions of children with ADHD, regardless of what type of physical activity <p>Álvarez-Bueno, C., Pesce, C., Cavero-Redondo, I., Sánchez-López, M., Martínez-Hortelano, J. A., & Martínez-Vizcaíno, V. (2017). The Effect of Physical Activity Interventions on Children’s Cognition and Metacognition: A Systematic Review and Meta-Analysis. <i>Journal of the American Academy of Child and Adolescent Psychiatry</i>, 56(9), 729–738. https://doi.org/10.1016/j.jaac.2017.06.012</p> <ul style="list-style-type: none"> • Physical activity interventions are useful strategies to foster the development of children’s cognition, including core executive functions and higher-level executive functions; curricular exercise and programs that increased time of physical activity are more likely to have effect on executive functions <p>Nejati, V. (2021). Balance-based Attentive Rehabilitation of Attention Networks (BARAN) improves executive functions and ameliorates behavioral symptoms in children with ADHD. <i>Complementary Therapies in Medicine</i>, 60, 102759–102759. https://doi.org/10.1016/j.ctim.2021.102759</p>

		<ul style="list-style-type: none"> • A Balance-based Attentive Rehabilitation of Attention Networks (BARAN) improves working memory, cognitive flexibility, and inhibitory control
<p>Family Education on reducing screentime and following a sleep routine</p>	<p>Occupational Therapy for Children with ADHD: a Delineation Model of Practice</p> <p>“The importance of appropriate parent education is highlighted so that they can interact with and support the child in an appropriate manner, achieving better long-term outcomes.” (Chu & Reynolds, 2007)</p> <p>Social Cognitive Theory</p> <p>“The theory stresses the key roles played by vicarious, symbolic, and self-regulatory processes as people seek to develop a sense of agency in their lives. Early modeling studies supported the role of vicarious processes in learning and performance. An important personal variable is self-efficacy, which researchers have shown to affect and be influenced by motivation and learning.” (Schunk & DiBenedetto, 2023)</p>	<p>Zhu, H., Xiao, L., & Tu, A. (2022). Effectiveness of technology-based interventions for improving sleep among children: a systematic review and meta-analysis. <i>Sleep Medicine</i>, 91, 141–150. https://doi.org/10.1016/j.sleep.2022.02.013</p> <ul style="list-style-type: none"> • Technology-based interventions such as using web-based platforms, smartphone apps, Facebook, emails, phone calls, and text messages can be used to improve sleep in children. <p>Halal, C. S. E. & Nunes, M. L. (2014). Education in children's sleep hygiene: which approaches are effective? A systematic review. <i>Jornal de Pediatria</i>, 90(5), 449–456. https://doi.org/10.1016/j.jped.2014.05.001</p> <ul style="list-style-type: none"> • Effective methods that can be used to improve sleep include extinction, gradual extinction, minimal checking with systematic extinction, positive routines, programmed awakening, and sleep remodeling <p>Fangupo, L.J., Haszard, J. J., Reynolds, A. N., Lucas, A. W., McIntosh, D. R., Richards, R., Camp, J., Galland, B. C., Smith, C., & Taylor, R. W. (2021). Do sleep interventions change sleep duration in children aged 0–5 years? A systematic review and meta-analysis of randomised controlled trials. <i>Sleep Medicine Reviews</i>, 59, 101498–101498. https://doi.org/10.1016/j.smr.2021.101498</p> <ul style="list-style-type: none"> • There are positive results in increasing the sleep of children that includes using sleep diaries to assess 24-hour sleep duration <p>Pearson, N., Biddle, S. J. H., Griffiths, P., Sherar, L. B., McGeorge, S., & Haycraft, E. (2020). Reducing screen-time and unhealthy snacking in 9-11 year old children: The Kids FIRST pilot randomised</p>

		<p>controlled trial. <i>BMC Public Health</i>, 20(1), 122–122. https://doi.org/10.1186/s12889-020-8232-9</p> <ul style="list-style-type: none"> • Changes in self-efficacy for reducing TV viewing and computer use are likely to require clear parental input through modeling of appropriate screentime and personal encouragement for alternative behaviors. <p>Jones, A., Armstrong, B., Weaver, R. G., Parker, H., von Klingraeff, L., & Beets, M. W. (2021). Identifying effective intervention strategies to reduce children's screen time: a systematic review and meta-analysis. <i>The International Journal of Behavioral Nutrition and Physical Activity</i>, 18(1), 1–126. https://doi.org/10.1186/s12966-021-01189-6</p> <ul style="list-style-type: none"> • Highly tailored behavioral strategies may benefit individuals while social support and role modeling may be used for larger populations.
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Steps, Topics, Content and Activities

Week/Module	Topic	Content and Activities	Research to Support the Initiative	Applicable Framework/Theory Principle
Week 1	Assessment of Executive Functions	<p>Welcome</p> <p>Activity: overview of each executive function</p> <p>Family education: Importance of Sleep and Screen Time</p>	Diamond (2013) assessment of executive functions article	-OT delineation model of practice for ADHD: dynamic interplay of factors relating to the child, the environment, and the task
Week 2	Family Education on screentime and sleep routine	A talk on the importance and techniques to reduce screentime and develop a good sleep routine for school-aged children diagnosed with ADHD	<p>Halal & Nunes, (2014), Zhu et al. (2022), Fangupo et al. (2021) sleep articles</p> <p>De Lepeleere et al. (2017), Pearson et al. (2020), and Jones et</p>	-OT delineation model of practice for ADHD: dynamic interplay of factors relating to the child, the environment, and the task, parent education

			al. (2021) screentime articles	-SCT: self-efficacy, goal setting, self-regulated learning, reinforcements
Week 3,4, 5	Executive Functions Intervention- Inhibitory Control	Content: 30-minute cognitive training, 20-minute physical activity, 10-minute feedback to family <i>Activities that target inhibitory control:</i> <ul style="list-style-type: none"> • Stop dance • Simon Says • Red light-green light • Sit and Wait for instructions • Following instructions worksheets 	Lowery et al. (2022), Simpson (2012), and Doebel & Zelazo (2013) labeling to develop EF skills articles Espinet et al. (2013), Wood et al. (2018), Zelazo et al. (2018), and Milaré et al. (2021) reflection and rule use to develop EF skills articles Ziereis & Jansen (2015), Álvarez-Bueno et al. (2017) and Nejati (2021) physical activity to develop EF skills articles	-IR model: reflection, rule use, goal directed modulation and attention and behavior -SI theory: 3 basic senses (tactile , proprioceptive, vestibular) -OT delineation model of practice for ADHD: parent education, environmental adaptation, task selection, and child factors
Week 6, 7, 8	Executive Functions Intervention Cognitive Flexibility	Content: 30-minute cognitive training, 20-minute physical activity, 10-minute feedback to family <i>Activities that target cognitive flexibility:</i> <ul style="list-style-type: none"> • Word Games • Board games that switch up rules 		-SCT: self-efficacy, goal setting, self-regulated learning, reinforcements
Week 9,10, 11, 12	Executive Functions Intervention Working Memory	Content: 30-minute cognitive training, 20-minute physical activity, 10-minute feedback to family <i>Activities that target working memory:</i> <ul style="list-style-type: none"> • Visualization games • Shadow games • Memory games • Sequencing Stories 		
Week 13, 14, 15	Executive Functions Intervention	Content:		

	Planning and Prioritizing	<p>30-minute cognitive training, 20-minute physical activity, 10-minute feedback to family</p> <p><i>Activities that target planning and prioritizing:</i></p> <ul style="list-style-type: none"> • Calendar and schedule making • Drawing plans • Mind map 		
Week 16,17, 18	Executive Functions Intervention Organization	<p>Content:</p> <p>30-minute cognitive training, 20-minute physical activity, 10-minute feedback to family</p> <p><i>Activities that target organization:</i></p> <ul style="list-style-type: none"> • School-work folder system • Picture symbols to organize an environment • Checklist making • Sort your things • Monthly clean up 		
Week 19, 20, 21	Executive Functions Intervention: Emotional Regulation	<p>Content:</p> <p>30-minute cognitive training, 20-minute physical activity, 10-minute feedback to family</p> <p><i>Activities that target emotional regulation:</i></p> <ul style="list-style-type: none"> • Behavior Bingo • Emotions Scavenger hunt checklist • Discussion of appropriate and inappropriate behaviors 		
Week 22,23	Executive Functions Intervention	<p>Content:</p> <p>30-minute cognitive training, 20-minute physical activity, 10-minute feedback to family</p>		

	Integration of EF skills	<i>Activities that integrate executive functions:</i> <ul style="list-style-type: none"> • Games with Rules • Discussion and processing of what was learned 		
Week 24	Re-assessment of Executive Functions	-Reassessment of executive functions using standardized tasks and interview with the parents	Diamond (2013) assessment of executive functions article	-OT delineation model of practice for ADHD: dynamic interplay of factors relating to the child, the environment, and the task

A Brief Administrative Assessment: Resources Critical to the Success of Implementing the Initiative

- Time frame: This helps organize the events and makes it easy to determine when and what motion or event occurred. It's critical to recognize and comprehend trends in a particular time frame to know what works and what does not work for further development of the initiative.
- Budget: This ensures the author that the money spent is not more than the money earned. This allows the author to plan short- and long-term expenses.
- Personnel: This includes those who will help run the initiative such as OT and administrative staff. Personnel help create and maintain a good relationship and harmonious environment among the children and their families, colleagues, and potential stakeholders.
- Marketing: This makes potential clients aware of the services being offered; and helps them decide on whether to avail of the service.

Evaluation Plan

Formative (process) evaluation components

Formative data collection will include semi-structured one-on-one interviews and an online survey using Google Surveys. The first formative component is the semi-structured one-on-one interviews with the parents that will be conducted either face-to-face in the OT clinic or virtually via Zoom, depending on the situation or requests of the parents. These interviews will be recorded for documentation purposes and will take place quarterly throughout the child's participation in the program. A set of predetermined open-ended questions will be asked, and follow-up questions will be used as verbal prompts to draw out further comments. The second formative component of the study will involve answering a Google survey at their preferred time wherein the parents will be asked to answer open-ended questions on how to improve the program at the end of the survey.

Summative (impact and outcome) evaluation components.

Quantitative data will be gathered with the use of surveys, questionnaires, attendance records, and standardized tests. To manage the data for surveys and questionnaires, Google Forms will

be used. With an electronic device and a secure internet connection, participants will be able to access this data. Responses will be saved in a Google Drive and a separate hard drive. For the results of the standardized assessments, statistical analysis software can be used such as the Statistical Package for the Social Sciences (SPSS) which has built-in manipulation tools such as recoding and transforming variables. It can calculate data as per IBM guidelines.

Critical Review

Strengths and Limitations of its Evidence Base

This initiative has a number of strengths including the following: interventions used for cognitive training and physical activity are proven to be effective in developing EF skills in previous studies, it can also be individualized depending on the needs of the child, and techniques used for family education also reported positive effects on the child. However, there are a few limitations that must be considered including limitations on time components and frequency of the intervention program. Moreover, the long-term effects of the interventions need further research.

Strengths and Limitations of its Theoretical Grounding

This initiative's strength in theoretical grounding is that each component of the intervention program is based on either a theory/model/framework. This helps give a rationale and prove the effectiveness of each component. Moreover, this initiative combined a number of theories/models/frameworks, taking in the relevant assumptions to formulate evidence-based interventions. However, despite these strengths, there are still a few weaknesses including the Social Cognitive Theories' assumption of when the environment changes, the person changes as well (this may not always be the case), the Iterative Reprocessing Model's lack of evidence of transfer of skill in the natural environment, and the oversimplification of the OT Delineation Model of Practice for Children with ADHD to provide a solution to a problem with multiple layers.

Potential Barriers and Challenges to Implementation of the Initiative.

Potential barriers and challenges for this initiative include possible inconsistent attendance or absences of the children due to unforeseen circumstances such as illness or emergencies. In a 24-week program, it may be difficult to predict these absences; the development of skills may be affected. Moreover, Another challenge could be training the OTs to implement the program consistently to ensure the fidelity of the intervention. Due to changing conditions and different environmental settings, OTs may improvise or modify the program. Finally, implementing follow-up of home instructions may be the biggest challenge, as this would require time, dedication, and effort on the side of the families to incorporate techniques learned in therapy in the home environment.

Conclusion

This intervention manual aims to ensure the fidelity of the treatments provided as it articulates the distinct differences and specifications of the intervention components to ensure that outcomes are replicated. This manual includes users of the manual, population served, objectives of the initiative, rationale and descriptions of the theories guiding the initiative, outline of the initiative, resources, evaluation plan, and critical review to guide therapists in conducting an intervention to promote occupational justice, and health and wellness of school-aged children diagnosed with ADHD who experience executive dysfunction.

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APPENDIX B – Reimbursement to Clinic per Program Participant

Service provided	Budget allotted for the center's share (this is 25% of the income the author will earn)
Assessment of Executive Functions	1,000 php
Session on family education on screen time and sleep routine	500 php
Week 3: EF intervention- inhibitory control	500 php
Week 4: EF intervention- inhibitory control	500 php
Week 5: EF intervention- inhibitory control	500 php
Week 6: EF intervention- cognitive flexibility	500 php
Week 7: EF intervention- cognitive flexibility	500 php
Week 8: EF intervention- cognitive flexibility	500 php
Week 9: EF intervention- working memory	500 php
Week 10: EF intervention- working memory	500 php
Week 11: EF intervention-working memory	500 php
Week 12: EF intervention- working memory	500 php
Week 13: EF intervention- planning and prioritizing	500 php
Week 14: EF intervention- planning and prioritizing	500 php
Week 15: EF intervention- planning and prioritizing	500 php
Week 16: EF intervention- organization	500 php
Week 17: EF intervention- organization	500 php
Week 18: EF intervention- organization	500 php
Week 19: EF intervention- emotional regulation	500 php
Week 20: EF intervention- emotional regulation	500 php
Week 21: EF intervention- emotional regulation	500 php
Week 22: EF intervention- integration of EF skills	500 php
Week 23: EF intervention- integration of EF skills	500 php
Week 24: EF intervention- reassessment of executive functions	750 php
TOTAL	12,750 php

APPENDIX C – Executive Summary

Build Your Executive Functions: An Intervention Program Combining Cognitive Training, Physical Activity, and Family Education for Children Diagnosed with Attention Deficit Hyperactivity Disorder (ADHD)

Introduction

In order for the occupational therapy (OT) profession to grow, topics and concerns that are understudied and underdeveloped must be continually explored. Innovative and evidence-based interventions support the advancement of the profession, among allied medical services. One of these understudied topics, which is especially close to the author's heart, is facilitating the development of executive functions (EF) in school-aged children diagnosed with ADHD. Executive functions (EFs) are higher cognitive processes that play an important role in directing thoughts and behaviors toward a functional goal (Ambrosini et al., 2019). Children with ADHD have associated EF deficits that affect their occupational participation and life satisfaction (Schwörer et al., 2020). Despite this, there are limited interventions in OT that address this problem. Therefore, this project, *Build Your Executive Functions: An Intervention Program Combining Cognitive Training, Physical Activity, and Family Education for Children Diagnosed with ADHD* aims to fill the gap in OT practice with an intervention program that combines cognitive training, physical activity, and family education to develop EF skills in children with ADHD.

Findings from Literature

After an extensive review of the literature, it was inferred that cognitive training

including labeling and reflection helps develop EF skills (Zelazo et al., 2018). Labeling includes using visual cues such as pictures or words throughout the intervention while reflection makes children think of their actions, rather than simply telling them what is right or wrong. Moreover, physical activity also contributes to the development of EF skills (Álvarez-Bueno, C., et al. 2017; Nejati, V., 2021). Curricular exercise and increased physical activity help develop EF skills by targeting the basic sensory systems that are the foundation for higher cognitive skills, including EF. In addition to cognitive training and physical activity, family education also plays a vital role in helping the child succeed. Family education, focusing on reducing screen time and following a consistent sleep routine was proven to help develop EF skills in children with ADHD (Holingue et al., 2021; Olfu et al., 2021).

Theoretical Frames of Reference

To provide an evidence-based intervention program, the author conducted another intensive literature review that identified three models or theories that address the problem of difficulty developing executive function skills for children with ADHD. These include the Iterative Reprocessing (IR) Model (Cunningham et al., 2007; Zelazo et al., 2015), Sensory Integration (SI) Theory (Bundy et al., 2019; Vives-Villarraig et al., 2022), and Occupational Therapy for Children with ADHD: A delineation model of practice (Chu & Reynolds, 2007). These three models or theories were vital for the development of the *Build Your EF* program.

The Iterative Reprocessing (IR) Model uses the dynamic and complex interaction of the environment and the reflective functions of a person that lead to behavior change

(Cunningham et al., 2007; Zelazo et al., 2015). This supports the cognitive training component of the program wherein a person is made capable of reflecting on his actions and behavior.

The Sensory Integration (SI) Theory believes that integrating the basic sensory systems, which are the foundations for learning, is essential to building on higher cognitive functions, including EF skills (Bundy et al., 2019; Vives-Villarraig et al., 2022). This supports the physical activity component of the program wherein movement-based activities and exercises will be used to target the basic sensory systems.

The Occupational Therapy for Children with ADHD: A Delineation Model of Practice uses a family-centered approach that makes use of environmental adaptation, task selection, and child factors (Chu & Reynolds, 2007). This supports the family education component of the program that teaches the families of children with ADHD how to integrate healthy sleep routines and reduce screen time.

Best Practices for Intervention

The author used evidence-based research to propose a program, *Build Your EF*, that combines cognitive training, physical activity, and family education to address EF skills. This 24-week program will be limited to children diagnosed with ADHD, aged 6-9 years old. For the first week of the intervention, a complete assessment of EF skills will be used. Questionnaires and standardized assessments will be conducted to assess the child's baseline skills. In the second week of the program, parents and caregivers of the child will be educated via handouts and talks on the benefits of reducing screen time and having a consistent sleep routine for the children to follow. For weeks 3-23, each EF skill

will be targeted through a set of activities. For the last week of the program, a reassessment will be conducted to compare the EF skills of the children before and after undergoing the program.

Assessments and Outcome Measures

Build Your EF: An intervention program combining cognitive training, physical activity, and family education for children with ADHD will be evaluated in three phases. The first phase of assessment will be conducted before the child participates in the program. This will measure the child's baseline skills prior to the intervention. Then, immediately after the intervention, the second phase begins. This will occur at the 24th week, which is the final week of the intervention program. Here, the child's immediate improvements in EF will be assessed through standardized measures that will be recorded and analyzed to determine program outcomes in addition to qualitative information from questionnaires the parents will answer in an online survey. The third and last phase will be conducted three months after the intervention to assess the effectiveness of the program even months after its implementation. Here, standardized assessments and questionnaires using Google Forms will be conducted again to ensure the program's lasting effectiveness and client satisfaction.

Funding and Dissemination Plan

To be able to gather both OTs and program participants, conduct the program, and disseminate information about the program's results, a funding plan is necessary. To gather participants, the author aims to reach out to referral sources such as developmental pediatricians; and partner with private therapy centers. Meanwhile, to encourage OTs to

learn more about the program, the author plans to work together with the Philippine Academy of Occupational Therapists (PAOT) to spread information on the program. Once both OTs and program participants are set, the program can be conducted in private therapy centers. The private therapy centers will be given 20% of the income of the program as they will be providing the use of physical space, equipment, and other resources including printing materials and toys to be used. Finally, to disseminate information about the program, specific activities such as engaging in conference sessions and workshops will be provided for licensed occupational therapists, parents of children with ADHD, developmental pediatricians, and other healthcare professionals, and staff of local government units. All can help spread the program and its positive results to entice more children and families to participate.

Conclusion

The *Build Your EF Program*: An intervention program combining cognitive training, physical activity, and family education for children with ADHD combines evidence-based approaches to help clients develop executive functions (EF) This program was developed by an occupational therapist who aimed to fill the gap of the lack of intervention programs that contribute to the development of EF skills for children with ADHD. Evidence-base and theory-driven, the *Build Your EF Program* is a novel intervention that combines its three components into one program. Future directions of this program include a comprehensive program evaluation to assess the program's effectiveness, disseminating the program for use of other OTs, and funding the program to benefit more children. The *Build Your EF Program* advances occupational therapy in

terms of providing a novel intervention program to address executive functions for better occupational performance and life satisfaction of children with ADHD.

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APPENDIX D – Fact Sheet

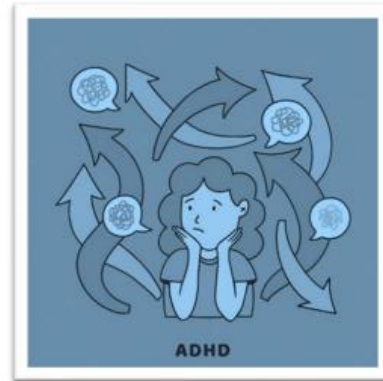
**BOSTON
UNIVERSITY**

*Build Your Executive Functions: An Intervention Program
Combining Cognitive Training, Physical Activity, and Family
Education for Children with ADHD*

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OTD Candidate

Executive functions and Attention-deficit/ hyperactivity Disorder

Executive functions (EFs) are higher cognitive processes that play an important role in directing thoughts and behaviors toward a functional goal (Ambrosini et al., 2019). There are certain medical diagnoses that relate to deficits in executive functions. In this doctoral project, the focus will primarily be on the diagnosis of **Attention-deficit/hyperactivity Disorder** (ADHD). Schwörer et al. (2020) report associated deficits in executive functions of children with ADHD. These deficits include difficulty in working memory, response inhibition, cognitive flexibility, emotional regulation, and planning and organization.



THE PROBLEM

There is a lack of occupational therapy interventions provided for school-aged children and youth with occupational performance issues that are associated with deficits in executive functions.

THE SOLUTION

An intervention program combining cognitive training, physical activity, and family education for children with ADHD



Cognitive Training

- Incorporation of labeling, reflection, and rule use
- Associating visual features with labels, which changes dimensional attention, a mechanism of executive function, by influencing object representations and guiding goal-directed behavior
- Effective strategies to induce flexible, adaptive behavior, include encouraging children to reflect on their actions rather than simply telling them when behavior is incorrect or inappropriate



Physical Activity

- Physical activity interventions are useful strategies to foster the development of children's cognition, including core executive functions and higher-level executive functions; curricular exercise and programs that increase time of physical activity are more likely to have effect on executive functions.



Family Education

- The home environment and parent participation have a prominent role in the development of executive functions in early childhood.
- In this intervention program, parents will be educated about the associated causes of deficits in EF such as long hours of screen time, the importance of following a daily schedule and managing the home environment, and problems that can arise from the lack of adequate sleep routine for children with ADHD.

EXPECTED OUTCOMES

- Increased child's occupational participation and parental satisfaction on the development of EF skills
- Decreased reported problems by parents and teachers related to child's executive dysfunction
- Increased quality of child's school and social participation as reported by parents and teachers

FUNDING and DISSEMINATION OF PROGRAM EVALUATION RESULTS

- Funding: In partnership with private therapy centers in the Philippines
- Dissemination: Workshops, conferences, and seminars with applied continuing professional development (CPD) units

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