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# Self management of daily life tasks in diploma-track youth with disabilities

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BOSTON UNIVERSITY  
SARGENT COLLEGE OF HEALTH AND REHABILITATION SCIENCES

Dissertation

**SELF MANAGEMENT OF DAILY LIFE TASKS IN  
DIPLOMA-TRACK YOUTH WITH DISABILITIES**

by

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Submitted in partial fulfillment of the  
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Doctor of Philosophy

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## **DEDICATION**

To my partner, Mike Munsell.

You take the concept of responsibility to a whole new level.

## **ACKNOWLEDGEMENTS**

I am honored to have had the opportunity to work with such an experienced and encouraging dissertation committee: Wendy Coster, Gael Orsmond, and Dan Fulford. Thank you for being generous with your time, providing thoughtful guidance, and helping me negotiate the unexpected turns and roadblocks I experienced as I completed this research. Dan Fulford provided practical and thoughtful feedback and encouragement. Gael Orsmond served as a secondary mentor to me and was committed to providing opportunities for me to develop my research skills through my work on the ROAD Ahead project. My mentor, Wendy Coster, guided me through my time in the doctoral program and has challenged me to become a more confident, thoughtful, and independent researcher. I have admired Wendy's work since I arrived at BU's Occupational Therapy department as an MSOT student. To have had the opportunity to learn from Wendy, work alongside her, and get to know her has been an opportunity of a lifetime.

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DIPLOMA-TRACK YOUTH WITH DISABILITIES**

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**ABSTRACT**

Academically capable youth with disabilities often have daily functioning challenges that impact adulthood outcomes. The studies in this dissertation address this concern by focusing specifically on a particular area of challenge: the ability to take over the decision making, problem solving, and organization needed to carry out complex daily life tasks in real life contexts. The purpose of the two studies were to: (1) distinguish deficits in discrete skills from challenges organizing skills to self-manage complex tasks associated with adult roles and (2) explore the extent to which challenges in social, cognitive and behavioral factors relate to self-management of daily life tasks.

In Study 1, data from the National Longitudinal Transition Study-2 (NLTS2) were analyzed using a structural equation modeling approach to test associations between executive functioning, behavioral health, and social communication skills and self-management of daily life tasks in youth who graduated with a high school diploma. The model findings were compared with an alternate model testing the associations of the underlying factors and discrete functional skills. Study 1 findings indicated that challenges in underlying factors in diploma-track youth with disabilities are more strongly associated with the ability to self-manage life tasks, supporting the conceptual



distinction between daily task management and discrete, foundational functional skills. While this study provided a generalizable model of factors associated with management of life tasks for academically capable youth with disabilities, this study was limited in that the variables were not specifically tailored to the constructs of interest, thus providing a broad, yet possibly imprecise picture of the relationships among these variables.

Study 2 expanded on Study 1, providing a more detailed investigation of the factors associated with self-management of daily life tasks by using measures that were specifically selected to represent metacognition, internalizing behaviors, and social communication skills within a sample of academically capable autistic youth ( $N= 46$ ). Study findings suggested that all three factors are associated with the ability to manage complex tasks, with executive functioning partially mediating the association between social communication skills and internalizing behaviors on task management.

Together, the study findings confirm self-management of daily life tasks as a distinct area of challenge for academically capable youth with disabilities and provide a more detailed understanding of what is breaking down in the process of learning to manage life tasks and participate in valued adult roles. These findings can ultimately provide guidance on how to design targeted interventions in order to enable participation in independent living and productivity for academically capable youth with disabilities as well as highlight a potential target for outcome measurement in intervention studies that aim to improve daily life functioning and participation in the community.

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## **LIST OF ABBREVIATIONS**

**ADHD:** Attention deficit hyperactivity disorder

**EF:** Executive function

**ICF:** International Classification of Function, Disability and Health

**IQ:** Intelligence quotient

**NLTS2:** National Longitudinal Transition Study-2

**SMDLT:** Self-management of daily life tasks

## INTRODUCTION

Taking responsibility for one's own life (i.e., taking control over organizing and managing daily life tasks) is a key feature of the transition from adolescence to adulthood and is important for success in adulthood including living independently, participating in the community, attending post-secondary education, and gaining and maintaining employment (Goodnow, 1988; Kao, Kramer, Liljenquist, & Coster, 2015; Salusky et al., 2014; Singg & Ader, 2001). However, the term "responsibility" has been defined and studied in many different ways in the literature (Arnett, 2001; Haley, Coster, Dumas, Fragala-Pinkham, & Moed, 2012; Mergler & Patton, 2007; Ochs & Izquierdo, 2009; Raffaelli et al., 2017; Roberts, Chernyshenko, Stark, & Goldberg, 2005; Rogoff, 1990; Salusky et al., 2014; Schlenker, Britt, Pennington, Murphy, & Doherty, 1994; Singg & Ader, 2001; Such & Walker, 2004; Warton & Goodnow, 1991; Weisner, 2001; White & Brinkerhoff, 1981; Wood, Larson, & Brown, 2009). Currently there is no agreed-upon conceptual model of responsibility that integrates the literature from various disciplines to provide a comprehensive understanding of how youth take responsibility for their lives. In the introduction of this dissertation, I will provide an overview of the concept of taking responsibility and cover the following topics:

- I. The theoretical background on the construct of daily responsibilities
  - a. Defining taking responsibility for one's life
  - b. A summary of research describing the development of responsibility

- c. A discussion of the limited conceptual literature related to responsibility development for youth with disabilities
- II. Situating the exploration of daily responsibilities within the field of rehabilitation sciences
- III. Summary of studies included in this dissertation

### **Theoretical background on the construct of daily responsibilities**

Figure 1 presents a proposed conceptual model developed from a synthesis of eight areas of literature (Table 1) addressing the broader construct of taking responsibility for one's own life. This section will discuss a key differentiation between the various conceptualizations of responsibility: responsibility as an internal experience versus responsibility as behavioral competency. While nearly all areas of literature discuss both aspects of responsibility, most definitions emphasize one aspect over the other.

### **Defining taking responsibility for one's life**

**Taking responsibility for one's own life as an internal experience.** Literature from childhood work, personal responsibility, positive youth development, emerging adulthood, youth perspectives of responsibility, and the big five personality traits discuss responsibility as an internal, subjective experience (Arnett, 2000; Bogg & Roberts, 2004; Goodnow, Bowes, Warton, Dawes, & Taylor, 1991; Mergler & Patton, 2007; Such & Walker, 2004; Wood et al., 2009). I use the phrase "internal experience" to describe processes or states that happen within the person and are not directly observable. They may be cognitive, affective, or psychological in nature. Studies investigating the internal experience of responsibility generally focus on attitudes or values held by youth or

others' perceptions of youth, rather than behavioral actions carried out by youth. The conceptualization of responsibility as an internal experience may involve one or more of the following components.

***Moral reasoning.*** Research in the areas related to childhood work (e.g., schoolwork, housework, chores, care for other family members) and positive youth development include the development of moral reasoning in the conceptualization of taking responsibility for one's own life (Larson, 2004; Ochs & Izquierdo, 2009; Warton & Goodnow, 1991; White & Brinkerhoff, 1981). Ochs and Izquierdo (2009) describe this aspect of responsibility as "a generative, cross-situational awareness of...other's needs and desires" (p. 391). Moral responsibility entails the concepts of compassion, social awareness, social responsiveness, and reliability to others (Larson, 2004; Ochs & Izquierdo, 2009; Raffaelli et al., 2017; Warton & Goodnow, 1991; Wood et al., 2009) and is rooted in Piaget's and Kohlberg's theories about the development of moral character (White & Brinkerhoff, 1981). For example, possessing moral responsibility means that one understands their social role and recognizes a commitment to their community (Ochs & Izquierdo, 2009).

***Personal accountability.*** Another component of the subjective, internal experience of responsibility described in the literature involves "accepting accountability for one's action, or lack of action, and the resulting consequence(s)" (Mergler & Patton, 2007, p. 58). Personal accountability as an aspect of the concept of taking responsibility for one's own life is discussed primarily in emerging adulthood literature and personal responsibility literature, but is also mentioned in some childhood work literature (Arnett,



2000, 2001, 2007b; Mergler & Patton, 2007; Ochs & Izquierdo, 2009). An orientation towards accepting responsibility for oneself and making independent decisions is seen as part of the subjective experience of becoming an adult (Arnett, 2000) or the development of one's self-concept during adolescence (Mergler & Patton, 2007). Personal responsibility literature also describes a reasoning process that contributes to youth learning to hold oneself or others accountable for actions (Schlenker, Mergler & Patton, 2007).

***Self-reliance.*** Youth seeing themselves as self-reliant or self-sufficient is also described as part of the internal experience of taking responsibility for one's own life. In addition to accepting responsibility for oneself (personal accountability), emerging adulthood literature also emphasizes the concept of being self-sufficient as a key feature of becoming an adult (Arnett, 2000, 2001). Ochs and Izquierdo (2009) expand on this concept within the context of childhood work, describing self-reliance as developing a perspective of not expecting others do for you what you can do for yourself. Adopting a perspective of self-reliance involves recognizing one's capabilities as well as one's moral obligation to others in their social milieu.

***Identity.*** Many areas of the responsibility literature focus on seeing oneself as responsible or being viewed as a responsible person by others. Responsibility-related literature from the five factor theory of personality and emerging adulthood literature proposes that seeing oneself as responsible and capable of making responsible decisions is a key component of achieving adulthood and becomes more important to one's self-concept with age (Arnett, 2000, 2001; Wood et al., 2009). Achieving the identity of a

“responsible person” is also recognized in the literature as an outcome of one’s actions or natural development. For example, studies of youth’s perspectives of responsibility describe how they construct an identity as a moral and responsible person as a result of being given responsibilities and carrying out responsible actions (Bjerke, 2011; Such & Walker, 2004).

***Personality/character trait.*** The construction of being responsible for one’s own life as a personality or character trait is based in the five factor theory of personality. According to this theory, responsibility is one of six sub-facets that comprise the personality trait of “conscientiousness” (Bogg & Roberts, 2004; Caspi, Roberts, & Shiner, 2005; Roberts & Bogg, 2004; Roberts et al., 2005; Salusky et al., 2014). Here, responsibility is defined as possessing the trait of “dutifulness, reliability, and socialization” (Bogg & Roberts, 2004, p. 890; Roberts & Bogg, 2004, p. 328), or “someone who follows through with and complies with obligations” (Salusky et al., 2014, p. 417). While the traditional conceptualization of responsibility based on the five factor theory of personality includes some of the previously described components of the construct (e.g., moral reasoning, self-reliance, personal accountability), a major difference is that taking responsibility for one’s life is thought of as a personality trait that is relatively constant or static, as opposed to having the potential to change or develop with experience and in response to one’s environment (McCrae & Costa, 2010).

**Responsibility as the ability to demonstrate behavioral competency.** Literature in the areas of childhood work, guided participation, behavioral autonomy, and youth perspectives of responsibility primarily define responsibility as an ability to demonstrate

behavioral competency in real-life contexts. Across much of this literature (Haley et al., 2012; Kao, Coster, Cohn, & Orsmond, 2021; Kao et al., 2015; Warton & Goodnow, 1991), demonstrating responsibility in one's life includes "knowing what tasks need to get done and when to do them, getting the task done on one's own or orchestrating resources to get it done, evaluating if the task was performed properly, identifying solutions if there is a problem, and solving problems until the task is completed satisfactorily" (Kao et al., 2015, p. 68). From a perspective of behavioral competency, having responsibility involves internal processes (e.g., cognition) but is ultimately demonstrated through an individual's observable actions. That is, taking responsibility for one's own life means having and using multiple skills or abilities in unison to complete obligations and fulfill daily life tasks concerning oneself and others (Warton & Goodnow, 1991). There are two commonalities across the literature in this area: demonstrating responsibility involves (a) a shift in management of behaviors by others (e.g., a parent) towards self-management (Goodnow, 1988; Goodnow et al., 1991; Rogoff, 1990) that may lead to increased autonomy (Bjerke, 2011; Such & Walker, 2004; Wray-Lake, Crouter, & McHale, 2010) and (b) real-life participation in a variety of domains (Kao et al., 2015).

***Shift in management of behaviors by others towards self-management.***

Childhood work and guided participation literature have used the context of household work as a way to understand and describe a shift in responsibility from parents to youth. The transition from youth's role of "helping" towards "being responsible" for one's own life is characterized by a shift in the youth's involvement in goal setting, carrying out

tasks, and the level of adult supervision (Goodnow, 1988; Goodnow et al., 1991; Rogoff, 1990; Warton & Goodnow, 1991). Literature on youth's perspectives of responsibility and childhood work extend the description of responsibility beyond demonstrating skills to carry out tasks to include increased autonomy in how one chooses to live their life (Bjerke, 2011; Daddis & Smetana, 2005; Such & Walker, 2004; Wray-Lake et al., 2010). In some literature, the shift in decision making from parents to adolescents is labeled as "behavioral autonomy," defined as the "ability to make independent decisions, developed through a gradual transactional process between parents and children" (Daddis & Smetana, 2005, p. 371; Wray-Lake et al., 2010). As youth develop responsibility they are afforded more opportunities to negotiate with adults regarding how and when daily life tasks are done. The ability to negotiate and become more involved in goal setting around carrying out tasks is seen by youth as an opportunity for increased autonomy, power, and choice in their lives (Bjerke, 2011; Such & Walker, 2004).

***Individual domain.*** The domains in which youth take responsibility for their lives are inconsistently defined and labeled across areas of literature. However, most areas of literature include some form of behavior in the individual domain (Bjerke, 2011; Bowes, Flanagan, & Taylor, 2001; Daddis & Smetana, 2005; de França Drummond, Gomes, Coster, & Mancini, 2015; Dunn, 2004; Goodnow, 1988; Grolnick et al., 2014; White & Brinkerhoff, 1981; Wray-Lake et al., 2010). The individual domain involves demonstrating responsibility for one's own belongings and space (Dunn, 2004; White & Brinkerhoff, 1981), including carrying out tasks such as picking up toys, cleaning one's room, or making one's bed. Behavioral competency in the individual domain also

includes self-care activities such as maintaining one's personal hygiene, getting enough sleep, getting ready for school, etc. (Bjerke, 2011; Bowes et al., 2001; Grolnick et al., 2014). Bjerke (2011) highlights that tasks in the individual domain can extend across contexts. For example, many of the tasks may take place in the youth's home; however, youth are also responsible for taking care of their own belongings in school (e.g., homework, classroom materials) and in the community (e.g., bikes, pets). Results of developmental studies show that youth in the United States often first take over responsibility for tasks in the individual domain before experiencing the shift in responsibility in other domains (Dunn, Coster, Cohn, & Orsmond, 2009; Goodnow et al., 1991). One explanation for this is that decisions in the individual domain primarily impact the youth and have little impact on others, thus adults may be more willing to allow responsibility to shift to youth for these tasks (Dunn, Coster, Orsmond, & Cohn, 2009; Wray-Lake et al., 2010).

***Collective domain.*** Taking responsibility for one's own life in the collective domain involves caring for common community spaces and others in one's social environment (Dunn, 2004; White & Brinkerhoff, 1981). Demonstrating responsibility in this domain stems from a concern for the welfare of others and is influenced by cultural norms within the family, community, and society (Bowes et al., 2001; Ochs & Izquierdo, 2009; Wray-Lake et al., 2010). Accordingly, cultural norms serve as guidelines for defining responsible behavior across the contexts of home, school, and local community (Wray-Lake et al., 2010). Tasks in the collective domain include household and family care tasks such as monitoring and completing laundry and caring for siblings, tasks at

school such as cleaning the classroom and helping to enforce classroom rules, and tasks in the community such as not littering and maintaining toys and equipment in parks and other community spaces (Bjerke, 2011; White & Brinkerhoff, 1981).

***Moral domain.*** Taking responsibility within the moral domain can be conceptualized as an extension of demonstrating responsibility in the collective domain. Actions in the collective domain may arise from a concern for the welfare of others; thus, a component of the collective domain involves a moral orientation to act in a considerate and thoughtful way towards others (Bjerke, 2011; Bowes et al., 2001). Actions guided by a set of pro-social values fit best within the definition of the moral domain (Wray-Lake et al., 2010; Wray-Lake, Syvertsen, & Flanagan, 2016). Behaviors in this domain include demonstrating “manners” as dictated by cultural norms, supporting friends, following school rules, helping others, and being inclusive towards others (Bjerke, 2011). It should be noted that the definition of responsibility within the moral domain ties closely into the internal experience of responsibility, including self-reliance and moral reasoning. Both aspects of responsibility involve being attuned to what is occurring in one’s social milieu; however, here the focus of taking responsibility for one’s life is on one’s outward actions and behaviors in relation to others in the social environment (Ochs & Izquierdo, 2009).

***Prudential/health and safety domain.*** Taking responsibility for one’s own life in this domain includes freedom of choice over behaviors that have potential negative consequences for health and safety. The term “prudential responsibly” is found in behavioral autonomy and youth perspectives literature and is related to the idea of autonomy gained through demonstrating responsibility (Daddis & Smetana, 2005; Wray-

Lake et al., 2010). Tasks and behaviors in this domain include being careful when crossing the road, avoiding dangerous locations, staying home alone, etc. (Bjerke, 2011; Daddis & Smetana, 2005).

## **Conclusion**

The proposed conceptual model lends itself to multiple approaches to defining responsibility depending on the aspect of the model on which one chooses to focus. In this dissertation, I explore the behavioral competency portion of responsibility. While other factors in the model (e.g., one's internal experience of responsibility) could impact behavioral competency, focusing specifically on behavioral competency highlights youth's functional performance across a variety of domains and contexts. This definition of taking responsibility for daily life tasks may be particularly relevant to youth with disabilities as they often experience challenges in the process of learning to manage the responsibilities of adulthood (Antshel et al., 2010; Barf et al., 2009; Barkley, Fischer, Smallish, & Fletcher, 2006; Grinblat & Rosenblum, 2016; Kuriyan et al., 2013; Sharfi & Rosenblum, 2016). Focusing on responsibility as a behavioral competency can provide a target for evaluating the functional performance challenges youth may experience in their daily lives and provide guidance for interventions to address this area.

### **The development of responsibility for daily life tasks**

The development of responsibility for daily life tasks is described in the literature as taking place via four main avenues: (a) opportunities for participation, (b) experience in social roles, (c) scaffolding by adults, and (d) opportunities for decision making.

## **Opportunities for participation**

Participation across contexts is an important way that youth develop the skills they need to carry out responsible behaviors, which can ultimately impact youth's internal experience of responsibility (Dunn & Gardner, 2013; Goodnow, 1988; Kao et al., 2015; Ochs & Izquierdo, 2009; Weisner, 2001). Opportunities for participation may arise in various contexts, including youth's home, school, or community. It is through this participation that more experienced adults monitor and negotiate what the child is able to do, the child gains practice and experience, and adults have opportunities to teach the child what they might need to know to become more responsible. Bjerke's (2011) discussion of the "participating child" suggests that, like adults, children have the potential to participate across multiple contexts in a way that is valuable to society. Providing youth with opportunities for participation allows youth to be viewed as responsible beings by themselves and others.

## **Experience in social roles**

Much of the literature on how experiences in social roles impact responsibility comes from emerging adulthood and five factor theory of personality literature (e.g., Arnett, 2000; Roberts and Bogg, 2004; Salusky et al., 2014). This literature generally underemphasizes the influence of behavioral competency on one's internal conception of responsibility; however, the concepts of participation (involving practice, experiencing consequences, and gaining feedback or instruction from more experienced adults) and experience in social roles are, in fact, complementary. Part of participation across contexts can involve youth taking on different social roles that embody different, and



often gradually more challenging expectations for demonstrating responsibility. For example, Roberts and Bogg (2004) note that consistent experiences in employment or long term romantic relationships are related to increases in one's internal experience of taking responsibility. Arnett (2000) recognizes that youth who experience parenthood shift their identity to view themselves as responsible adults. Salusky et al. (2014) describe how taking on social roles brings about behavioral competency and thus, changes in internal experiences of responsibility for youth in youth programs: social roles act as "mechanisms that provide structured behavioral expectations" (p. 418). Accordingly, meeting these expectations improves behavioral competency and influences one's perception of themselves as responsible (Salusky et al., 2014). Furthermore, displaying behavioral competency may also impact youth's self-identity by opening up opportunities for youth to take on new "adult" roles in their society (Kao et al., 2015).

### **Scaffolding by adults**

Participation may be most effective in guiding youth to take responsibility for their own life when the adults in their social environments provide scaffolding to their participation. This experience of mutual participation incorporates five central processes: (a) shared problem solving, (b) importance of routine activities, (c) tacit and explicit communication, (d) structuring efforts of novices, and (e) transfer of responsibility for handling skills from experts to novices (Rogoff, 1990). For example, consider learning to manage laundry tasks. At first, the parent may serve as a model of participation with the child primarily as an observer, but with successive participation, the child will begin to take on additional responsibility for tasks of increasing complexity: folding the washed

clothes, loading the washing machine when asked, and ultimately, managing the entire task from determining when laundry needs to be completed through task completion. It is through this participation that the child and parents monitor and negotiate what the child is able to do and parents have opportunities to teach the child new skills and strategies to develop responsibility. Goodnow (1988) uses the context of household work to demonstrate that not all forms of participation may be equal: “efficient execution of chores [by the parent] makes for inefficient teaching of the young” (p. 14). Plainly stated, youth learning through participation is facilitated when adults teach skills and strategies with gradually decreasing scaffolding. This process impacts responsibility at the level of behavioral competence and internal experience (Goodnow, 1988; Weisner, 2001).

Rogoff’s sociohistoric-cultural theory describes the process through which the shift in responsibility from parents to youth takes place as “guided participation” (Rogoff, 1990). In guided participation, skilled “experts” guide “novices” in learning skills in a new domain through mutual participation within their cultural context (Larson, 2004; Rogoff, 1990, 2003). Through guided participation, responsibility for daily life tasks naturally and gradually shifts from experts (e.g., parents, caregivers, etc.) to the youth, until the youth is able to manage valued tasks independently (Kao et al., 2021; Larson, 2004). This process takes place within the youth’s social environment and valued skills are determined by shared cultural beliefs about what constitutes “responsibility” in adulthood (Rogoff, 2003). As such, youth have an active role in interacting with other members of their society to learn culturally valued behavioral competencies needed to become more autonomous (de França Drummond et al., 2015; Dunn, 2004; Dunn &

Gardner, 2013; Rogoff, 1990). Although children's household work is frequently used as the model of guided participation (Goodnow, 1988; Grolnick et al., 2014; Larson, 2004; Rogoff, 1990, 2003), this process has also been described in the context of youth programs (Salusky et al., 2014). Program leaders scaffold youth's experiences to progressively allow youth to take on more challenging obligations, building skills to increase responsibility, and, in turn, reinforcing youth's internal conception of themselves as a responsible person (Salusky et al., 2014).

### **Opportunities for decision making**

Opportunity for youth to make decisions is inherent in the shift in management of tasks by others (e.g., parents) towards self-management. Self-determination theory recognizes that independent decision making, expression of preferences, and choice making impacts youth's autonomy, agency, and identity development (Wehmeyer & Shogren, 2017). The internal conception of responsibility also involves enacting self-determination and agency. Emerging adulthood literature focuses on the need to demonstrate agency (acting on a belief that one is in control of one's decisions and responsible for outcomes) in order to achieve an adult identity (Arnett, 2000). Similarly, the development of responsibility has been coupled with self-determination in literature on childhood work (Grolnick et al., 2014). A key feature of the guided participation process is experiencing a shift from the parent as primary decision maker to youth-driven decision making with age and experience (Wray-Lake et al., 2010). An investigation of parents' scaffolding of household work shows that the type of support provided by the parent can help or inhibit self-determination, which may ultimately impact youth's

internal experience of responsibility (Grolnick et al., 2014).

**Lack of conceptual literature related to responsibility development for youth with disabilities**

The proposed conceptual model (Figure 1) is intended to be an organizational structure for understanding how different areas of literature relate to other areas.

However, much of the literature used to develop the conceptual model does not directly address the concept of taking responsibility for one's life for youth with disabilities. This may impact the usefulness of the conceptual model, as it may not be completely generalizable to this population.

Despite the limited conceptual literature specific to youth with disabilities, features of responsibility have been an area of investigation in this population, particularly in the literature related to adaptive behavior. The construct of adaptive behavior, defined as “conceptual, social and practical skills performed by people in their everyday lives” (AAIDD, 2010), encompasses a range of skills and abilities from discrete functional skills to complex tasks taking place within varying contexts. Studies consistently report that individuals with disabilities such as autism spectrum disorder, mental health conditions, and attention deficit disorder (ADD/ADHD) are more likely to show limitations in adaptive behavior compared to same age peers (Balboni, Incognito, Belacchi, Bonichini, & Cubelli, 2017; Buelow et al., 2012; Farmer, Swineford, Swedo, & Thurm, 2018; Tarazi, Mahone, & Zabel, 2007). Further, adaptive behavior challenges are independent of intelligence quotient (IQ) and thus may also be found among youth with disabilities who are academically capable, for example, who graduate high school with a

regular diploma (Alvares et al., 2020; Baker, Stavropoulos, Baker, & Blacher, 2021; Buelow et al., 2012; Kraper, Kenworthy, Popal, Martin, & Wallace, 2017; Tassé, Luckasson, & Schalock, 2016). Research on adaptive behavior has also established a link between adaptive behavior challenges and poor traditional adulthood outcomes (Clarke, McCauley, & Lord, 2020; Stephens, Collins, & Dodder, 2005). However, measures of adaptive behavior that are widely used in research include items that are more concrete, foundational and discrete (e.g., tells time using digital clock) as well as more complex task management items (e.g., plans his/her monthly expenses and sticks to the plan). Academically capable youth with disabilities are not likely to have difficulty with acquiring more basic skills included in adaptive behavior scales; rather, they are likely to be challenged by more complex tasks that require higher-order cognitive abilities. As such, the range of items included in adaptive behavior measures make it difficult to distinguish task-level challenges from problems acquiring discrete skills (Gleason & Coster, 2012) and limit our ability to focus specifically on the area of suspected limitation for academically capable youth with disabilities: the youth's performance of the complex self-management tasks needed to meet the responsibilities of adult roles.

In this dissertation, I focus specifically on measuring the ability to self-manage daily life tasks in order to provide a more targeted understanding of this area of challenge for academically capable youth with disabilities. The approach to measuring daily task management is based on a distinction demonstrated by the authors of the Pediatric Evaluation of Disability Inventory - Computer Adaptive Test (PEDI-CAT; Haley, Coster, Dumas, Fragala-Pinkham, & Moed, 2012). The Responsibility domain of the PEDI-CAT

captures the construct of self-management of daily life tasks separately from daily activities, social/cognitive, and mobility skills domains. The four factor solution for the PEDI-CAT domains was confirmed by factor analysis of a large sample of youth with and without disabilities (Haley et al., 2011), suggesting that while related, self-management of daily life tasks and the ability to carry out discrete daily activities are conceptually distinct. In distinguishing complex task management from foundational functional skills, we can explore more specifically what influences the ability to self-manage daily tasks and how to best address the development of the skills needed to do so.

### **Managing daily responsibilities within the ICF**

The International Classification of Functioning, Disability and Health (ICF) (Figure 2) (World Health Organization, 2001) provides a framework to distinguish important aspects of the concept of daily task management. The daily life tasks that are the focus of this dissertation are classified as **activity** in the ICF model, defined as “the execution of a specific task or action”. This definition is broad and captures a continuum of activities from simple discrete skills (e.g., reaching for a cup) to more complex activities in which multiple skills are used together (e.g., cleaning one’s cooking area and utensils) (Coster & Khetani, 2008; World Health Organization, 2001). As noted in the previous section, youth with disabilities who are academically capable may be less likely to have difficulty acquiring simple, foundational functional skills. Therefore, in this dissertation I will focus on activities at the complex end of the activity continuum that most directly support **participation in life situations** such as independent living, employment, and post-secondary education. These are activities that require higher-order

cognitive abilities that may be affected by a variety of disability conditions experienced by academically capable youth. For instance, academically capable youth with disabilities may experience challenges responding to environmental conditions, making maximal use of the available resources, and modifying their environment as needed (e.g., asking for help that they need) in order to manage important daily tasks. Figure 3 summarizes where self-management of daily life tasks is situated within the ICF and the other factors that may influence task management.

In the ICF framework the environment influences activity and participation. The **environment** in which activities take place can support or inhibit participation for all individuals (World Health Organization, 2001); however, the environment may differentially affect participation across individuals depending on other factors, such as an individual's abilities or skills. Academically capable youth with disabilities have average intellectual ability and demonstrate many of the basic skills needed for post-secondary education, employment, or independent living, (e.g., dressing oneself, preparing simple meals, counting money, sending an email, etc.). Consequently, it may be assumed that these individuals' skill level matches the demands of typical culturally-valued environments post-high school (e.g., working at a job, attending college), as it generally does for youth without disabilities. However, the poor participation outcomes reported in the literature on academically capable youth with disabilities suggest that this may not be the case. It may be that difficulty carrying out more complex functional skills, such as those needed to organize and manage the responsibilities of adulthood (Alvares et al., 2020; Hill, Gray, Kamps, & Varela, 2015; Kanne et al., 2011; Kraper et al., 2017; Lee

& Park, 2007; Meyer et al., 2018), is causing an unanticipated gap in the match between the expectations in typical environments and the youths' skill level. In a qualitative study of the experiences of autistic<sup>1</sup> youth and their parents during the transition to adulthood, First et al. (2016) summarized this challenge: "The unpredictability of transitioning into new environments was particularly stressful for many of the adolescent participants. Caregivers and adolescents reported difficulties with youth adapting to the changes of entering adulthood and managing multiple responsibilities" (p. 227). In other qualitative accounts, parents shared that youth need services and supports to learn life skills in addition to education and employment skills (Anderson, Sosnowy, Kuo, & Shattuck, 2018). For example, parents wanted counselors or job coaches to facilitate their youth's ability to manage daily life tasks such as communicating with employers about medical needs, paying bills, managing laundry, or grocery shopping and meal preparation (Anderson et al., 2018; First et al., 2016; Morrison, Sansosti, & Hadley, 2009). While accommodations may provide some supports in post-secondary education or employment settings, they are fairly limited and they do not appear to address more complex daily life tasks (Anderson, Stephenson, & Carter, 2017; Gelbar, Smith, & Reichow, 2014; Hedley et al., 2017; Lorenc et al., 2018). The inability to carry out complex activities in order to self-manage the demands of adulthood may constrain the types of environments in which youth with disabilities can successfully participate. Because they are more dependent on environmental supports to enable participation, they may experience less success in unaccommodating environments.

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<sup>1</sup> Identity first language used per Kenny et al. (2016)



In addition to the environment, body function limitations also may underlie the observed activity and participation limitations in academically capable youth with disabilities. **Body functions** include the underlying cognitive functions needed to put component skills together to facilitate self-management of daily life tasks. Executive functions, social communication skills, and behavioral and emotional health are three body functions that have consistently been identified in the literature as influences on daily functioning for academically capable youth with disabilities (Chavez-Arana et al., 2018; Demetriou et al., 2018; Follmer, 2018; Mullin, Perks, Haraden, Snyder, & Hankin, 2020; Silverstein et al., 2020; Whitehouse & Bishop, 2009). It is useful to note that these underlying body functions have been theoretically associated with adaptive behavior; however, there is some conceptual overlap between body functions and activities within the ICF for these domains. For example, shifting attention, time management, and working memory are body functions, but learning and applying knowledge is characterized as activity in the ICF (executive functions). Reception and expression of language and gestures are body functions, whereas communicating and receiving nonverbal messages are activities (social communication skills). Lastly, psychic stability and regulation of emotions are listed as body functions, while handling stress and other psychological demands are considered activities within the ICF (behavioral and emotional health). Indeed, many of the measures used to assess these underlying competencies (executive functions, social communication skills, and behavioral and emotional health) are in fact capturing the expression of these factors at the level of activity, as opposed to basic body functions. For example, the Behavior Rating Inventory

of Executive Function (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000) assessment captures the behavioral manifestation of executive function abilities but implies that the resulting score is a proxy for executive function at the body function level.

Regardless of the blurred distinction between body functions and the foundational skills or activities that the functions support, evidence suggests that these three factors (executive function, social communication skills, and emotional and behavioral health) support more complex task management. Many diploma-track youth with disabilities demonstrate executive functioning challenges (Chavez-Arana et al., 2018; Demetriou et al., 2018; Follmer, 2018; Mullin et al., 2020; Silverstein et al., 2020; Soares, Evans, & Patel, 2018; Vaidya et al., 2019), which have been negatively associated with daily functioning as operationalized by adaptive behavior measures (Perna, Loughan, & Talka, 2012; Pugliese et al., 2016; Sharfi & Rosenblum, 2016; Wallace et al., 2016). Weak social communication skills and poor behavioral and emotional health have also been associated with poor adaptive skills for youth with disabilities including autism, traumatic brain injury, mental health conditions, and ADHD (Baker et al., 2021; Gjervan, Hjemdal, & Nordahl, 2016; Hill et al., 2015; Kraper et al., 2017; Mullin et al., 2020; Wallace et al., 2016). In addition, there is evidence that these three constructs underlying daily functioning are interrelated (Al-Yagon, Forte, & Avrahami, 2020; Andersen, Skogli, Hovik, Egeland, & Øie, 2015; Mullin et al., 2020; Pugliese et al., 2016). These underlying factors have been examined in different combinations in previous literature related to daily functioning for youth with disabilities. However, it is likely that these factors interrelate and together influence the performance of complex tasks. Thus,

exploring the combined impact of these factors together, rather than independent from each other, would provide a more comprehensive picture of how they interact to influence self-management. The studies in this dissertation are the first to look at the relations among self-management of daily life tasks and executive function, social communication skills, and behavioral and emotional health together.

### **Summary of dissertation studies**

The overall research question for this dissertation was: *To what extent do executive functioning, social communication skills, and behavior and emotional health predict difficulty with managing daily life tasks in diploma-track youth with disabilities?*

The two studies in this dissertation focus specifically on academically capable youth who are on track to graduate with a regular high school diploma, referred to as “diploma-track” youth. These youth are assumed to have mastered the basic skills needed to adapt to typical environments in order to participate in adult roles, yet they face participation restrictions in these contexts. Both studies in this dissertation build on existing evidence of daily functioning challenges in youth with disabilities from studies using traditional adaptive behavior measures (Bal, Kim, Cheong, & Lord, 2015; Duncan & Bishop, 2015) by focusing more specifically on the proposed area of challenge for diploma-track youth: youth’s ability to take over the decision making, problem solving, and organization needed to carry out complex daily life tasks in real life contexts (Kao, Orsmond, Cohn, & Coster, 2020). The study findings provide a more detailed understanding of what is breaking down in the process of learning to manage life tasks and participate in valued adult roles through exploring how executive function, social communication skills, and

emotional and behavioral health relate and contribute to the ability to self-manage daily life tasks.

In Study 1 I used a subset of data from the National Longitudinal Transition Study-2 (NLTS2) conducted by SRI International for the U.S. Department of Education. The NLTS2 data provides a large sample that is representative of the national population of youth with disabilities who are receiving school-based special education services. This large data set allowed for complex statistical analyses and provided a generalizable model of factors associated with the construct of responsibility in daily life for diploma-track youth with disabilities. In this study, I tested the associations between executive functioning, behavioral health, and social communication skills on self-management of daily life tasks for high-school youth who ultimately graduated with a diploma. I also tested associations of the same three underlying factors and discrete functional skills. The associations in the two models were compared in order to explore the extent to which challenges in social, cognitive, and behavioral factors relate to these two aspects of daily functioning. Study 1 findings indicated that common areas of challenge in diploma-track youth with disabilities (executive functions, social and communication skills, and emotional and behavioral health) are more strongly associated with the ability to self-manage life tasks, supporting the conceptual distinction between daily task management and discrete, foundational functional skills. However, this study was limited in that the variables were selected from preexisting survey items and were not specifically tailored to the constructs of interest, thus providing a broad, yet possibly imprecise picture of the relationships among these variables. In particular, despite it being well established in the

literature that diploma-track youth with disabilities often have executive functioning challenges that make it difficult for them to negotiate common occurrences that they face when engaging in daily tasks (Chavez-Arana et al., 2018; Demetriou et al., 2018; Follmer, 2018; Mullin et al., 2020; Silverstein et al., 2020; Soares et al., 2018; Vaidya et al., 2019), the lack of variables that address executive functioning in the NLTS2 data set limited the ability to treat executive functioning as separate predictor from the other underlying factors in this study.

Study 2 explored the overall research question within a sample of diploma-track autistic youth. It is likely that many autistic youth display features of all three of these underlying factors due to the high incidence of anxiety and depression and executive dysfunction in this population (American Psychiatric Association, 2013; Bauminger, Solomon, & Rogers, 2010). However, previous investigations of these factors in autistic youth without intellectual disability have not yet explored all three factors together (Duncan & Bishop, 2015; Kraper et al., 2017; Pugliese et al., 2016, 2015; Wallace et al., 2016). In addition, Study 2 expanded on Study 1 by providing a more detailed investigation of the factors associated with self-management of daily life task by using measures that were specifically selected to represent the variables of interest. In this study I explored complex associations between the underlying factors of internalizing behavior, social communication skills, and executive functioning as they relate to self-management of daily life tasks. Study findings suggested that executive functioning partially mediated the association between social communication skills and internalizing behaviors on task management and emphasized the influence that strong executive functioning skills may

have on mitigating other challenges that contribute to poor daily task management.

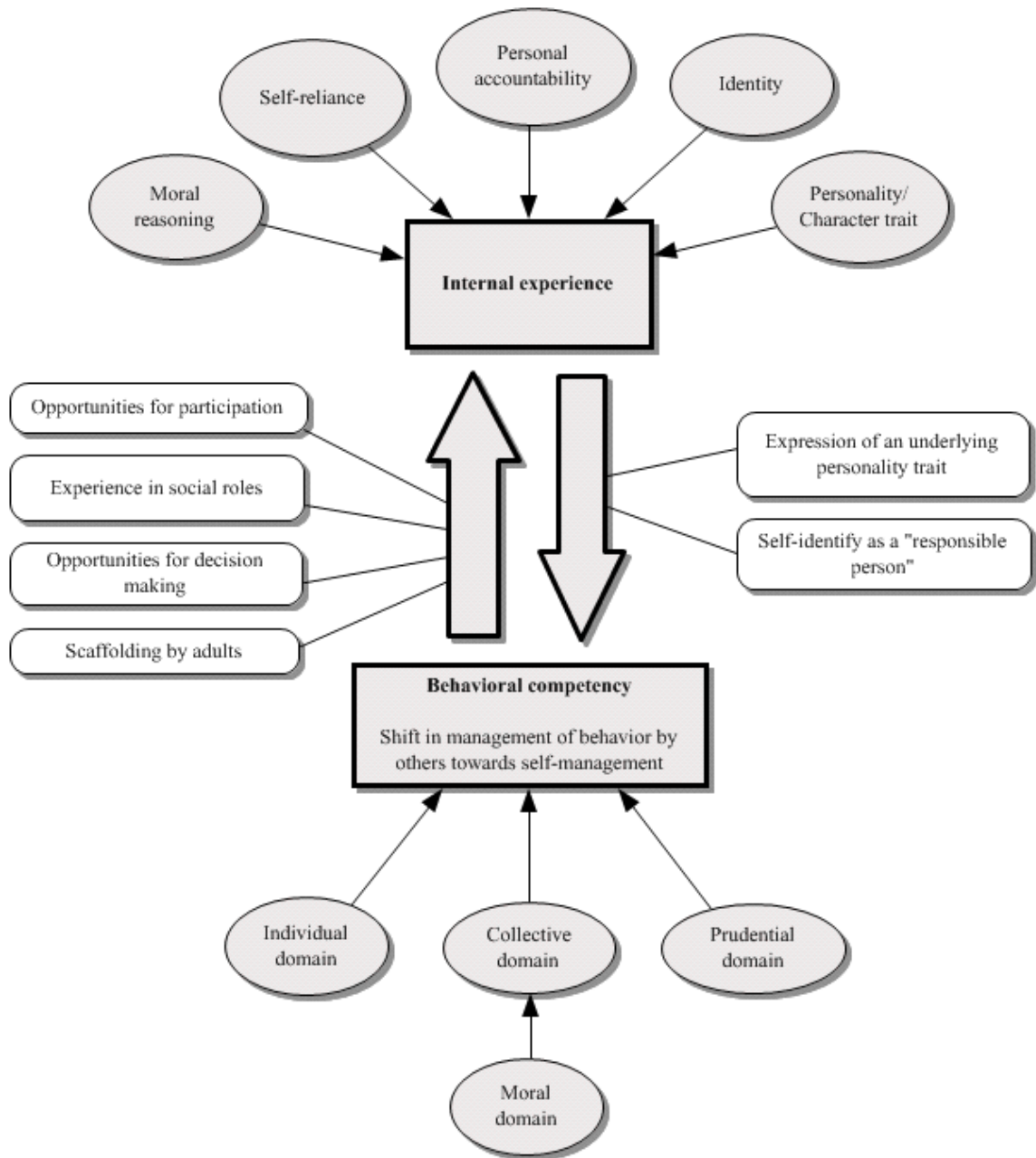
Together, the findings from these dissertation studies help refine our understanding of the difficulties identified among youth with disabilities using traditional adaptive behavior measures. Focusing on the construct of self-management of daily life tasks in academically capable youth with disabilities enables a more direct examination of the challenges that likely contribute to their difficulty achieving adult outcomes commensurate with their academic performance. Ultimately, an improved understanding of the construct of self-management of daily life tasks can provide guidance on how to design targeted interventions in order to enable participation in independent living and productivity for academically capable youth with disabilities as well as highlight a potential target for outcome measurement in intervention studies that aim to improve daily life functioning and participation in the community.

**Table 1***Eight areas of responsibility literature*

Area of literature	Selection of key responsibility references
Emerging adulthood	(Arnett, 2000, 2001; Schwartz, Côté, & Arnett, 2005)
Childhood work	(Goodnow, 1988; Goodnow, Bowes, Warton, Dawes, & Taylor, 1991; Larson, 2004; Ochs & Izquierdo, 2009; Warton & Goodnow, 1991; White & Brinkerhoff, 1981)
Behavioral autonomy	(Daddis & Smetana, 2005; Wray-Lake et al., 2010, 2016)
Youth perspectives of responsibility	(Bjerke, 2011; Such & Walker, 2004)
Five factor theory of personality	(Bogg & Roberts, 2004; Roberts & Bogg, 2004; Roberts et al., 2005)
Positive youth development	(Raffaelli et al., 2017; Salusky et al., 2014; Wood et al., 2009)
Personal responsibility	(Mergler & Patton, 2007; Mergler & Shield, 2016; Schlenker et al., 1994)
Guided participation	(Dunn, 2004; Kao et al., 2015; Rogoff, 1990, 2003)

**Figure 1**

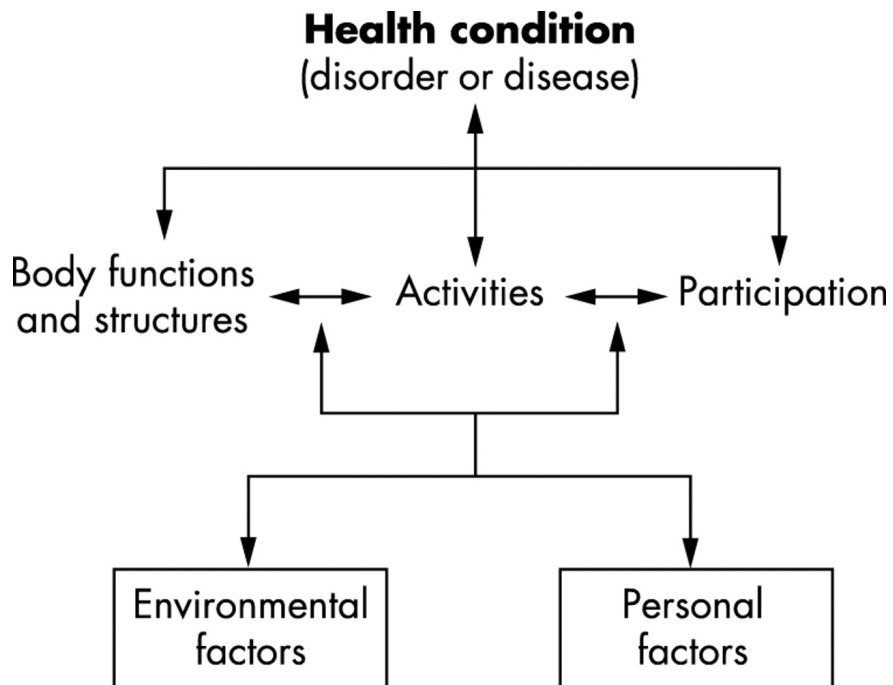
*Conceptual model of responsibility*





**Figure 2**

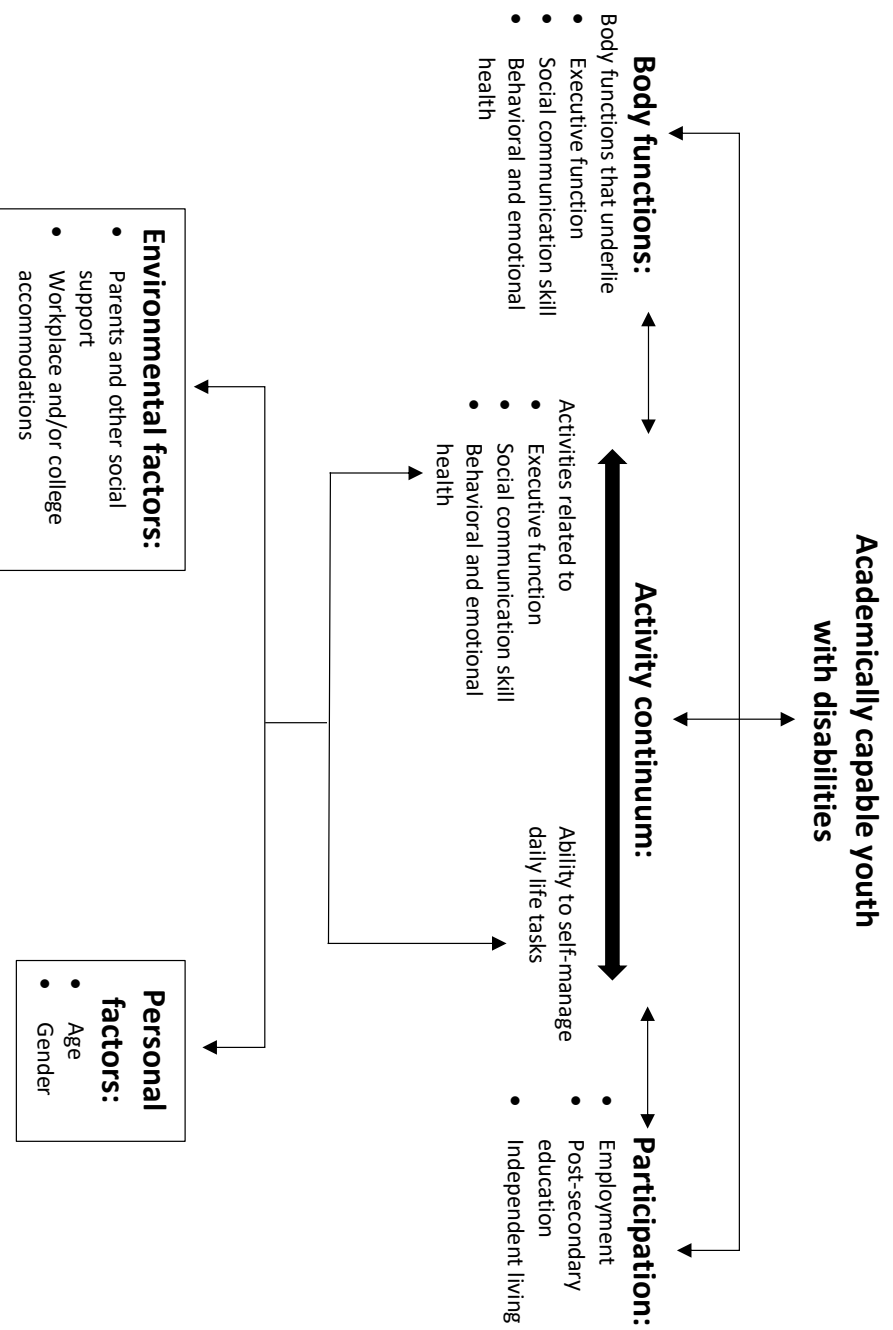
*International Classification of Functioning, Disability and Health (ICF)*



*Notes.* (World Health Organization, 2001)

**Figure 3**

*Using the ICF to model self-management of daily life tasks and underlying factors for academically capable youth with disabilities*



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## STUDY 1

### Self-management of daily life tasks in diploma-track youth with disabilities

#### Abstract

**Purpose:** Youth with disabilities who graduate with a regular high school diploma often continue to have daily functioning challenges that ultimately impact adulthood outcomes. To better understand these challenges and determine how best to address them, it is important to distinguish deficits in discrete skills from difficulty organizing skills to self-manage complex tasks associated with adult roles. The purpose of this study was to explore the extent to which challenges in social, cognitive and behavioral factors relate to these two aspects of daily functioning.

**Methods:** This is a secondary analysis of the National Longitudinal Transition Study 2 funded by the United States Department of Education. The direct and indirect associations between youth underlying factors and self-management of daily life tasks (SMDLT) versus discrete functional skills were modelled using structural equation modelling.

**Results:** A model incorporating social skills, communication, and behavioral regulation explained 55% of the variance in SMDLT. In contrast, the model predicting discrete functional skills had fewer significant associations and described less variance (37%) in the outcome.

**Conclusions:** Findings have implications for designing targeted interventions and measures of SMDLT aimed at enabling participation in independent living and

productivity for diploma-track youth with disabilities.

Keywords: transition, adaptive behaviour, daily functioning skills, NLTS-2, structural equation modelling, secondary analysis

## **Introduction**

Successful transition from high school to adulthood traditionally involves taking on new roles in the contexts of employment or education. In addition to possessing necessary academic skills, participation in these adult roles requires the ability to manage the life tasks essential to meeting societal expectations. Managing daily life tasks includes having the ability to organize activities into effective sequences, monitor task performance, and make necessary adjustments in order to carry out tasks, as well as adapting to changing contexts for task performance (Kao et al., 2015). For typically developing youth, responsibility for daily life tasks naturally and gradually shifts from caregivers to the youth over a period of years, with a significant portion of the shift culminating in late adolescence (Kao et al., 2021; Rogoff, 2003). As a result, most youth eventually learn to manage the tasks required for adult roles through informal learning experiences during childhood and adolescence, and they continue to learn as they take on new roles in employment and education (Rogoff, 2003).

However, difficulty acquiring the skills needed to manage life tasks creates challenges to achieving “traditional” outcomes like gaining and maintaining employment, participating in post-secondary education, and living independently (Anderson et al., 2018). Accordingly, difficulty managing life tasks may partially explain the observed discrepancy in academic abilities and poor outcomes for youth with disabilities who graduate with a regular high school diploma (diploma-track youth). By completing the requirements to obtain a regular high school diploma, these youth are assumed to have mastered the basic skills needed to adapt to typical environments (i.e., employment, post-

secondary education settings) in order to participate in adult roles, yet their participation in these contexts is often limited (Howard et al., 2016; Howlin & Magiati, 2017; Roux, Shattuck, Rast, Rava, & Anderson, 2015; Sharfi & Rosenblum, 2014).

Much of the research that explores functioning in daily life has focused on the concept of adaptive behavior. Adaptive behavior is defined as “conceptual, social and practical skills performed by people in their everyday lives” (AAIDD, 2010, p. 4). Studies consistently report that individuals with disabilities such as autism spectrum disorder, mental health conditions, and attention deficit disorder (ADD/ADHD) are at risk for deficits in adaptive behavior compared to same age peers (Balboni et al., 2017; Buelow et al., 2012; Farmer et al., 2018; Tarazi et al., 2007). Further, adaptive behavior challenges are independent of intelligence quotient (IQ) and thus may also be found among youth with disabilities who are preparing to graduate with a regular diploma (Alvares et al., 2020; Baker et al., 2021; Buelow et al., 2012; Kraper et al., 2017; Tassé et al., 2016). Research on adaptive behavior has also established a link between adaptive behavior challenges and poor traditional adulthood outcomes (Clarke et al., 2020; Stephens et al., 2005). While it is evident that many diploma-track youth with disabilities have adaptive behavior challenges, more research is needed to understand the nature of this relationship.

The construct of adaptive behavior encompasses many skills and abilities, ranging from discrete functional skills to complex tasks taking place within varying contexts. The design of measures of adaptive behavior that are widely used in research makes it difficult to distinguish task-level challenges from problems acquiring discrete skills. For



example, The Vineland Adaptive Behavior Scales-III (VABS-III; Sparrow, Cicchetti, & Saulnier, 2016) and Adaptive Behavior Assessment System (ABAS-3; Harrison & Oakland, 2003) are commonly used measures of adaptive behavior in studies of youth with disabilities (Gleason & Coster, 2012; Wallace et al., 2016). Each assessment assesses three major domains (VABS-III: communication, daily living skills, and socialization; ABAS-3: conceptual, social, practical). The scales in the assessments incorporate items that reflect a range of behavioral complexity, from discrete functional skills (e.g., fastens snaps; tells time using digital clock; wipes up his/her own spills) to complex self-management items (e.g., keeps track of his/her medicines and refills when needed; notices when simple tasks around the house need to be done and does them; plans his/her monthly expenses and sticks to the plan) (Gleason & Coster, 2012). The range of behavioral complexity in traditional adaptive behavior scales has limitations when used in research with the population of youth with disabilities who graduate with regular high school diplomas. It is unlikely that this group of youth who are academically capable have difficulty with the discrete skills included in measures of adaptive behavior. However, the design of the instrument makes it difficult to focus an evaluation specifically on the area of suspected deficit: the youth's performance of the complex self-management tasks needed to meet the responsibilities of adult roles.

Measures that focus specifically on the ability to self-manage daily life tasks would provide a more targeted approach to understanding the areas of challenge for many diploma-track youth with disabilities. For example, the authors of the Pediatric Evaluation of Disability Inventory - Computer Adaptive Test (PEDI-CAT; Haley, Coster,

Dumas, Fragala-Pinkham, & Moed, 2012) conceptualized this distinction in the design of the measure. The Responsibility domain of the PEDI-CAT captures the construct of self-management of daily life tasks separately from daily activities, social/cognitive, and mobility skills domains. Confirmatory factor analyses supported the four distinct content domains in a mixed sample of 2,205 young people (ages 0–21) with and without disabilities (Haley et al., 2011). Using the PEDI-CAT Responsibility domain measure, a preliminary study of 125 youth with autism without intellectual disability found that 46% of the sample fell in the significantly delayed range and an additional 40% of youth were in the borderline delayed range. Notably, 61% of youth age 18–21 were significantly delayed, compared to 38% of youth age 14–17, indicating that older youth who have increased expectations for responsibility experience a greater discrepancy in their ability to self-manage daily life tasks compared to peers (Munsell & Coster, 2020). These preliminary data support the hypothesis that diploma-track youth with disabilities experience challenges specific to self-management of daily life tasks.

Separating measurement of complex task management from performance of discrete skills also would enable exploration of underlying factors that influence an individual's ability to self-manage daily life tasks. Three such underlying factors suggested by the literature are executive functions, social communications skills, and behavioral health. Executive functions (i.e., higher order cognitive processes, including working memory, planning, flexibility, and organization, that support problem-solving and behavioral regulation (Diamond, 2013)) play a key role in initiation, time management, organization, and problem solving used to coordinate the skills needed to

manage daily life tasks (Hume, Boyd, Hamm, & Kucharczyk, 2014; Tarazi et al., 2007). Executive functions (EF) develop throughout childhood and typically increase rapidly beginning in adolescence (Paus, 2009; Wehmeyer & Shogren, 2017). However, many diploma-track youth with disabilities demonstrate EF challenges (Chavez-Arana et al., 2018; Demetriou et al., 2018; Follmer, 2018; Mullin et al., 2020; Silverstein et al., 2020; Soares et al., 2018; Vaidya et al., 2019) that persist after controlling for the impact of IQ (Gardiner & Iarocci, 2018). Poor metacognitive EFs which include “problem solving, abstracting, planning, strategy development and implementation, and working memory” (Ardila, 2008, p. 93), have been shown to be negatively related to daily functioning as operationalized by adaptive behavior measures (Perna et al., 2012; Pugliese et al., 2016; Sharfi & Rosenblum, 2016; Wallace et al., 2016). Impairments in metacognitive EFs make it difficult for youth to negotiate common occurrences that they face when engaging in daily tasks such as planning and sequencing multi-step actions or adjusting their plan when something unexpected happens (Chavez-Arana et al., 2018; Pugliese et al., 2015; Soares et al., 2018).

Although considerable evidence suggests that EFs are a key contributor to the management of complex daily tasks, weak social communication skills and poor behavioral and emotional health may also disrupt daily functioning. Both of these underlying factors have also been associated with decreased adaptive skills for youth with disabilities including autism, TBI, mental health conditions, and ADHD (Baker et al., 2021; Gjervan et al., 2016; T. L. Hill et al., 2015; Kraper et al., 2017; Mullin et al., 2020; Wallace et al., 2016). Kraper and colleagues (2017) found that poor adaptive functioning

was related to higher levels of repetitive behavior, ADHD, anxiety, and poorer social functioning for transition aged youth with autism without intellectual disability. Notably, the associations between daily functioning and EF, social communication, and behavioral health are based on studies using broad measures of adaptive behavior (i.e., measures that include both discrete functional skills and more complex task management items). Thus, further investigation is needed to specifically determine the presence and magnitude of associations between these underlying factors and self-management of daily life tasks. In addition, there is evidence that decreased social communication skills and poor behavioral and emotional health are associated with EF in diploma-track youth with disabilities (Al-Yagon et al., 2020; Andersen et al., 2015; Mullin et al., 2020; Pugliese et al., 2016). While the literature provides little empirical guidance on the directions of these associations, it is likely that these three constructs underlying daily functioning are interrelated.

The present study is an initial investigation of the construct of self-management of daily life tasks (SMDLT) using data from the National Longitudinal Transition Study-2 (NLTS2; SRI International, 2000). The NLTS2 data set has a sufficient sample size and survey items that can be used to explore the proposed relationships between underlying factors (executive function, social communication skills, and behavioral health) in a representative sample of diploma-track youth with disabilities in the United States (SRI International, 2000). In addition, the NLTS2 data set has items that relate to both SMDLT and discrete functional skills, providing the opportunity to separately examine the associations and explained variance between underlying factors and the two outcomes.

Separating SMDLT from discrete functional skills will provide information about the construct of SMDLT in two ways. First, exploring the magnitude and strength of the relationships between underlying factors and SMDLT will demonstrate how EF, social communication, and behavioral health contribute to SMDLT for diploma-track youth with disabilities. Second, examining an alternate model of the same three underlying factors (EF, social communication, and behavioral health) using discrete functional skills as the outcome allows us to establish the extent to which SMDLT and discrete functional skills are distinct constructs.

The aims of this study were to: (a) Explore how SMDLT relates to potential underlying factors (i.e., EF, social communication, and behavioral health) of youth with disabilities and (b) examine how discrete functional skills relate to the same set of underlying factors. We hypothesized that SMDLT would be significantly associated with these underlying factors and explain a moderate amount of variance in the outcome (SMDLT). In contrast, we hypothesized that the model predicting discrete functional skills would demonstrate weaker associations and describe less variance in discrete functional skills.

## **Methods**

### **NLTS2 data collection and instruments**

The National Longitudinal Transition Study 2 (NLTS2) is a 10-year prospective study of youth receiving special education services conducted by the United States Department of Education through SRI International. The study included five waves of data collection between 2001–2009 evaluating the transition experiences, youth

characteristics, and post high school outcomes of a nationally representative sample of youth (ages 13–16 at the start of the study) from each of the 12 federal special education disability categories established in the Individuals with Disabilities Education Act (Individuals with Disabilities Education Act, 2004). The five waves of data collection beginning in 2001/2 took place at two-year increments across 10 years total (SRI International, 2000). This analysis uses items from the wave 2 parent interview as this wave uniquely included items that were relevant to the construct of self-management of daily life tasks.

### **NLTS2 sample**

The NLTS2 sample was a stratified random sample designed to be generalizable to the United States population of students within and across disability categories. Thus, data were weighted in each statistical analysis to ensure that the target population was adequately represented (SRI International, 2000). The present study analyzes a subgroup of high school students with disabilities who graduated high school with a diploma. Participants (n = 1070) were determined to fit this criterion based on report of graduation with a regular diploma on wave 3, 4 or 5 of data collection (variable codes: np5A2g, np4D1L, np3D1L).

### **Variable selection**

Variables that align with the constructs of interest were selected from the NLTS2 wave 2 parent survey (Table 2). *Ability to self-manage daily life tasks*: Selection of NLTS2 items was guided by the operationalization of self-management of daily life on the PEDI-CAT: Responsibility Domain (Haley et al., 2012). Eight items were selected to

capture complex daily living tasks or functional cognitive skills that were linked to a specific life task. *Discrete functional skills*: Four indicators of discrete functional skills were selected following previous work on the NLTS2 dataset that captured this construct (Bouck & Joshi, 2015; Myers, Davis, Stobbe, & Bjornson, 2015). *Social communication skills*: Five items were selected to capture the social communication skills. The same five items were used in a composite with good internal consistency (Cronbach's alpha = .74) by Shattuck and colleagues (2012; 2011) for a subsample of youth with autism. *Behavioral and emotional health*: The NLTS2 items rely strongly on parent report, thus most of the items related to emotional and behavioral health focus on observable externalizing behaviors. Five items, used previously by Shattuck et al. (2011) to explore the impact of externalizing behaviors on social participation for adolescents with autism (Cronbach's alpha = .60) were selected. *Executive functions (EF)*: The NLTS2 parent survey does not focus on EF, thus EF has never been directly examined using NLTS2 data. Selection of EF items for this analysis was guided by the Behavior Rating Inventory of Executive Function (BRIEF; Gioia et al., 2000) assessment that captures the behavioral manifestation of EF abilities. In addition, only items that were general statements related to EF were included, rather than items that were linked to performance of a specific task, in order to differentiate EF items from items reflecting ability to self-manage daily life tasks. Two EF items were identified from the NLTS2 parent survey: 1) How often youth works at something until finished and 2) How good youth is at being well organized. These items align with the task monitor, plan/organize, and organization of materials subscales of the BRIEF.

## Data Analysis

We developed models of the direct and indirect associations between youth underlying factors (i.e., EF, social communication skills, behavioral health) and their ability to self-manage daily life tasks (*SMDLT*) using structural equation modeling (SEM). We compared the *SMDLT* models with alternate models of the association between youth underlying factors and their *discrete functional skills*.

All data analyses were conducted in Mplus, version 8.4 (Muthén & Muthén, 1998). NLTS2 survey data were weighted using Mplus weight, strata, and cluster commands and type=complex command, where applicable. Six of the selected NLTS2 indicators did not meet requirements for normally distributed data (including three items for discrete functional skills). Thus, robust maximum likelihood (MLR) estimator was used for all analytic procedures. MLR is the recommended estimation procedure for continuous variables that do not meet the requirements for normal distribution (Marsh, Morin, Parker, & Kaur, 2014). The presence of missing data was also explored. All items had less than 10% missing data except for how well youth can use public transportation (23%) and how well youth can arrange a train or plane trip (24%). MLR assumes normality when modeling missing data, which is appropriate for the two indicators with more extensive missing data (Yuan, Yang-Wallentin, & Bentler, 2012).

**Model fit.** A non-significant Chi-square ( $\chi^2$ ) test is indicative of good model fit. However, the Chi-square significance test tends to be inflated with larger sample sizes (Brown, 2015); thus, several other indices were also considered to holistically assess goodness of model fit. In general, standardized root mean square residual (SRMR) < .05,



root mean square error of approximation (RMSEA)  $< .05$  with 90% confidence interval (90% CI) of RMSEA between  $< .05 - < .10$ , Tucker-Lewis index (TLI)  $> .90$ , and comparative fit index (CFI)  $> .90$  supported good fit of the model to the data (Brown, 2015). Bayesian information criterion (BIC) was also used to compare fit of nested models. In addition, we examined modification indices and standardized residuals to identify potential localized points of ill fit (Brown, 2015). While modifications were prompted by statistical results, all potential changes were evaluated for conceptual plausibility.

**Exploratory structural equation modeling (ESEM).** The exogenous variables representing underlying factors (executive functioning, social skills, and behavioral health) were fit using ESEM. The number of factors specified was based on a parallel analysis (100 replications) and scree plot of eigen values from the reduced correlation matrix (Brown, 2015). ESEM can be a useful intermediate step between exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to gain an understanding of the underlying factor structure and develop realistic measurement models (Brown, 2015; Marsh et al., 2014). Using aspects of EFA, CFA, and structural equation modeling (SEM), ESEM allows for factor cross loadings among items (similar to EFA) while providing valuable information such as fit and modification indices (similar to CFA). Further, like SEM, ESEM allows for modeling regressions between EFA factor blocks and CFA factors (as employed in this analysis) (Brown, 2015). The extracted factors were rotated using oblique (geomin) rotation which is recommended for its ability to produce factor loadings and factor correlations similar to those of CFA without having to

specify the factor loading pattern (Schmitt & Sass, 2011).

**Confirmatory factor analysis (CFA).** A single factor CFA is structurally and statistically equivalent to a single factor ESEM, thus CFA was used to establish the measurement models for the outcomes of interest. Our rationale for a tentative CFA model of the latent factor for SMDLT was based on previous empirical analysis of this construct using items from the PEDI-CAT Responsibility domain (Haley et al., 2011). CFA analysis indicated that items similar to those identified from the NLTS2 data set loaded significantly on to the same underlying factor. For the comparison model, data were fit to a CFA model of discrete functional skills based on the previous empirical work that grouped the same NLTS2 variables into a summary score (Bouck & Joshi, 2015; Myers et al., 2015). Goodness of fit indices were used to evaluate how well data fit the specified models and modification indices were examined when considering adjustments in parameter specification to improve the fit of data to the model.

## **Results**

### **Establishing the Measurement Model**

**Self-management of daily life tasks (SMDLT).** CFA was used to model the SMDLT outcome. The initial model included eight indicators that were hypothesized to fit into the factor model; however, Pearson correlations and modification indices were examined to guide modification to the model to improve fit. While suggested modifications were prompted by statistical results, changes were only made if they were determined to be conceptually acceptable, as described here. The following modifications were made: (a) *how well youth uses public transportation* was removed due to the high

correlation with two other items (*Navigate*:  $r = .55$ ; *Trip*:  $r = .56$ ), suggesting extensive conceptual overlap across these items leading to redundancy in the measurement model (Clark & Watson, 2019); (b) two of the indicators, *how well youth fixes simple meals* and *how often youth cleans their room* were removed due to low communalities ( $R^2 < .06$ ) — conceptually, these items may be a greater reflection of parenting style and a parent’s influence on the home environment rather than youth’s ability to manage the tasks; (c) modification indices suggested that covariance between residuals for *how often youth do their own laundry* and *how often youth buy items at a store* be freely estimated in the final model to improve model fit, which may be due to these two items capturing the frequency (“often”) of behavior rather than the ability (“well”) that the other items capture. Model fit indices suggest that the final, five item CFA model for SMDLT fit the data well (Figure 4). Inspection of standardized residuals and modification indices indicated no localized points of ill fit in the solution (e.g., largest standardized residual = .874, largest modification index = 4.933).

**Discrete functional skills.** The outcome of discrete functional skills was also modeled using CFA. The initial four item model (Figure 5) demonstrated good fit to the data and no localized points of strain in model fit (e.g., largest standardized residual = .629, largest modification index = 2.418).

**Underlying factors.** ESEM was used to model the latent factors for underlying factors, including executive function, social communication, and behavioral health. A parallel analysis was conducted to determine the number of latent factors to retain in the ESEM model. One thousand correlation matrices were generated from the data using

Monte-Carlo simulation. The results of the parallel analysis indicated that a two factor solution fit the data well. Sequential  $\chi^2$  model tests were also examined along with the factor structure for each solution. While the  $\chi^2$  test statistic demonstrated significant improvement in model fit from two to three factors, only two items loaded on the third factor and two other items that were included to represent executive functions were not significantly associated with any of the factors. Thus, we ultimately selected the two factor ESEM solution in order to align with the conceptual underpinnings of this study. We named the two factors *social skills* and *behavior regulation*. Following inspection of modification indices, we made two modifications to the model: error variances were freed to covary between (a) *How often youth gets into trouble situations* and *How often youth behaves poorly at home* and (b) *How often youth works at something until finished* and *How good youth is at being well organized*. In both instances, the items loaded on to the same factor and included similar content (i.e., trouble behaviors and executive functioning, respectively), thus these modifications were deemed theoretically reasonable. The final model (Table 3) had acceptable overall fit and no localized areas of poor fit (e.g., largest standardized residual = .855, largest modification index = 8.481).

### **Path Analyses for the Structural Model**

**Model predicting SMDLT.** Our initial model tested direct associations between the exogenous variables of underlying factors (*social skills* and *behavior regulation*) and *SMDLT* or *functional skills*. For the *SMDLT* model, the path from *social skills* to *SMDLT* was significant (fully standardized estimate (SE) = .690 (.095),  $p < .001$ ), while the path from *behavior regulation* to *SMDLT* was not significant (estimate (SE) = .107 (.120),  $p =$

.372). The overall model explained 55% variance in *SMDLT* ( $R^2 = .554, p < .001$ ) and the fit was generally acceptable ( $\chi^2 (103) = 161.836, p < .001$ ; RMSEA: .023 (90% CI = .016 – .030); SRMR: .052; CFI: .919; TLI: .893). However, inspection of modification indices prompted us to consider freely estimating the direct path from the indicator *How well youth converses* to *SMDLT* as an alternative model. Applying this modification was theoretically and conceptually consistent, as the ability to hold a conversation is likely a required skill that is independently related to *SMDLT* while also influencing the underlying factors of behavior regulation and social skills. Adding the direct path from *converse* to the outcome positioned the *converse* indicator as a partial mediator of the two latent ESEM factors and the outcome. This alternative model (Figure 6) had a higher level of fit than the initial model (BIC of initial vs. alternative model = 36,482.10 vs. 36,421.32) and explained 55% variance in *SMDLT* ( $R^2 = .551, p < 0.001$ ), had good overall fit, and had no localized areas of poor fit (e.g., largest standardized residual = .890, largest modification index = 9.085). Notably, all direct paths to *SMDLT* were significant in this model.

**Model predicting discrete functional skills.** The initial model for *functional skills* demonstrated the same pattern of associations as the initial *SMDLT* model. Only the direct path from *social skills* to *functional skills* was significant (fully standardized estimate (SE) = .452 (.104),  $p < .001$ ); *behavior regulation* to *functional skills*: estimate (SE) = .208 (.116),  $p = .073$ ). The overall model explained 33.2% of the variance in *functional skills* ( $R^2 = .332, p < .001$ ). Model fit was adequate ( $\chi^2 (89) = 152.949, p < .001$ ; RMSEA: .026 (90% CI = .019 – .033); SRMR: .051; CFI: .923; TLI: .896) and

modification indices also suggested freely estimating the direct path from *converse* to *functional skills* as an alternative model of the associations between underlying factors and functional skills. The updated model with this modification (Figure 7) had a higher level of fit than the initial model (BIC of initial vs. alternative model= 31,711.19 vs. 31,641.46) and explained 37% variance in *functional skills* ( $R^2 = .369$ ,  $p < .001$ ), had improved overall model fit and no localized areas of poor fit (e.g., largest standardized residual = .858, largest modification index = 9.041). Of note, only the paths from *converse* and *behavior regulation* were associated with *functional skills* in the updated model; *social skills* were no longer significantly associated with *functional skills*. Further, the overall model for *functional skills* explained less variance in the outcome than the model for *SMDLT* (37% vs. 55%).

## Discussion

As hypothesized, *SMDLT* was significantly associated with underlying factors of social skills, communication, and behavioral regulation and the overall model explained a moderate amount of variance (55%) in the *SMDLT* outcome. In contrast, the model predicting discrete functional skills had fewer significant associations and described less variance (37%) in the functional skills outcome. Taken together, these findings indicate that common areas of challenge in diploma-track youth with disabilities, including social and communication skills, executive functioning, and behavioral regulation, are more strongly associated with the ability to self-manage life tasks (e.g., managing laundry, buying items at a store, getting places outside of the home) than performance of discrete functional skills (e.g., counting change, using the phone, telling time).

The greater variance explained in the SMDLT model supports the conceptual distinction between SMDLT and foundational functional skills. While other studies have used various combinations of the NLTS2 items to capture functional skills (Bouck & Joshi, 2015; Myers et al., 2015; Roux et al., 2013; Shattuck et al., 2012; Shattuck, Orsmond, et al., 2011; Shattuck, Wagner, Narendorf, Sterzing, & Hensley, 2011), this is the first study using the NLTS2 data to construct a measure of SMDLT. Our measure was guided by the operationalization of self-management of daily life on the PEDI-CAT: Responsibility Domain (Haley et al., 2012) and is comprised of items that are complex tasks that take place in variable or unpredictable contexts. SMDLT items are representative of the type of complex tasks that youth are expected to carry out in adulthood. Most of the items in the SMDLT factor take place in the community (i.e., buying items at a store, getting to places outside the home) and involve tasks that require the individual to coordinate multiple underlying skills over time and adjust to external contexts. Items in this measure also require social awareness and safety judgement in contexts that can vary across occasions. In contrast, the items that comprise the discrete functional skills factor represent basic functional skills that do not require the same coordination of multiple underlying factors.

Of note, the ability to carry on a conversation was an important predictor of the outcome in both models. This association was expected for SMDLT as conversational skills are required for interacting with others in order to carry out daily life tasks in the community (Chan, Klinger, Adkisson, & Klinger, 2020). The relationship of conversation with discrete functional skills is less clear; one potential explanation for the association

with functional skills is that parents may rely on youth's ability to communicate in order to assess their child's skill level. The conversation (*converse*) variable was a complete mediator of social skills on the functional skills outcome, suggesting that social skills do not play a significant role in performance of discrete functional skills outside of being able to communicate. However, the SMDLT model indicated that social skills also had a significant direct effect on SMDLT aside from the mediation path through the conversation variable. This suggests that social skills (e.g., ability to initiate a conversation, appearing confident in social situations, etc.) are particularly relevant to the self-management of daily life tasks. Adequate social skills are necessary to be able to navigate different social interactions that take place in the varying contexts in which daily life tasks are carried out (Armstrong, Dedrick, & Greenbaum, 2003; Patton, 2009; Sung et al., 2019). These findings are from an initial exploration of the role of conversational skill as it relates to SMDLT, discrete functional skills, and underlying factors, thus these relations should be investigated further with more complete measures of conversational skills.

The SMDLT model also had a small but significant negative association between behavioral regulation and the conversation variable. This finding implies that lower behavior regulation scores are associated with better conversation ability. One potential interpretation of this finding is that youth who are quieter (perhaps reflecting lower conversation ability) are less likely to show the externalizing behaviors included in the behavior regulation factor, such as controlling one's temper when arguing or receiving criticism well. On the other hand, moderate behavioral responses may facilitate



conversation and intervention (McCrae & Costa, 2010; Van Heel et al., 2019), thus ultimately encouraging more self-management of tasks.

There is a growing body of evidence on the relationships between social communication skills, behavioral health, and EF and daily functioning (Baker et al., 2021; Gjervan et al., 2016; T. L. Hill et al., 2015; Kraper et al., 2017; Mullin et al., 2020; Wallace et al., 2016), as well as interventions that target these underlying factors in order to improve daily functioning (e.g., Cognitive Behavior Therapy (Antshel, Faraone, & Gordon, 2014), social skills training (Laugeson, Frankel, Gantman, Dillon, & Mogil, 2011), and mindfulness interventions (McCloskey, 2015)). The majority of these studies operationalize daily functioning using measures that combine discrete functional skills and complex task performance within the same measure or domain. Our findings suggest that dismantling the broad operationalization of adaptive behavior by considering SMDLT as a construct that is related to yet distinct from more discrete foundational functional skills could provide a more targeted approach to understanding the challenges in daily functioning that diploma-track youth with disabilities may experience. Task-level performance is complex and requires coordination, flexibility, problem solving, and adaptation to in vivo contexts, in addition to possessing discrete functional skills. This complexity has been explored by Brown and colleagues through a study of the everyday task of going to the grocery store, using the Test of Grocery Shopping Skills (TOGGS) (Hamera & Brown, 2000). This measure involves a detailed task analysis of how one completes a typical grocery shopping task in an everyday grocery store. Brown's work highlights the complexities of everyday task performance and distinguishes task

performance from underlying factors, such as metacognition (Brown, Rempfer, Hamera, & Bothwell, 2006; Rempfer, Hamera, Brown, & Cromwell, 2003). However, research analyzing everyday task performance is limited; thus, an improved understanding of self-management of daily life tasks is needed. Research describing the variation in SMDLT across different disability groups and typically developing peers, determining variations in associations of underlying factors with SMDLT across groups, and quantifying the relationship between ability to self-manage daily tasks and success in traditional adult outcomes (e.g., employment, post-secondary education, and independent living) would provide needed insight on this potential area of challenge.

Considering SMDLT as a distinct construct may provide useful guidance to design targeted interventions to enable participation in independent living and productivity for diploma-track youth with disabilities. It also suggests a potential target for measurement in intervention studies that aim to improve daily life functioning and participation in the community. Current interventions to enhance daily functioning tend to focus on developing (or remediating) underlying factors like social or executive functioning skills and behavioral health (Antshel et al., 2014; Laugeson et al., 2011; McCloskey, 2015) but do not necessarily emphasize the actual doing of tasks in real-life contexts. In contrast, interventions to improve self-management of tasks would extend beyond teaching specific sequences of functional skills to include teaching strategies and practice coordinating underlying skills in flexible ways that meet the varying demands of tasks and diverse environments. Cognitive Orientation to daily Occupational Performance (CO-OP; Polatajko et al., 2001) and Unstuck and on Target (UOT; Cannon,

Kenworthy, Alexander, Werner, & Anthony, 2011) are examples of interventions that incorporate some of these principles. UOT is an executive function intervention for youth with autism in which youth learn strategies to accommodate for flexibility and other executive functioning challenges (Cannon et al., 2011). Notably, UOT uses a multi-contextual approach in which strategy teaching is embedded during typical daily activities in real life contexts at school and home. In a study comparing UOT to a traditional social skills training intervention, the UOT group demonstrated greater improvement in classroom performance compared to the social skills training group (Kenworthy et al., 2014). CO-OP was originally developed for children with developmental coordination disorder but has since been adapted to other populations, including adults post stroke (McEwen, Polatajko, Huijbregts, & Ryan, 2010; Miller, Polatajko, Missiuna, Mandich, & Macnab, 2001; Polatajko, McEwen, Ryan, & Baum, 2012). Similar to UOT, CO-OP emphasizes guided self-discovery of task-specific and problem solving strategies within real life contexts to improve functional task performance (Polatajko et al., 2001). Studies using the CO-OP approach in adults post stroke demonstrate evidence of improved functional performance and generalization of skills (McEwen et al., 2010) compared to interventions that employ component based training (Polatajko et al., 2012). These findings support the effectiveness of contextually-based, task-level, strategy training interventions.

Considering SMDLT as a distinct construct and target for intervention also suggests the need to refine the approach to measuring daily functioning for academically capable youth with disabilities. In this study, use of a more refined measure enabled us to

explore factors that contribute to variation in ability to self-manage daily life tasks more precisely. Self-management of daily life tasks should be measured separately from discrete functional skills in order to more specifically identify potential areas of weakness in this population. Using a measure of SMDLT would also provide a more precise target to assess to determine the efficacy of interventions (Coster, 2013; Munsell & Coster, 2021). The Responsibility Domain of the PEDI-CAT is one measurement tool that was developed to capture the extent to which youth takes responsibility for managing their daily life tasks; however, other measurement approaches may need to be identified or developed.

### **Limitations**

In this study we explored self-management of daily life tasks using a pre-existing data set, the NLTS2. As such, the study sample is comprised of students who were identified as having a disability under United States federal special education law (Individuals with Disabilities Education Act, 2004) which differs somewhat from clinical diagnostic criteria. In addition youth in this sample were expected to meet the educational criteria for receiving a high school diploma in the United States. Diagnostic categories and requirements for graduation may differ internationally, thus limiting the generalizability of the study sample and findings. In addition, secondary analysis of an existing data set has inherent limitations (Hofferth, 2005). One limitation of this study is that the factors representing our constructs of interest are comprised of preexisting survey items that are not specifically tailored to our research question. Thus, our analysis provides a broad, yet possibly imprecise picture of the relationships among these

variables. In particular, the NLTS2 lacks items that specifically address executive functioning. It is well established that diploma-track youth with disabilities often have EF challenges that make it difficult for them to negotiate common occurrences that they face when engaging in daily tasks, such as planning and sequencing multi-step actions or adjusting their plan when something unexpected happens (Chavez-Arana et al., 2018; Demetriou et al., 2018; Follmer, 2018; Mullin et al., 2020; Silverstein et al., 2020; Soares et al., 2018; Vaidya et al., 2019). However, we were only able to use two items to capture executive functioning, limiting our ability to treat executive functioning as a separate predictor from the other underlying factors. Theoretically, it is expected the executive functioning would influence SMDLT more than discrete functional skills but we were unable to test this direct association. There is a need to replicate these models using a large, independent data set using measures that more precisely capture our constructs of interest.

## **Conclusion**

Our findings support the conceptual distinction between SMDLT and discrete functional skills for diploma-track youth with disabilities, suggesting that these domains should be examined separately. Diploma-track youth with disabilities are assumed to have mastered the basic skills needed to adapt to typical environments in order to participate in adult roles, yet they face participation restrictions in the contexts of employment, post-secondary education, and independent living. Focusing on the construct of self-management of daily life tasks in this population of youth could facilitate clearer understanding of the challenges that likely contribute to their difficulty

achieving adult outcomes commensurate with their academic performance. These findings have implications for designing targeted interventions and measures aimed at enabling participation in independent living and productivity for diploma-track youth with disabilities.

**Table 2***List of latent factors and observed variables.*

<b>Proposed latent factor</b>	<b>Survey item (variable name)</b>	<b>W2 variable code</b>
Social Communication	How well youth converses ( <i>Converse</i> )	np2B5d
	How often youth joins group activities without being told ( <i>Group</i> )	np2G1a
	How often youth makes friends easily ( <i>Friends</i> )	np2G1b
	How often youth starts conversations ( <i>StartConvo</i> )	np2G1f
	How often youth seems confident in social situation ( <i>Confident</i> )	np2G1d
Behavior Regulation	How often youth ends disagreements with you calmly ( <i>Disagree</i> )	np2G1c
	How often youth gets into trouble situations ( <i>Trouble</i> )	np2G1e
	How often youth receives criticism well ( <i>Criticism</i> )	np2G1g
	How often youth behaves poorly at home ( <i>PoorBehav</i> )	np2G1h
	How often youth controls temper when arguing with peers ( <i>Temper</i> )	np2G1i
Executive Function	How often youth works at something until finished ( <i>Persevere</i> )	np2G1j
	How good youth is at being well organized ( <i>Organized</i> )	np2G2a
Functional Skill	How well youth can tell time on clock with hands ( <i>Time</i> )	np2G3a_a
	How well youth can read/understand common signs ( <i>Signs</i> )	np2G3a_b
	How well youth can count change ( <i>Count</i> )	np2G3a_c
	How well youth can look up phone numbers/use phone ( <i>Phone</i> )	np2G3a_d
SMDLT	How well youth can get places outside the home ( <i>Navigate</i> )	np2G3a_e
	How well youth can buy own clothes at a store ( <i>Clothes</i> )	np2G3a_g
	How well youth can arrange a plane or train trip ( <i>Trip</i> )	np2G3a_h
	How often youth does laundry ( <i>Laundry</i> )	np2G3b_b
	How often youth buys a few things at the store ( <i>Store</i> )	np2G3b_d

**Table 3***ESEM solution for underlying factors measurement model*

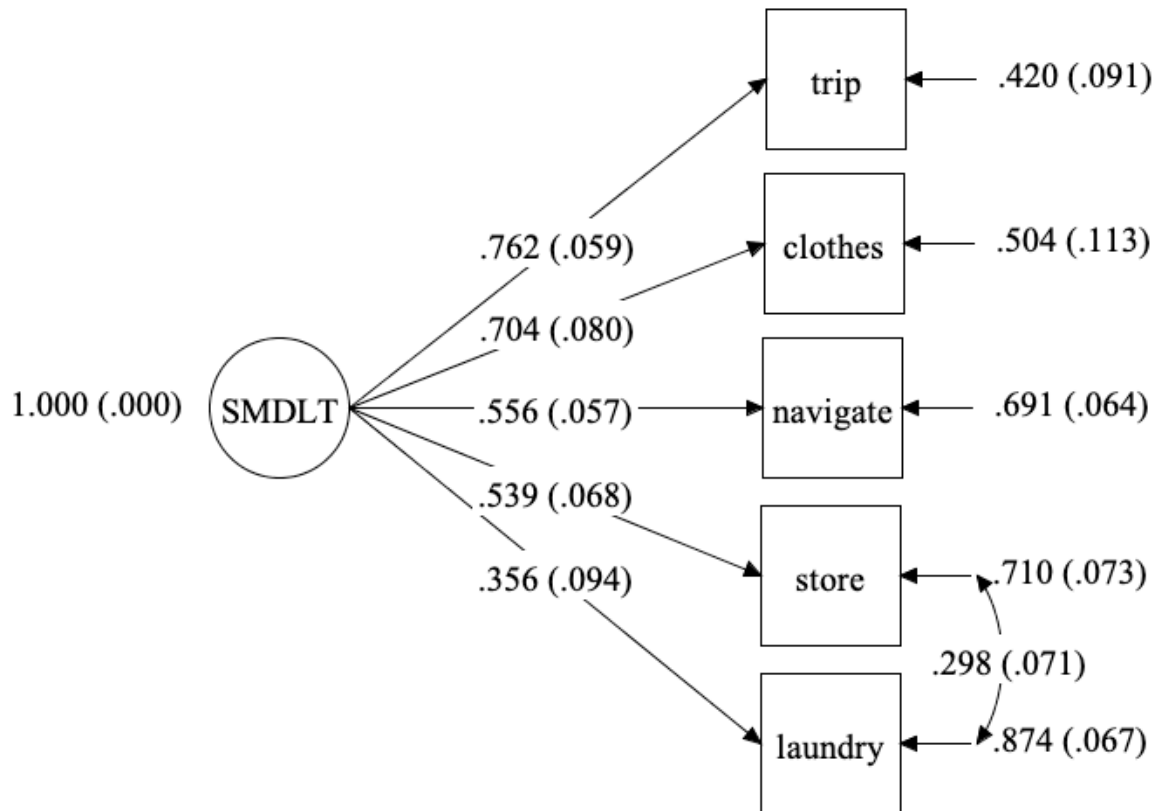
Items	Factor 1			Factor 2			Dimension
	Est.	S.E.	Sig.	Est.	S.E.	Sig.	
Confident	<b>.762</b>	.047	***	.005	.016		Social skills
Friends	<b>.600</b>	.076	***	.096	.106		
Converse	<b>.593</b>	.066	***	-.182	.089	*	
StartConvo	<b>.589</b>	.087	***	-.041	.112		
Group	<b>.547</b>	.121	***	.016	.151		
Disagree	.002	.055		<b>.716</b>	.096	***	Behavioral regulation
Criticism	.004	.076		<b>.680</b>	.108	***	
Temper	-.040	.110		<b>.528</b>	.137	***	
Trouble <sup>a</sup>	-.147	.131		<b>.430</b>	.143	**	
Persevere <sup>b</sup>	.120	.121		<b>.367</b>	.150	*	
PoorBehav <sup>a</sup>	.044	.112		<b>.361</b>	.121	**	
Organized <sup>b</sup>	.067	.114		<b>.346</b>	.130	**	

*Notes.* Extraction method: robust maximum likelihood; Rotation method: geomin. Completely standardized parameter estimates and standard errors.  $\chi^2(41) = 55.762, p < .062$ ; RMSEA: .018 (90% CI = .000 – .030); SRMR: .038; CFI: .963; TLI: .940. Loadings larger than .3 are in bold. <sup>a,b</sup>Correlated residual errors. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .



**Figure 4**

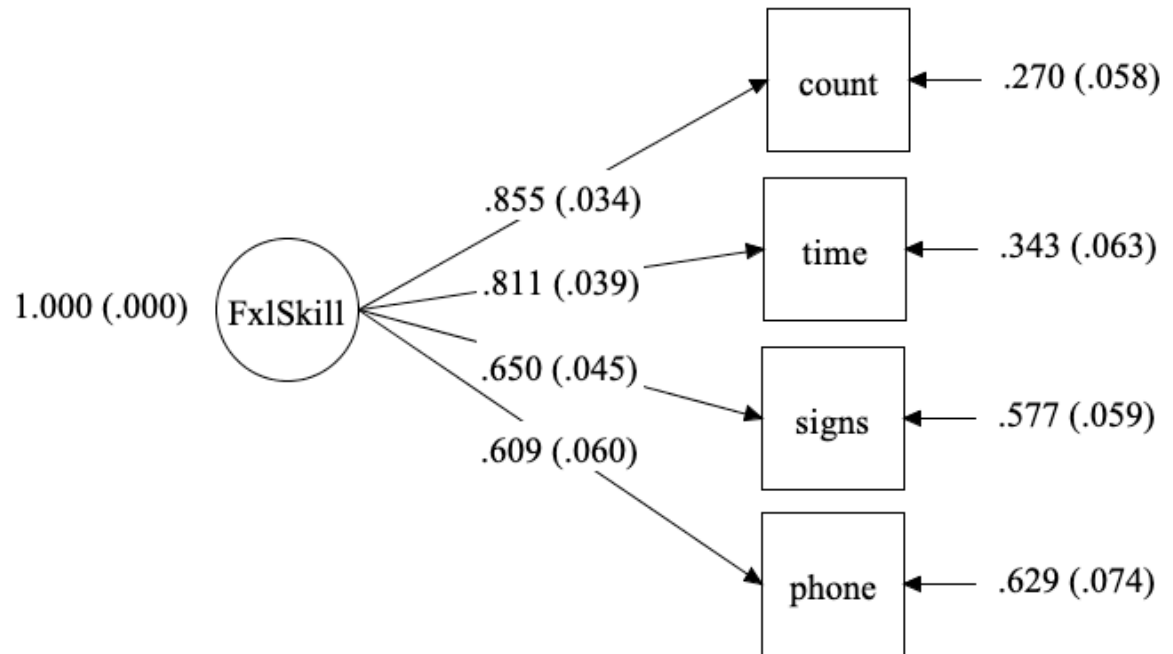
*SMDLT measurement model.*



*Notes.* Completely standardized parameter estimates and standard errors.  $\chi^2 (4) = 7.276$ ,  $p = .122$ ; RMSEA: .028 (90% CI = .000 – .059); SRMR: .031; CFI = .980; TLI = .949. All factor loadings significant at  $p < .001$ .

**Figure 5**

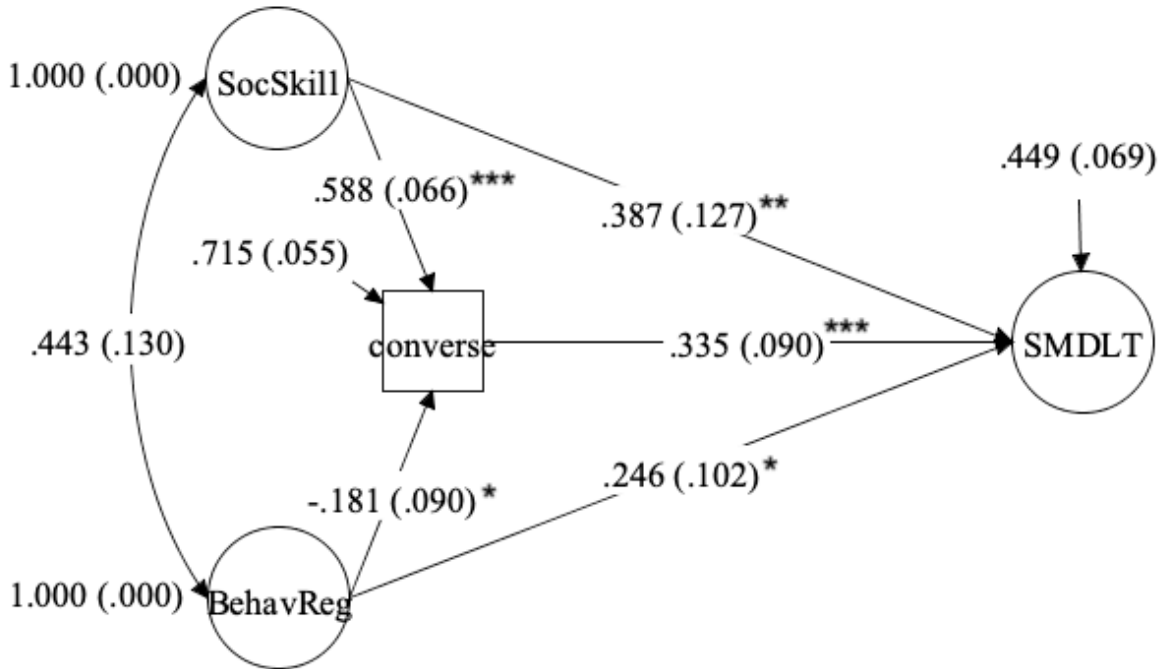
*Discrete functional skill measurement model*



*Notes.* Completely standardized parameter estimates and standard errors.  $\chi^2 (2) = 2.489$ ,  $p = .288$ ; RMSEA: .015 (90% CI = .000 – .065); SRMR: .018; CFI = .998; TLI = .994. All factor loadings significant at  $p < .001$ .

**Figure 6**

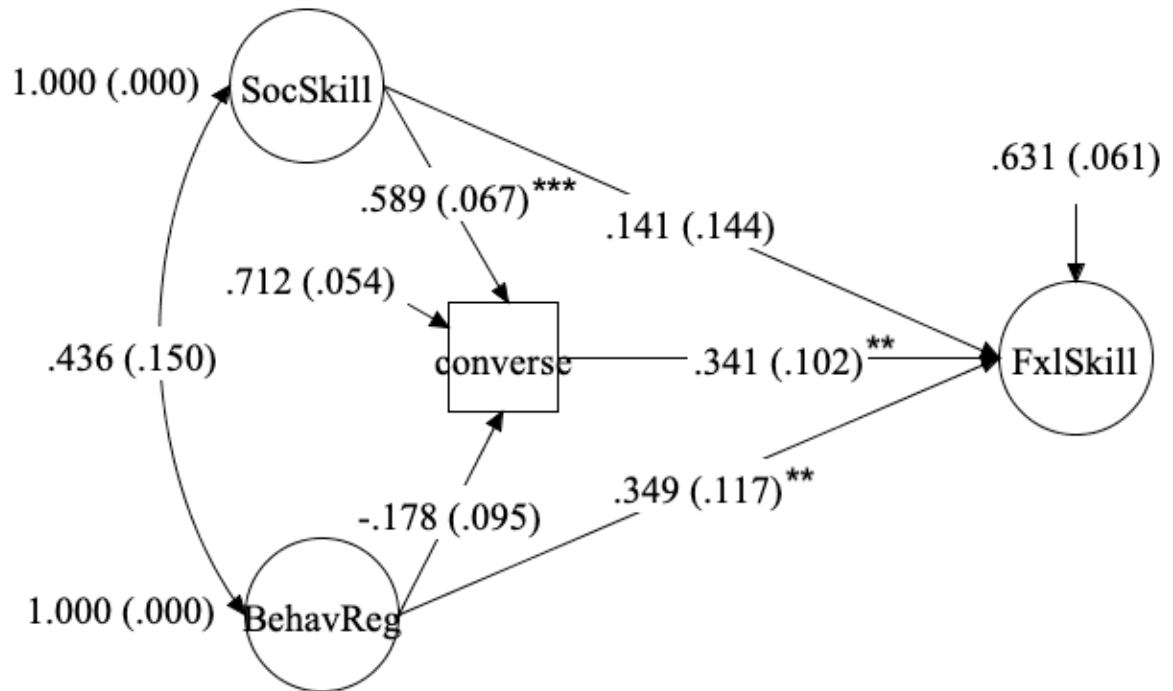
*Model of underlying factors predicting SMDLT*



*Notes.* Completely standardized parameter estimates and standard errors.  $\chi^2 (102) = 148.124, p = .002$ ; RMSEA: .021 (90% CI = .013 – .028); SRMR: .049; CFI = .936; TLI = .915. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ . Paths from other indicators besides convers to social skills and behavior regulation not shown.

**Figure 7**

*Model of underlying factors predicting functional skill*



*Notes.* Completely standardized parameter estimates and standard errors.  $\chi^2(88) = 136.450, p < .001$ ; RMSEA: .023 (90% CI = .015 – .030); SRMR: .044; CFI = .941; TLI = .920. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ . Paths from other indicators besides convers to social skills and behavior regulation not shown.

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## **STUDY 2**

Metacognition mediates the effect of social communication and internalizing behaviors on self-management of daily life tasks for diploma-track autistic youth

### **Abstract**

Social communication and executive functioning challenges as well as co-occurring anxiety/depression may make acquiring the skills needed to manage daily life tasks difficult for diploma-track autistic youth, thus limiting their participation in adult roles. This study describes the associations between executive function, social communication skills, and internalizing behaviors on task management in academically capable autistic adolescents ( $N= 46$ ). The three predictors and youth age explained a moderate amount of variance in task management. Metacognition mediated the effect of social communication skills and internalizing behaviors on task management. Relations between underlying factors that influence self-management of daily life tasks are complex, supporting the need for multifaceted assessment and intervention approaches for academically capable autistic youth.

## **Introduction**

The transition from high school to adulthood traditionally involves youth taking on new roles in the contexts of employment or education. To do so successfully, youth must not only have necessary academic skills, but also the ability to manage the life tasks essential to meeting societal expectations in their new roles. Managing daily life tasks includes organizing activities into effective sequences, monitoring task performance, and making necessary adjustments to carry out tasks, all while adapting to changing contexts for task performance (Kao et al., 2015). Examples of these daily tasks include planning and following a weekly schedule, managing routine health appointments, paying bills on time, and informing one's employer that they will be late or absent. For many youth, taking on the responsibility for daily life tasks begins in early childhood and naturally and gradually shifts from caregivers to the youth over a period of years, with a significant portion of the shift culminating in late adolescence (Kao et al., 2021; Rogoff, 2003). Self-management of essential life tasks required for adult roles is typically learned through informal learning experiences throughout childhood and this learning continues as young adults undertake new roles in employment and education (Rogoff, 2003).

Difficulty acquiring the skills needed to manage life tasks creates challenges to achieving employment, education, and independent living outcomes (Anderson et al., 2018). Accordingly, difficulty managing life tasks may partially explain the observed discrepancy in academic abilities and poor "traditional" outcomes for autistic youth who graduate with a regular high school diploma. Diploma-track autistic youth are at risk of not achieving traditional adult outcomes commensurate with their potential, such as

completion of a post-secondary education degree or gainful employment, and have poor outcomes in the areas of relationships, independent living, and mental health (Howlin & Magiati, 2017; Roux et al., 2015).

Self-management of daily life tasks has been identified in the qualitative and quantitative literature as a potential explanation for the challenges autistic youth may face upon entering adulthood roles. In a qualitative study of the experiences of autistic youth and their parents during the transition to adulthood authors summarized this challenge: “The unpredictability of transitioning into new environments was particularly stressful for many of the adolescent participants. Caregivers and adolescents reported difficulties with youth adapting to the changes of entering adulthood and managing multiple responsibilities.” (First et al., 2016, p. 227). In other qualitative accounts, parents of autistic youth shared that youth need services and supports to learn the skills needed to carry out important life tasks in addition to education and employment skills (Anderson et al., 2018). For example, parents wanted counselors or job coaches to facilitate their youth’s ability to manage daily life tasks such as communicating with employers about medical needs, paying bills, managing laundry, or grocery shopping and meal preparation (Anderson et al., 2018; First et al., 2016; Morrison et al., 2009). Indeed, challenges with daily living skills among autistic youth have been well established and deficits increase with age compared to typically developing peers (Bal et al., 2015; Duncan & Bishop, 2015).

There are likely many underlying factors that influence an autistic individual’s acquisition of the ability to self-manage life tasks including their profile of autistic



characteristics, co-occurring health conditions, educational experiences, societal expectations, and birth order, as well as influences from parenting approaches and societal expectations. In the present study we focus on three factors that are hypothesized to be associated with self-management of daily life tasks: social communication skills, internalizing behaviors, and executive functioning. Impairments in social communication skills are part of the DSM-5 diagnostic criteria for autism spectrum disorder (American Psychiatric Association, 2013). Autistic individuals may demonstrate reduced social-emotional reciprocity, differences in nonverbal communication used for social interaction, and/or difficulties adjusting behavior to suit various social contexts. Internalizing behaviors, such as withdrawal, anxiety, and depression commonly co-occur in adolescents and young adults with autism (Bauminger et al., 2010). Incidence rates for anxiety and depression among autistic young adults is greater than 50% (Kirsch et al., 2020).

Lastly, autistic individuals often demonstrate challenges with executive functioning (EF; American Psychiatric Association, 2013; Hill, 2004; O’Hearn, Asato, Ordaz, & Luna, 2008). Executive functions (i.e., higher order cognitive processes, including working memory, planning, flexibility, and organization, that support problem-solving and behavioral regulation; Diamond, 2013) play a key role in initiation, time management, organization, and problem solving needed to manage daily life tasks (Hume et al., 2014; Tarazi et al., 2007). Studies of EF in autistic youth differentiate between lab-based measures of EF and rating scale measures of EF in which EF abilities are assessed within the context of real-world scenarios (Soto et al., 2020). While findings from lab-

based measures of EF in autistic youth are somewhat conflicting (Kenworthy, Yerys, Anthony, & Wallace, 2008; Wallace et al., 2016), studies that have used measures of EF as they are implemented in everyday, real-world settings, such as the Behavior Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000; Granader et al., 2014), consistently show that autistic youth experience EF challenges. These challenges persist after controlling for the impact of intelligence quotient (Gardiner & Iarocci, 2018; Gilotty, Kenworthy, Sirian, Black, & Wagner, 2002; Pugliese et al., 2015; Wallace et al., 2016). Furthermore, Rosenthal et al. (2013) reported that the discrepancy in metacognitive EFs (i.e., planning, initiating, using working memory, organizing and monitoring task performance) in autistic youth compared to their peers widens as they enter adolescence. Impairments in metacognitive EFs make it difficult for youth to negotiate common situations they face when engaging in daily tasks such as planning and sequencing multi-step actions or adjusting their plan when something unexpected happens (Gardiner & Iarocci, 2018; Hume et al., 2014; Pugliese et al., 2015).

Prior research has explored the relations between different combinations of EF, social communication skills, internalizing behaviors and daily functioning. Poor metacognition has been shown to be negatively related to daily functioning in autistic youth (Pugliese et al., 2016; Wallace et al., 2016). In particular, metacognitive behaviors were predictive of current (Pugliese et al., 2015) and future adaptive behavior in autistic youth after controlling for age and intelligence quotient (Pugliese et al., 2016). Wallace et al. (2016) found that metacognition was associated with adaptive behavior in autistic adults. Notably, this relationship was partially mediated by ADHD symptoms. Social

communication skills and internalizing behaviors have also been associated with decreased ability to self-manage daily life tasks by autistic youth (Hill, Gray, Kamps, & Varela, 2015; Kraper, Kenworthy, Popal, Martin, & Wallace, 2017). Kraper and colleagues (2017) found that higher levels of anxiety and poor social functioning were related to adaptive behavior challenges for transition-aged autistic youth without intellectual disability. Likewise, Duncan and Bishop (2015) found social communication was significantly associated with daily living skills in autistic adolescents without intellectual disability. Interestingly, internalizing behaviors were not significantly associated with daily living skills in this sample.

There also is evidence that poor social communication skills and internalizing behaviors are associated with EF in autistic youth (Andersen et al., 2015; Bertollo et al., 2020; Gardiner & Iarocci, 2018; Hollocks et al., 2014; Pugliese et al., 2016, 2015; Wallace et al., 2016). While the literature provides little empirical guidance on the directions of these associations, one theory is that EF (specifically metacognition) impacts social communication skills via deficits in theory of mind in autistic individuals (Baraka, El-Dessouky, El-Wahed, & Allam Amer, 2019; Hughes & Leekam, 2004; Leung, Vogan, Powell, Anagnostou, & Taylor, 2016). In addition, the attentional control theory of anxiety postulates that anxiety results, in part, from reduced cognitive flexibility and ability to shift attention (Eysenck, Derakshan, Santos, & Calvo, 2007). Executive functioning theory in autism suggests that characteristics of autism arise from EF deficits (Hill, 2004), as autistic individuals “have problems with exerting effortful control when they need to deal with novel, complex, or ambiguous situations in everyday life”

(Goldstein, Naglieri, Princiotta, & Otero, 2014, p. 122). The relations between these underlying factors and self-management of daily life tasks are clearly complex. Accordingly, in this study we will explore the relations between social communication skills, internalizing behaviors, EF, and self-management of daily life tasks together to better understand how the factors interrelate to influence youth's behavior.

Most of the existing research in this area uses traditional measures of adaptive behavior as a proxy for daily functioning (e.g., Duncan & Bishop, 2015; Pugliese et al., 2016, 2015; Wallace et al., 2016). The construct of adaptive behavior is defined as “conceptual, social and practical skills performed by people in their everyday lives” (AAIDD, 2010, p. 4). Traditional measures operationalizing adaptive behavior encompass many skills and abilities, ranging from discrete functional skills to complex tasks taking place within varying contexts (Gleason & Coster, 2012). As such, the design of measures of adaptive behavior that are widely used in research make it difficult to distinguish task-level challenges from problems acquiring discrete skills (Gleason & Coster, 2012) and limits our ability to focus an evaluation specifically on the area of suspected deficit for diploma-track autistic youth: the youth's performance of the complex self-management tasks needed to meet the responsibilities of adult roles.

Measures that focus specifically on the ability to self-manage daily life tasks provide a more targeted approach to understanding the areas of challenge for many diploma-track autistic youth. For example, the authors of the Pediatric Evaluation of Disability Inventory – Computer Adaptive Test (PEDI-CAT; Haley, Coster, Dumas, Fragala-Pinkham, & Moed, 2012) conceptualized this distinction in the design of the

measure. The Responsibility domain of the PEDI-CAT captures the construct of self-management of daily life tasks separately from more discrete daily activities, social/cognitive, and mobility skills domains. The four distinct content domains were supported by factor analysis in a mixed sample of 2,205 young people (ages 0–21) with and without disabilities (Haley et al., 2011). The specific focus of the PEDI Responsibility domain (PEDI:R) on managing complex life tasks allows us to build on and extend what is already known from studies using traditional adaptive behavior measures by refining our investigation of where autistic youth experience activity performance difficulties.

Finally, many previous investigations in this area have focused on autistic youth or young adults across the full autism spectrum. In this study we explore the specific sub population of autistic youth who are on track to graduate with regular high school diplomas. This population is potentially unique in that graduation with a high school diploma may carry the expectation that these youth will fully participate in typical adult environments (at work, post-secondary education, or living independently). As such, the demands for self-management of daily life tasks in adulthood may be higher in this group, making it increasingly important to understand potential contributing factors to the development of these abilities.

The present study had three aims: (a) demonstrate the variability in ability to self-manage daily life tasks (SMDLT) in diploma-track autistic youth; (b) test the associations between EF, social communication skills, and internalizing behaviors and SMDLT (measured by the PEDI:R) in this population; and (c) explore if EF mediates the

associations of social communication skills and internalizing behaviors on SMDLT in this population.

## **Methods**

### **Participants**

Autistic youth and parent dyads ( $n = 46$ ) were recruited for the study through (1) schools and school districts providing special education services to high school students with autism, (2) directly through parents via local and regional parent autism advocacy and support groups using emailed letters and informational flyers or postings on internet sites and listservs, and (3) through community groups providing services for high school students with autism. Inclusion criteria were: current high school student (age 14–20 years old) with prior diagnosis of autism by a professional and current or past receipt of special education services under the autism disability category (Individuals with Disabilities Education Act, 2004), and expectation of graduation with a regular high school diploma, per parent report. History of symptoms consistent with an autism diagnosis were verified by a Lifetime form of Social Communication Questionnaire (Rutter, Bailey, & Lord, 2003) score of 15 or higher (administered during a phone screen). Exclusion criteria were: expectation of graduation with a high school completion certificate, intellectual disability, or major physical limitation, per parent report. When available, Individualized Education Programs were used to confirm that youth met criteria.

Demographic characteristics of parents and youth are reported in Table 4. Most parents and youth identified as white, lived in suburban communities, and most parents

(80%) had at least a bachelor's degree. Autistic youth were primarily male (76%) and most had co-occurring conditions per parent report, including anxiety disorder (76%), ADD/ADHD (67%), depression (46%), and learning disability (41%).

### **Data collection procedure**

Ethical approval for the study was obtained by the Institutional Review Board at Boston University. All youth and parents provided informed consent (or assent for youth younger than 18 years old) prior to completing study procedures. Parents and youth provided data on youth's internalizing behaviors, social communication skills, and EF through a combination of assessments administered online or mailed paper forms. After completing the mailed and online assessments, the parents completed an assessment of youth's ability to self-manage daily life tasks that was administered over the phone using online screen share.

### **Measures**

Youth and parent demographic characteristics including age, gender, race and ethnicity, community type, parent level of education, and youth co-occurring conditions were collected via online survey in addition to the following four measures.

*Pediatric Evaluation of Disability Inventory – Computer Adaptive Test – ASD: Responsibility domain*; PEDI:R (Haley et al., 2012). The PEDI:R is a parent-report scale measuring youth's ability to organize and manage daily life tasks, including planning, flexibility, and ability to respond to environmental and social cues and generate strategies to achieve goals. The Responsibility domain includes items such as *Informing home, school, or work when he or she will be late or absent; locating needed services or*

*supports (e.g., finding a community program or repair business); tracking spending and managing money; maintaining cleanliness and upkeep of living space; and making healthy choices to maintain health and well-being.* Items are rated on a five-point scale quantifying the extent to which an individual relies on environmental supports or help from others to carry out complex tasks (from ‘adult/caregiver takes full responsibility for the task’ to ‘child takes full responsibility for the task’). This rating scale provides more nuanced information about how that individual uses supports to enable functioning in their typical daily contexts (Dunn, Coster, Orsmond, et al., 2009; Kao et al., 2015; Kramer, Coster, Kao, Snow, & Orsmond, 2012). T-scores range from 0–100 ( $M=50$ ,  $SD=10$ ) with high scores indicating that youth takes more responsibility for managing their daily life tasks compared to same age peers. The PEDI has been validated specifically for use with adolescents with autism (Kramer et al., 2012). Using the PEDI:R in a study of 125 youth with autism without intellectual disability, 46% of the sample fell in the significantly delayed range on the PEDI:R and an additional 40% of youth were in the borderline delayed range (Munsell & Coster, 2020). Notably, 61% of youth age 18 and older were significantly delayed, compared to 38% of youth age 14–17, indicating that older youth experience a greater discrepancy in ability to self-manage daily life tasks compared to peers.

*Behavior Rating Inventory of Executive Function, Adult (Gioia et al., 2000) and Behavior Rating Inventory of Executive Function, Second Edition (Gioia, Isquith, Guy, & Kenworthy, 2015): Metacognition Index; BRIEF:MI.* The BRIEF is a parent report scale measuring executive functioning in everyday contexts. The metacognition index (MI)



consists of five subscales: initiate, working memory, plan/organize, task monitor, and organization of materials. Items are rated on a three-point scale of the extent to which a behavior has been a problem in the past month (never, sometimes, often). T-scores range from 0–100 ( $M=50$ ,  $SD=10$ ) with high scores indicating more executive function problems. The BRIEF has good internal consistency with alpha coefficients ranging from .80 to .98 for the clinical scales and the index scores (Roth et al., 2005). Evidence of convergent and discriminant validity has been reported in many populations including autism (Gioia et al., 2000). Parents of youth under the age of 17 in this study received the BRIEF-2, all other participants completed the BRIEF-Adult version.

*Adult Self Report* (Achenbach & Rescorla, 2003) and *Youth Self Report* (Achenbach & Rescorla, 2001): *Internalizing behavior subscale; IB*. The internalizing behavior subscale (IB) of the Adult and Youth Self Report measures is a self-report scale measuring youth's internalizing symptoms. It consists of three subscales: anxiety/depression, withdrawn behavior, and somatic complaints. Items are rated on a three-point scale on the extent to which behaviors describe themselves (not true, somewhat true, very true). T-scores range from 0–100 ( $M=50$ ,  $SD=10$ ) with high scores indicating more internalizing behaviors. The Adult and Youth Self Report measures have good internal consistency, with alphas above .70 (Achenbach & Rescorla, 2003), and have been shown to be valid measures of emotional and behavioral disorders in autistic individuals (Pandolfi et al., 2011). Youth under the age of 17 in this study received the Youth Self Report, all other participants completed the Adult Self Report.

*Communication Checklist – Adult; CCA* (Whitehouse & Bishop, 2009). The CCA is designed for adults (ages 17+) with developmental disabilities including individuals with subtle communication difficulties, such as autism and specific language impairment (Whitehouse, Coon, Miller, Salisbury, & Bishop, 2010). It is a parent-report scale measuring aspects of youth’s social communication skills including social engagement, pragmatic skills, and structural language. Seventy items are scored on a three-point scale of frequency of behavior (from ‘less than once a week or never’ to ‘several times a day or always’). Raw scores range from 0–140 with higher scores indicating more social communication problems. Raw scores were used in this analysis in order to capture the full extent of variability in CCA scores across participants.

### **Data analysis**

All statistical analyses were conducted using SPSS Statistics, Version 27 (IBM Corp., 2020). Descriptive analyses of mean, range, or frequencies were calculated to describe participant and student characteristics and PEDI:R scores. Pearson’s correlations were performed to assess the bivariate relationships between the dependent variable (PEDI:R) and four independent variables (CCA, IB, MI, youth age). All variables met the skew and kurtosis criteria for normal distribution and thus were treated as continuous variables. Results of the correlation analyses informed mediation models.

*Regression analyses.* Multiple linear regression analysis was performed to evaluate the associations between the dependent variable (ability to self-manage daily life tasks; PEDI:R T-score) and independent variables. Four independent variables were entered in one step into the regression analysis: youth age, communication ability (CCA

raw score), metacognition (MI T-score), and internalizing behaviors (IB T-score).

*Mediation analyses.* Mediation analyses can expose instances where the relationship between the independent (X) and dependent (Y) variable is influenced through a third, mediator (M) variable (Baron & Kenny, 1986). We used Baron and Kenny's (1986) approach to testing mediation through a series of linear regression analyses (Figure 8) using the PROCESS macro for SPSS, version 3.5.3 (Hayes, 2012). First, we tested for significant associations between X and Y (path c) and X and M (path a). Then we estimated path b by testing the association between M and Y, controlling for X. Finally, path c' was compared to path c to determine the extent of mediation. In light of our small sample size, our analysis focused on effect sizes and confidence intervals. We also tested the robustness of the mediation estimation using Preacher and Hayes (2008) bootstrap procedure.

## **Results**

### **Descriptive analyses of self-management of daily life tasks (SMDLT)**

Overall, autistic youth performed below age-based normative scores on PEDI:R. A T-score of 50 is considered average for age. T-scores for the sample ranged from 15 – 44 with a mean T-score of 30.87 ( $SD = 7.15$ ). Thirty-seven percent of the sample fell in the significantly delayed range (T-score < 30). The remaining youth were in the borderline delayed range. Notably, there was a significant negative correlation between T-scores and age ( $r = -.45, p = .002$ ), indicating that older youth had larger discrepancies in performance compared to peers.

### **Correlation analyses**

Table 5 shows the full correlation matrix for PEDI:R and four independent variables. All independent variables had significant negative correlations of moderate magnitude with PEDI:R. In addition, social communication and internalizing behaviors were correlated with metacognition. Higher metacognition (MI) was significantly correlated with better social communication (CCA;  $r = .50, p < .001$ ) and less severe internalizing behaviors (IB;  $r = .41, p = .008$ ).

### **Regression analysis**

Table 6 shows the regression analysis results. Youth age, internalizing behaviors, metacognition, and social communication skills explained 49% of the variance in PEDI:R ( $R^2 = .49, SE = 5.27, p < .001$ ) with only metacognition explaining a significant amount of unique variance in PEDI:R ( $\beta = -.27, SE = .09, p = .006$ ).

### **Mediation analysis**

The results of the correlation and regression analyses suggested that metacognition may mediate the effect of social communication on PEDI:R and also the relationship between internalizing behaviors and PEDI:R. The results of the mediation analyses supported these hypotheses.

*Metacognition mediates the effect of social communication on SMDLT* (Table 7). Results indicated that social communication was a significant predictor of both PEDI:R ( $\beta = -.09, SE = .03, 95\% \text{ CI } [-.15, -.02], p = .013$ ) and metacognition ( $\beta = .19, SE = .05, 95\% \text{ CI } [.08, .30], p = .001$ ). After controlling for metacognition, social communication was no longer a significant predictor of PEDI:R ( $\beta = -.03, SE = .03, 95\% \text{ CI } [-.10, .04], p$

= .343). Approximately 46% of the variance in PEDI:R was accounted for by the predictors. The indirect effect was tested using Preacher and Hayes (2008) bootstrapping procedure. Over 5,000 trials, the bootstrap estimated indirect effect was significant ( $\beta = -.05$ ,  $SE = .02$ , 95% CI [-.10, -.02]). Social communication skills directly accounted for approximately 38% of variance in PEDI:R, while 62% of the effect of social communication skills on PEDI:R was mediated through metacognition.

*Metacognition mediates the effect of internalizing behaviors on SMDLT (Table 8).*

Results indicated that internalizing behaviors were a significant predictor of PEDI:R ( $\beta = -.24$ ,  $SE = .09$ , 95% CI [-.41, -.06],  $p = .011$ ) and that internalizing behaviors were a significant predictor of metacognition ( $\beta = .40$ ,  $SE = .15$ , 95% CI [.10, .70],  $p = .010$ ). Internalizing behaviors were no longer a significant predictor of PEDI:R after controlling for the mediator, metacognition ( $\beta = -.11$ ,  $SE = .08$ , 95% CI [-.28, .06],  $p = .187$ ). Approximately 48% of the variance in PEDI:R was accounted for by the predictors. Over 5,000 trials, the bootstrap estimated indirect effect was significant ( $\beta = -.13$ ,  $SE = .06$ , 95% CI [-.28, -.04]). Internalizing behaviors directly accounted for approximately 47% of variance in PEDI:R, while 53% of the effect of internalizing behaviors on PEDI:R was mediated through metacognition.

## **Discussion**

In this study we demonstrated the complex relations among three underlying factors that influence the ability to self-manage daily life tasks in autistic youth. Together, metacognitive executive functioning, social communication skills, internalizing behavior, and youth age predicted 49% of the variability in daily task management, with

metacognition explaining significantly more unique variance in self-management of tasks after controlling for the other factors. Results of the mediation analysis suggested that metacognition mediates the association of internalizing behaviors (indirect effect: 47%) and social communication skills (indirect effect: 62%) on self-management of tasks.

Our findings build on existing evidence of daily functioning challenges in autistic youth from studies using traditional adaptive behavior measures (Bal et al., 2015; Duncan & Bishop, 2015). Unlike measures of adaptive behavior that combine discrete functional skills and complex task management in a single scale, the PEDI:R focuses specifically on youth's ability to take over the decision making, problem solving, and organization needed to carry out complex daily life tasks in real life contexts (Kao et al., 2020). Youth in our sample performed well below the age-expected level of responsibility on the PEDI:R, indicating that, overall, autistic youth were not yet assuming a level of responsibility comparable to their peers. Similar to the pattern seen in adaptive behavior (Duncan & Bishop, 2015), the discrepancy in level of self-management in typically developing youth compared to autistic youth was greater in older adolescents. These findings focus attention on a key area of difficulty for diploma-track autistic youth: This group remains significantly more dependent on external supports (e.g., help from their parent/caregiver) to manage daily life compared to same age peers. Future research using the PEDI:R or similar measures that specifically focus on self-management of complex daily tasks rather than more global adaptive behavior measures may be beneficial in describing areas of challenge and as a potential intervention target/outcome measure for diploma-track autistic youth (Coster, 2013).

In previous investigations of these factors in autistic youth without intellectual disability, researchers have explored associations between executive functioning, social communication skills, and internalizing behaviors using executive functioning as an outcome or have included a subset of these factors to predict adaptive behavior (Duncan & Bishop, 2015; Kraper et al., 2017; Pugliese et al., 2016, 2015; Wallace et al., 2016). However, it is likely that many autistic youth display features of all three of these underlying factors due to the high incidence of anxiety and depression and executive dysfunction in this population. To our knowledge, this is the first study that explores the combined associations of internalizing behavior, social communication skills, and executive functioning on daily functioning (i.e., self-management of daily life tasks) in diploma-track autistic youth. In our analyses, the three factors collectively explained a moderate amount of variance in the PEDI:R outcome in our sample; however, only metacognition significantly explained any additional unique variance in PEDI:R score. This finding suggests that each of these factors may play an important role in the ability to consistently self-manage daily tasks and may be present to different degrees in autistic youth, giving rise to variations in performance of complex task management. Different profiles of strengths and weaknesses in executive functioning, internalizing behaviors, and social communication may influence youth's ability to manage daily life.

In this study we also explored the mediation effect of executive functioning on self-management of daily life tasks. The partial mediation of executive functioning on the association between social communication skills and internalizing behaviors on task management emphasizes the influence that strong executive functioning skills may have

on mitigating other challenges that contribute to poor daily task management. All three factors clearly play an important role in the development of daily task management.

However, youth with higher levels of executive functioning may be able to call on their strengths in planning, task initiation, task monitoring, and flexibility to compensate for internalizing behaviors related to anxiety or depression, or social communication skill deficits in order to take on more responsibility for managing daily tasks.

It is well established that autistic youth, including those without intellectual disability, have differing profiles of autistic characteristics and, as a result, individualized approaches to intervention and assessment are considered best practice (Masi, Demayo, Glozier, & Guastella, 2017). The results of our analyses reflect the heterogeneity seen across autistic youth by showing that multiple factors play a role in demonstrating consistent ability to self-manage daily tasks. Consequently, it is necessary to carry out a comprehensive assessment of youth's strengths and weaknesses prior to engaging them in any type of intervention aimed at improving daily functioning or an underlying factor. Identifying individual variations can direct clinicians towards interventions that address youths' specific needs and make optimal use of their strengths rather than using a "one size fits all" approach to improving daily functioning in this population.

Furthermore, given the complex relations between social communication skills, internalizing behavior, and executive functioning and self-management of daily life tasks, it is likely that interventions addressing only one of these factors may not be universally effective for diploma-track autistic youth. Rather, multifaceted interventions that address the potential weaknesses across social communication, executive functioning, and



internalizing behavior using an integrated approach are needed. For example, Unstuck and on Target (UOT) (Cannon et al., 2011) is an executive function intervention for youth with autism in which youth learn strategies to accommodate for flexibility and other executive functioning challenges (Cannon et al., 2011). UOT uses a multi-contextual approach in which strategy teaching is embedded during typical daily activities in real life contexts at school and home. Notably, UOT addresses social communication skills and behavioral challenges through the development of cognitive flexibility. In a study comparing UOT to a traditional social skills training intervention, the UOT group demonstrated greater improvement in classroom performance compared to the social skills training group (Kenworthy et al., 2014). A modified version of Cognitive Behavior Therapy (CBT; Sze & Wood, 2008) has also been used with good effect to mitigate depression and anxiety as well as improve self-help skills and independence in daily routines in autistic children (Drahota, Wood, Sze, & Van Dyke, 2011). CBT could be incorporated into existing executive functioning interventions to address self-management of daily life tasks for autistic youth who have high levels of internalizing behaviors.

### **Limitations and future directions**

Our results provide a new perspective on the role of executive function, social communication skills, and internalizing behaviors on a specific area of challenge for diploma-track autistic youth: the ability to self-manage daily life tasks. However, these results are limited in their generalizability due to the small, relatively homogeneous study sample. Most of the participants identified as white, non-Hispanic/Latinx, and are from

families with highly educated parents. The transfer of responsibility for daily life tasks takes place within the social environment and valued skills are determined by shared cultural beliefs about what constitutes “responsibility” in adulthood (Rogoff, 2003). Thus, autistic youth from different backgrounds may demonstrate different patterns of influences on responsibility development compared to the youth in this sample. Future work could investigate the role of cultural and social environment in relation to the model described in this study. In addition, although mediation analysis implies a directional relationship among variables (Kraemer, Wilson, Fairburn, & Agras, 2002), our statistical findings are correlational and cross sectional, limiting our ability to draw definitive conclusions from our results. A longitudinal study design using a specific measure of complex daily task performance would help us further disentangle the relations among factors influencing self-management of daily life tasks.

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### **Declaration of Interest**

All authors declare that they have no conflict of interest.

**Table 4***Demographic characteristics of students and parents*

<b>Parents</b>	<b>% (n)</b>
Age, <i>M</i>	<i>M</i> = 48.9 ( <i>SD</i> = 5.32)
Gender, female	97.8% (45)
Race	
White	84.8% (39)
Two or more races	8.7% (4)
Asian	6.5% (3)
Hispanic/Latinx	4.3% (2)
Highest level of education completed	
High school graduate	2.2% (1)
Some college or two-year college degree	17.4% (8)
Four-year college degree	37.0% (17)
Graduate degree	43.5% (20)
Relationship to child	
Biological mother	95.7% (44)
Adoptive mother	2.2% (1)
Biological father	2.2% (1)
Community	
Suburban	73.9% (34)
Urban	23.9% (11)
Rural	6.5% (3)
<b>Students</b>	<b>% (n)</b>
Age, <i>M</i>	<i>M</i> = 17.75 ( <i>SD</i> = 1.00)
Gender, male	76.1% (35)
Race <sup>a</sup>	
White	78.3% (36)
Two or more races	10.9% (5)
Asian	8.7% (4)
Native Hawaiian or other Pacific Islander	2.2% (1)
Hispanic/Latinx	6.5% (3)
Co-occurring conditions	
Anxiety disorder	76.1% (35)
ADD/ADHD	67.4% (31)
Depression	45.7% (21)
Learning disability	41.3% (19)
Obsessive-compulsive disorder	15.2% (7)
Bipolar disorder	10.9% (5)
Oppositional defiant disorder	6.5% (3)

**Table 5***Pearson correlations between variables*

	PEDI:R	Age	IB	MI
Age	-.449**			
IB	-.440**	.086		
MI	-.571**	.206	.413**	
CCA	-.400**	.152	.269	.501**

**\*\***  $p < 0.01$  (2-tailed)

**Table 6***Regression of independent variables on self-management of daily life tasks*

	$\beta$	<i>SE</i>	Std. $\beta$	95% CI		<i>p</i>
				<i>LL</i>	<i>UL</i>	
Intercept	88.01	17.66		52.16	123.85	<.001
IB	-.11	.08	-.17	-.27	.06	.214
MI	-.27	.09	-.44	-.46	-.08	.006
CCA	-.04	.04	-.15	-.11	.04	.317
Age	-1.73	.98	-.22	-3.72	.23	.086

Dependent Variable: PEDI:R T-score

**Table 7***Analysis of mediation with social communication (CCA)*

Model <sup>a</sup>	B	SE	Lower 95% CI	Upper 95% CI	Effect size	<i>p</i>
STEP 1 ( <i>dependent variable: PEDI:R</i> )					$R^2 = .320$	
(constant)	86.17	15.93	54.00	118.33		<.001
CCA	-.09	.03	-.15	-.02		.013
Age	-2.82	.91	-4.65	-.99		.003
STEP 2 ( <i>dependent variable: MI</i> )					$R^2 = .268$	
(constant)	28.07	26.07	-24.59	80.73		.288
CCA	.19	.05	.08	.30		.001
Age	1.46	1.48	-1.54	4.46		.332
STEP 3 ( <i>dependent variable: PEDI:R</i> )					$R^2 = .458$	
(constant)	93.90	14.59	64.40	123.34		<.001
MI	-.28	.09	-.45	-.10		.003
CCA	-.03	.03	-.10	.04		.343
Age	-2.42	.83	-4.10	-.75		.006

<sup>a</sup> n = 44 for the analysis due to missing data

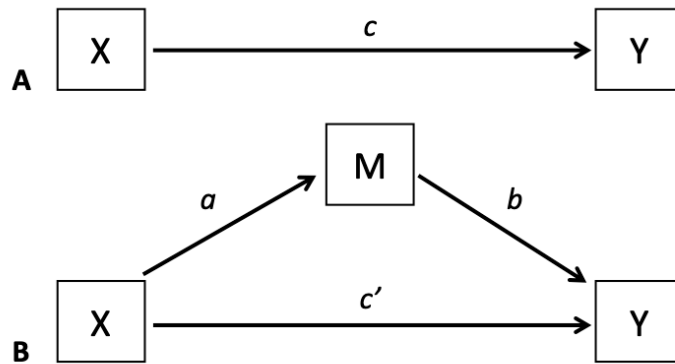
**Table 8***Analysis of mediation with internalizing behaviors (IB)*

Model <sup>a</sup>	B	SE	Lower 95% CI	Upper 95% CI	Effect size	<i>p</i>
STEP 1 ( <i>dependent variable: PEDI:R</i> )					$R^2 = .273$	
(constant)	91.43	20.00	50.91	131.95		<.001
IB	-.24	.09	-.41	-.06		.011
Age	-2.58	1.10	-4.81	-.35		.025
STEP 2 ( <i>dependent variable: MI</i> )					$R^2 = .200$	
(constant)	1.72	33.57	-66.29	69.74		.960
IB	.40	.15	.10	.70		.010
Age	2.16	1.85	-1.59	5.90		.250
STEP 3 ( <i>dependent variable: PEDI:R</i> )					$R^2 = .475$	
(constant)	91.97	17.23	57.03	126.91		<.001
MI	-.31	.08	-.49	-.14		.001
IB	-.11	.08	-.28	.06		.187
Age	-1.90	.96	-3.86	.06		.057

<sup>a</sup> n = 40 for the analysis due to missing data

**Figure 8**

*Mediation Model*



*Notes.* (a) direct effect of X on Y. (b) Mediation model; X has an indirect effect on Y through M (Baron & Kenny, 1986).



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## DISCUSSION

In this dissertation, I conducted two studies exploring the construct of self-management of daily life tasks (SMDLT). In Study 1, I used data from a large data set of diploma-track youth with disabilities (NLTS2; SRI International, 2000) to develop models of the associations between three underlying factors (social communication skills, executive functioning, and emotional and behavioral health) and (1) SMDLT and (2) discrete functional skills using a structural equation modeling approach. In Study 2, I completed mediation testing via multiple linear regression to explore the complex relationships among metacognition, internalizing behaviors, and social communication skills and how these factors relate to SMDLT in a smaller sample of diploma-track autistic youth. Together, these studies provided further evidence that the construct of complex daily task management is distinct from foundational functional skills and demonstrated complex relationships between social, cognitive, and behavioral factors, and SMDLT. These findings support the work by Haley et al. that established management of daily life tasks as a distinct domain that is separate from foundational functional skills needed for discrete daily activities (Haley et al., 2011).

In Study 1, I found that common areas of challenge in diploma-track youth with disabilities, including social and communication skills, executive functioning, and behavioral regulation, are more strongly associated with the ability to self-manage life tasks (e.g., managing laundry, buying items at a store, getting places outside of the home) than performance of discrete functional skills (e.g., counting change, using the phone, telling time). By separating self-management of daily life tasks from discrete functional



skills, I was able to explore the extent to which these factors contribute to variation in ability to manage life tasks more precisely. The results of this study also suggested that there are complex relations among underlying factors that influence SMDLT. The ability to carry on a conversation was directly associated with SMDLT and partially mediated the effect of behavioral regulation and social skills on SMDLT.

Study 2 expanded on the findings from Study 1. In this study, I focused on diploma-track autistic youth, as it is likely that many autistic youth experience some degree of difficulty with all three of the underlying factors due to the high incidence of anxiety and depression and executive dysfunction in this population (American Psychiatric Association, 2013; Bauminger et al., 2010). Youth in our sample performed well below the age-expected level of responsibility on the measure of SMDLT indicating that, overall, autistic youth were not yet assuming a level of responsibility for tasks comparable to their peers. The discrepancy in level of self-management in typically developing youth compared to autistic youth was greater in older adolescents. Again, these findings focus attention on a key area of difficulty for diploma-track autistic youth: their ability to take over the decision making, problem solving, and organization needed to carry out complex daily tasks in real life contexts (Kao et al., 2020).

The use of specific measures of metacognition, internalizing behaviors, and social communication in Study 2 provided the opportunity to more precisely explore the relations among these underlying factors. In both studies, these factors explained a moderate amount of variance in SMDLT. However, in Study 2 executive functioning partially mediated the association between social communication skills and internalizing

behaviors on task management. This finding emphasizes the influence that strong executive functioning skills may have on mitigating other challenges that contribute to problems with daily task management. However, results also demonstrate that executive function is not the only factor that predicts self-management, thereby differentiating executive functioning behaviors as related to, but not synonymous with self-management of daily life tasks.

The previous investigations of these factors in academically capable youth with disabilities have examined associations between executive functioning, social communication skills, and internalizing behaviors using executive functioning as an outcome or have included a subset of these factors to predict adaptive behavior (Baker et al., 2021; Gjervan et al., 2016; T. L. Hill et al., 2015; Kraper et al., 2017; Mullin et al., 2020; Wallace et al., 2016). However, it is likely that many youth with disabilities display features of all three of these underlying factors (Bauminger et al., 2010; Demetriou et al., 2018; Follmer, 2018; Mullin et al., 2020; Silverstein et al., 2020; Timmermanis & Wiener, 2011). The studies in this dissertation explored the combined impact of these factors on complex task management and suggest that all three play an important role in enabling consistent self-management of daily tasks. Different profiles of strengths and weaknesses in executive functioning, internalizing behaviors, and social communication may influence youth's ability to manage daily life tasks. However, youth with higher levels of executive functioning may be able to call on their strengths in planning, task initiation, task monitoring, and flexibility to compensate for internalizing behaviors related to anxiety or depression, or social communication skill deficits in order to take on

more responsibility in their daily lives.

The results of these studies have implications for research and clinical practice. Self-management of daily life tasks is distinct from foundational functional skills and therefore, should be a specific target of assessment and intervention aimed at enabling participation in adult roles for diploma-track youth with disabilities. Furthermore, given the complex associations between social communication skills, emotional and behavioral health, executive functioning and self-management of daily life tasks, it is likely that interventions addressing only one single facet of this model may not be universally effective for all youth. Rather, multifaceted assessment and interventions that address the potential weaknesses across social, cognitive, and behavioral factors using an integrated approach are needed. Given the importance of metacognition as a mediator of the effect of social communication and behavioral health on daily task management, strategies that address executive functioning should be a focus of intervention; however, interventions to improve self-management of tasks should also include teaching strategies and practice coordinating underlying skills in flexible ways that meet the varying demands of tasks and diverse environments.

Cognitive Orientation to daily Occupational Performance (CO-OP; Polatajko et al., 2001) and Unstuck and on Target (UOT; Cannon et al., 2011) are examples of interventions that incorporate some of the principles highlighted in these study findings. UOT is an executive function intervention for youth with autism in which youth learn strategies to accommodate for challenges in flexibility and other executive functions (Cannon et al., 2011). UOT uses a multi-contextual approach in which strategy teaching

is embedded during typical daily activities in real life contexts at school and home. Similar to UOT, CO-OP emphasizes guided self-discovery of task-specific and problem solving strategies within real life contexts to improve functional task performance (Polatajko et al., 2001). These interventions could be combined with a modified version of Cognitive Behavior Therapy (CBT; Drahota, Wood, Sze, & Van Dyke, 2011) to address self-management of daily life tasks for youth who have high levels of internalizing behaviors.

### **Future directions for research**

The work in this dissertation is a stepping off point for my long term research agenda focusing on youth's ability to manage responsibilities of adulthood. My overall goal for this line of research is to understand the process and influences on this area of challenge for academically capable youth with disabilities in order to develop interventions that best support youth to take responsibility in their daily lives in order to successfully participate in their desired adult roles.

The introduction of this dissertation described self-management of daily life tasks (SMDLT) within the ICF framework (World Health Organization, 2001). This dissertation specifically focused on how executive functioning, social communication skills, and emotional and behavioral health may impact daily task management. However, these factors are just one part of the framework laid out in figure 3. Additional research on factors associated with SMDLT and the process through which these factors interact to influence the development of complex task management is needed. This includes research that explores the impact of person factors (e.g., age, gender, diagnosis) and

environmental factors (e.g., parental support/philosophy, sociocultural expectations, availability of accommodations and supports) on one's ability to manage necessary tasks in their daily life. Relatedly, further description of the process by which youth with disabilities learn to manage daily life tasks is warranted. The existing literature on the transfer of responsibility from adults to youth describes the culturally driven process of guided participation as one way in which youth learn to assume responsibility (Rogoff, 2003); however, research specific to youth with disabilities is lacking. Research in these areas would provide a more wholistic picture of the influences on daily task management for youth with disabilities and suggest additional factors that may need to be considered for youth to learn to manage life tasks effectively.

Another area for future research is understanding how challenges managing the tasks required in adulthood impacts an individual's ability to participate in adult roles that are meaningful to them. Participation in adulthood is often measured by features of productivity or independence such as one's ability to gain and maintain employment, attend postsecondary education, and live independently (Barkley & Fischer, 2011; Haber et al., 2016; Howard et al., 2016; Roux et al., 2013). While the ability to manage daily tasks certainly affects these outcomes for many academically capable youth with disabilities, it is also important to explore less traditional participation outcomes. In recent literature, particularly in the area of autism research, researchers have called for a broader view of adulthood outcomes that includes quality of life, satisfaction, as well as person-environment fit (Henninger & Taylor, 2013; Schmidt et al., 2015). Self-management of daily life tasks may impact these areas as well. For example, the ability to

manage complex tasks could influence participation in other valued community activities (e.g., participating in meaningful leisure activities in the community, volunteering, dating and/or maintaining relationships, etc.). Feeling that one is able to manage their daily life may also influence an individual's satisfaction with their level of participation or overall quality of life. Self-management of tasks may also promote better person-environment fit by providing opportunities for young adults with disabilities to participate in a greater variety of culturally-valued environments because they are less reliant on environmental supports to enable participation. Research establishing the connection between self-management of daily life tasks and broad outcomes related to participation in adulthood will support the relevance of SMDLT as an intervention target.

Informed by an understanding of the many factors that influence the development of SMDLT, the next phase of this research program is to develop interventions that address daily task management for youth with disabilities. These interventions will likely have multiple targets for skill and strategy development and take place within the individual's daily contexts (i.e., at work, school, home, or in the community) in order to support generalization of skills. Based on the work in this dissertation, these interventions may draw on principles of task analysis and behavior change and include aspects of existing interventions focused on executive functioning strategy development (Cannon et al., 2011; Drahota et al., 2011; Polatajko et al., 2001).

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## CURRICULUM VITAE

