

PARENTAL PERCEPTIONS OF CHILDREN AND ADOLESCENT INTERNET USE,
EXECUTIVE FUNCTIONING, AND PARENTING STYLE

by

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ABSTRACT

There is minimal research that investigates how, and to what degree, children's and adolescents' problematic internet use (PIU) can be predicted by core neurocognitive processes and parents' parenting styles. To address this, the current study investigated how PIU was predicted by two core dimensions of executive functioning (EF), namely, inhibition and working memory, and Diana Baumrind's three parenting styles. Parents ($N = 144$) were administered one internet measure, the Parent-Child Internet Addiction Test (PCIAT; Young, 2016), one EF measure, the Childhood Executive Functioning Inventory for Parents and Teachers (CHEXI; Thorell & Nyberg, 2008), and one parenting style measure, the Parenting Styles and Dimensions Questionnaire-Short Version (PSDQ-Short Version; Robinson, Mandleco, Olsen, & Hart 2001). Results indicated inhibition and working memory each separately predicted PIU. Moreover, working memory predicted PIU to a greater degree. This suggests that the core EF skills needed to hold information in mind and restrain behavior are important to regulating internet behavior. This study did not find a relationship between parenting styles and PIU. These findings contribute to PIU and EF research by utilizing an EF dimensional approach on a non-clinical US sample of children and adolescents.

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CHAPTER ONE

INTRODUCTION

Currently, there is growing interest about the amount of time children and adolescents spend using the internet. Multiple national organizations such as the American Academy of Pediatrics (AAP), the American College of Pediatricians, and the American Psychiatric Association (APA), have indicated concern about the overuse of internet by children and teens. For example, the AAP acknowledges internet overdependence as an ongoing struggle for families (2010). Likewise, the American College of Pediatricians has recognized the negative outcomes associated with growth of internet use by children and adolescents (2016). Furthermore, the APA has identified that internet gaming disorder, a specific type of internet addiction focusing on internet gaming, is a developing problem. Consequently, internet use disorder has been included within the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) as a condition requiring research for the consideration of a future diagnostic label (APA, 2013).

Though these national organizations caution about internet overuse, it should be noted that research has acknowledged several positive outcomes related to internet use such as increased communication (Kennedy, Smith, Wells, & Wellman, 2008) and access to information (Storm, Stone, & Benjamin, 2016). Additionally, internet access has facilitated the distribution of ideas and technological innovations. Generally, according to these studies, as well as others, internet use can be beneficial to users.

However, the majority of research has documented that increases in internet use are associated with a number of physical health and mental health problems (Ciarrochi et

al., 2016). Regarding physical health, studies have linked increased levels of internet use to higher rates of obesity (Li, Deng, Ren, Guo, & He, 2014), decreased physical activity (Bener & Bhugra, 2013; Zach & Lissitsa, 2016), and sleep problems (Chen & Gau, 2016; Tan, Chen, Lu, & Li, 2016). Regarding mental health problems, studies have associated internet overuse as being related to social anxiety (Ostovar et al., 2016; Weinstein, Dorani, Elhadif, Bukovza, & Yarmuinik, 2015), loneliness (Ostovar et al., 2016; Yao & Zhong, 2014), and depression (Lam & Peng, 2010; Morrison & Gore, 2010; Tan et al., 2016). Overall, there is a growing body of research that documents that internet overdependence is related to a multitude of physical health and mental health problems.

Problematic Internet Use

Problematic internet use (PIU) is the first major construct in the current study. Problematic internet use has been defined and termed in multiple ways. For example, in the mid-1990s, Young (1998) used the term internet addiction (IA) to define an internet related impulse control disorder that causes damage to interpersonal, familial, and romantic relationships. Additionally, as a result of IA, individuals experience functional impairments in their academic and/or occupational performance. Similar to other types of addictions, individuals with internet addiction develop a growing tolerance to the internet, develop symptoms of withdrawal due to becoming psychologically dependent on internet use, are consumed with activities on the internet, and use the internet as a coping mechanism (Spada, 2014; Young, 1998). In addition to Young's (1998) criteria of tolerance, withdrawal, and functional impairment, Block (2008) proposed that another important characteristic of internet addiction is excessive internet use that results in "a loss of sense of time or a neglect of basic drives" (p. 306).

Similarly, Shapira, Goldsmith, Keck Jr., Khosla, and McElroy (2000) utilized the terminology of problematic internet use to describe difficulties controlling the impulse to use the internet, which adversely effects functioning and causes distress. Shapira et al. (2000) suggested that a core feature of problematic internet use is that an individual's use of the internet is uncontrollable, and does not co-occur during hypomanic or manic episodes. Similar to Young's (1998) definition, Shapira et al.'s (2000) definition defines problematic internet use as being related to impulse control as well as resulting in distress and impairments in functioning. Further adding to this definition, Davis (2001) suggests that a key component of IA, or pathological internet use as termed by Davis, is the individual's obsessive thoughts related to their internet use. Additionally, Davis (2001) posited that there might be different types of PIU. For example, individuals with specific pathological internet use (SPIU) overuse a particular function of the internet, but those with general pathological internet use (GPIU) overuse a wide variety of functions related to the internet. However, according to Davis, the major features of PIU are fairly similar to the other definitions presented. That is, individuals experience decreased impulse control, impairments in functioning related to overuse of the internet, and obsessive thoughts about the internet. Despite variations in terminology and definitions in current literature, most researchers generally agree that internet addiction is a condition characterized by difficulty with impulse control that is associated with a variety of problems that negatively impact the individual's interpersonal, occupational, or social functioning.

In the current study, the terminology “problematic internet use” (PIU) will be used to refer to excessive internet use that is associated with negative consequences due to using the internet for either specific or general functions.

Theoretical Model of Problematic Internet Use. Researchers have utilized a cognitive-behavioral framework to understand PIU. Davis (2001) proposed that PIU “results from problematic cognitions coupled with behaviors that either intensify or maintain the maladaptive response” (p. 188). Therefore, unlike other research on PIU that focuses on the behavioral components and adverse impact on functioning (i.e., Young, 1998), according to Davis (2001) the etiology of PIU lies within the individual’s cognitions, which then affect their behavior.

Regarding problematic cognitions, this model suggests that individuals with PIU tend to have maladaptive thoughts about two things: thoughts about themselves and thoughts about the world in which they live (Davis, 2001). Individuals with PIU tend to have dysfunctional cognitions about themselves that are related to “self-doubt, low self-efficacy, and negative self-appraisal” (Davis, 2001, p. 191). Examples of maladaptive cognitions are “I am a failure when I am offline” or “I am only good on the internet” (Davis, 2001, p. 191). Examples of problematic thoughts related to the world are “Nobody loves me offline” or “People treat me badly offline” (Davis, 2001, p. 192).

Regarding problematic behaviors, this model suggests that individuals with PIU tend to experience dysfunction as a result of their internet use. Specifically, individuals with PIU tend to experience negative consequences in their interpersonal relationships, occupation, and academics as a result of the amount and frequency of their internet use (Davis, 2001). Additionally, according to Davis (2001), other problematic behaviors

related to PIU include using the internet as a coping mechanism for one's own problems or an individual's deceitfulness about their internet use. Davis (2001) also notes that procrastination can play an important part in the development, persistence, and consequences of PIU because individuals with PIU tend to use the internet instead of performing their academic or occupational duties, which then results in an increased amount of stress on the individual. Overall, individuals with PIU tend to have problematic behaviors associated with their cognitions that maintain or intensify the problematic cognitions related to the internet that they already have, which causes an impairment in multiple areas of their lives. In summary, Davis's (2001) cognitive-behavioral model of PIU theorizes that PIU is the consequence of maladaptive thoughts that influence the enactment of behaviors that maintain or worsen an individual's PIU.

The field of psychology has begun to focus on the rates of internet use that are associated with the development of PIU and the overuse of technology in general because internet use is a highly preferred activity for children and adolescents (Brand, Young, & Laier, 2014; Dong, Lin, & Potenza, 2015; Wang et al., 2016). Moreover, internet use, including PIU, has been suggested by some researchers as being related to deficits in inhibition that results in difficulties overriding impulses to engage in purposeful, self-directed behavior (Ko et al., 2014; Li, Nan, Taxer, & Liu, 2016). In regards to the frequency of internet use by teens ages 13 to 17, 92% of teens reported using the internet at least once a day, however, 24% of teens indicated that they use the internet "almost constantly" (Lenhart, 2015, p. 17). Statistics such as these regarding technology and internet use have prompted researchers to consider the necessary cognitive skills children and teens need to regulate their own internet use. Overall, the preference of internet use

and increasing rates of use by children and adolescents may be related to an increased need for self-regulation, which is directly related to neuropsychological skills, or executive functioning.

Executive Functioning

Executive functioning (EF) is the second major construct in the present study. EF is a broad term that refers to the neuropsychological processes that contribute to an individual's self-regulation, focus, and purposeful goal-directed thoughts and behaviors (Barkley, 2012). Generally, executive functions are associated with the brain's prefrontal cortex, a specific part of the frontal lobes (Miyake et al., 2000). This area of the brain supports a number of EF related skills such as planning, goal setting, organizing, prioritizing, shifting, flexibility, and self-monitoring (Barkley, 2012; Meltzer, 2014). Moran and Gardner (2007) describe EF as three broad parameters: will, skill, and will. First, will can be considered metaphorically as the ability to form clear goals. Goals are important for helping individuals to set priorities they would like to achieve in the future. Once these goals are set, individuals must use the necessary skills to help facilitate the attainment of their goal. Individuals must select appropriate strategies and possess the required abilities needed to attain their predetermined goal. Third, will is considered as being the motivation to start and continue until a goal has been accomplished. Motivation is important in the process of goal attainment because it helps individuals update their strategy to reach a goal when they encounter difficulties in the process of completing their goal (Moran & Gardner, 2007). Broadly, EF can be defined as the fundamental skills that support purposeful goal-directed behavior. Despite the abundance of operational definitions of EF and corresponding skills, researchers generally agree that

EF is comprised of a number of cognitive processes that support skills such as behavioral regulation, inhibition, working memory, and goal-attainment (Barkley, 2012; Meltzer, 2004).

Theoretical Models of EF. There are several proposed models of executive function. For example, Miyake et al. (2000) postulated three basic executive functions: inhibition, shifting, and updating. Similarly, Gioia, Isquith, Guy, and Kenworthy (2000) hypothesize that there are two core EF skills areas, namely, behavioral regulation and metacognition. Behavioral regulation can be conceptualized as skills related to inhibition, while metacognition pertains to skills related to working memory. Though there are a number of proposed theoretical models of EF, most incorporate two core neurocognitive skills, namely, inhibition and working memory.

Inhibition. The first EF variable in this study is inhibition. Inhibition can be defined as the ability to regulate impulses and prevent the occurrence of behaviors (MacLeod, 2007). Inhibition was also defined by Miyake et al. (2000) as an executive function that is responsible for controlling behavior and impulses. Specifically, Miyake et al. (2000) defined inhibition as “one’s ability to deliberately inhibit dominant, automatic, or prepotent responses when necessary” (p. 57). This executive function is associated with the frontal lobe, specifically the orbitofrontal areas of the prefrontal cortex (e.g., Hodgson et al., 2002; Meyer & Bucci, 2016). This part of the brain is responsible for “selecting an appropriate course of action in the face of competing or interfering demands” (Garavan, Ross, Murphy, Roche, & Stein, 2002, p. 1826).

Working Memory. The second EF variable in this study is working memory. Working memory can be defined as the ability to hold information, manipulate the

information, and then act upon it (Baddeley, 2007). Additionally, working memory can be defined as the “brain system that provides temporary storage and manipulation of the information necessary for such complex cognitive tasks as language comprehension, learning, and reasoning” (Baddeley, 1992, p. 556). Shifting and updating are two cognitive processes associated with working memory. Shifting, also called attention shifting or task switching, is an executive function that allows individuals to be able to shift between mental tasks and operations (Miyake et al., 2000). Shifting can also be explained as stopping one task and beginning another more relevant task. Updating is another executive function that is responsible for the “updating and monitoring of working memory representations” (Miyake et al., 2000, p. 56). Overall, working memory abilities are associated with the prefrontal cortex, specifically the dorsolateral region (Miyake et al., 2000; Petrides, 2000).

EF skills develop throughout an individual’s life, and recent studies suggest that EF abilities are not fully developed until an individual is nearly thirty years old. Before then, children and adolescents need environmental support to help their emerging EF skills. Of these environmental supports, the role of parents is especially important. Parents can be considered as being their child’s external pre-frontal lobe because parents help their children learn self-regulation, a skill associated with EF, that allows a child to control (i.e., inhibition) and monitor (i.e., working memory) their own behavior and emotions independently (Bernier, Carlson, & Whipple, 2010; Muraven & Baumeister, 2000). For example, parents have a critical role in the development of their children’s self-regulatory behaviors through demonstrating and practicing self-regulation in response to real-life situations (Zeytinoglu, Calkins, Swingler, & Leerkes, 2017). The

development of self-regulation is especially important prior to entering elementary school because of the self-regulation expectations and demands placed on a child throughout the school day (e.g., paying attention to the teacher during instruction, following directions, following school rules, and the ability to stay on-task) (Morrison, Ponitz, & McClelland, 2010; Zeytinoglu et al., 2017). Furthermore, a vast amount of research exists that demonstrates the positive effects of high levels of self-regulation during adolescence. Specifically, during adolescence high rates of self-regulation are associated with more positive outcomes such as lower rates of substance use (e.g., Willis, Walker, Mendoza, & Ainette, 2006) and higher levels of academic achievement (e.g., Blair & Diamond, 2008). Therefore, it is important to consider parenting styles within the current study because research has suggested that parenting styles are related to the development of children's neuropsychological skills related to behavior regulation (Bernier et al., 2010; Blair, Raver, & Berry, 2013).

Parenting Style

Parenting style is the third construct in this paper. Parenting styles can be defined as “a constellation of attitudes toward the child that are communicated to the child, and taken together, create an emotional climate in which the parent's behaviors are expressed” (Darling & Steinberg, 1993, p. 483). Additionally, parenting styles can be considered as being “combinations of parenting behaviors that occur over a wide range of situations, creating an enduring child-rearing climate” (Berk, 2009, p. 569).

Theoretical Model of Parenting Style. Baumrind (1966) was one of the first researchers to develop a theoretical model of parenting styles. Using observations, ratings by observers, and interviews with parents, Baumrind identified three different parenting

styles, namely, authoritative, authoritarian, and permissive (Baumrind 1966, 1971).

Baumrind created her initial parenting styles from the parents' efforts to socialize their children through setting standards for behavior rather than only utilizing their parental control (Darling & Steinberg, 1993). In Baumrind's later work (1978, 1980, 1991), she centered her three parenting styles on two core dimensions, namely responsiveness and demandingness. According to Baumrind, demandingness was defined as "claims parents make on the child to become integrated into the family whole by their maturity demands, supervision, disciplinary efforts and willingness to confront the child who disobeys," and responsiveness was defined as "actions which intentionally foster individuality, self-regulation and self-assertion by being attuned, supportive, and acquiescent to the child's special needs and demands" (1991, p. 748, as cited in Darling and Steinberg, 1993, p. 492). Therefore, overall, Baumrind's parenting styles can be considered as behaviors parents use to express demandingness and responsiveness to their children.

Authoritative. Authoritative parenting is characterized by parents who set and enforce standards for behavior, but simultaneously encourage the child's input in the standards through bi-directional communication. Authoritative parents also actively shape future behaviors that are expected of their children (Baumrind, 1966).

Authoritative parents have high levels of demandingness as well as responsiveness (Darling & Steinberg, 1993). Overall, there is a general consensus in research that authoritative parenting is related to better outcomes in children and adolescents (e.g., grades, mental health, conduct, etc.) regardless of socioeconomic status, ethnicity, or family structure (e.g., Baumrind, 1991; Dornbusch, Ritter, Leiderman, Roberts, & Fraleigh, 1987; Lamborn, Mounts, Steinberg, & Dornbusch, 1991).

Authoritarian. Authoritarian parenting is characterized by parental control, where obedience is expected of children without question (Baumrind, 1966). Additionally, this parenting style uses punishment as a way to control children's behavior and autonomy. Authoritarian parents use parenting behaviors that are characterized by high levels of demandingness, but low levels of responsiveness (Darling & Steinberg, 1993).

Permissive. Permissive parenting is characterized by parents who do not actively set rules and guidelines for their child's current or future behavior and do not use punishment to correct their child's misbehavior. Instead, they allow the child to regulate their own behavior. When parents who utilize a permissive parenting style do need to exercise control over their children, they use manipulation and reasoning (Baumrind, 1966). Permissive parents typically utilize low levels of demandingness, but high levels of responsiveness.

PIU and EF

Currently, there is minimal research addressing the relationship between PIU and EF in children. Although existing studies document a relationship between PIU and EF in adolescents, more studies are needed to explore this relationship with children. In terms of existing research of the relationship between PIU and EF in adolescents, Brand, Young, and Laier (2014) conducted a meta-analysis focusing on internet addiction and prefrontal control processes, or executive functions (EF), in adolescents and adults. Among the many results of their analysis, results documented a general correspondence between internet addiction and neuropsychological components, specifically, executive functions. Meaning, their meta-analysis indicated that there is a relationship between internet addiction and EF. The studies utilized a variety of clinical neuropsychological EF

tests (e.g., Stroop Task, Iowa Gambling Task, Dice Task, Go/ No-Go Task) that measured inhibition, working memory, and decision-making. In general, the meta-analysis documented significant correlations between PIU and executive dysfunction in the prefrontal cortex.

Regarding specific EF deficits related to PIU, Nie, Zhang, Chen, and Li (2016) researched differences in inhibition and working memory between Chinese adolescents diagnosed with internet addiction (IA), attention-deficit/ hyperactivity disorder (ADHD), a comorbid diagnosis of IA and ADHD, or no diagnosis. Participants ($N = 95$) first completed two questionnaires to screen for IA and ADHD. After completing the two questionnaires, participants then completed two tasks, the Stop-Signal Task (SST) to measure inhibition and the 2-Back Task to measure working memory, using visual presentation of Chinese words that were either internet-related or internet-unrelated. Results indicated that individuals with IA, in comparison to the no diagnosis group, performed more poorly on both the SST and the 2-Back Task. Specifically, individuals with IA or with comorbid IA and ADHD had lower response inhibition for words related to the internet in comparison to words that were not related to the internet. Additionally, these same individuals had better working memory for words related to the internet in comparison to internet-unrelated words on the 2-Back Task. The authors generally concluded that adolescents diagnosed with IA, in comparison to those who are not diagnosed with IA, show deficits in both inhibition and working memory. Moreover, the study found that adolescents with IA tended to have lower response inhibition for internet-related stimuli, but have greater working memory for internet-related stimuli.

Additionally, Zhou, Zhou, and Zhu (2016) conducted a study to compare and contrast Chinese internet addicted (IA) individual's executive function (EF), impulsivity, and working memory to that of individuals with pathological gambling (PG). Participants ($N = 69$) were identified as having IA or PG based on a questionnaire. Participants were then administered multiple clinical measures including the Wisconsin Card Sorting Task as a measure of EF, a Go/No-Go task to measure impulsivity, and the Wechsler Adult Intelligence Scale-Revised China computerized version's Digit Span subtest as a measure of working memory. They also completed surveys about depression and impulsivity (i.e., Barrett Impulsiveness Scale-11 (BIS-11)). Among the results, it was found that IA individuals, in comparison to a control group, had deficits in EF, inhibition, and working memory. Interestingly, individuals with IA had higher levels of impulsivity, as measured by the Go/No-Go task and the BIS-11, than individuals with PG. Overall, this study suggests that individuals with IA have impairments in EF skills, including inhibition and working memory.

PIU and Parenting Styles

Conceptually, parents can be viewed as an external regulator for children and adolescents due to developmental deficits in EF. This regulation support includes helping children manage their use of the internet through modeling how to monitor (i.e., utilize working memory to remember rules related to internet use) and inhibit the use of the internet. Due to parents' roles in helping children learn self-regulation in all aspects of their lives, there is a demonstrated interest in the specific relationship between the use of technology and parenting styles in recent research (e.g., Eastin, Greenberg, & Hofschire, 2006; Lou, Shih, Liu, Guo, & Tseng, 2010; Valcke, Bonte, Wever, & Rots, 2010). There

is a minimal amount of research that investigates the relationship between PIU and parenting styles of children and adolescents, especially regarding children within the United States. A majority of existing research regarding the relationship between PIU and parenting styles was conducted outside of the United States, and the results of these studies may differ from a study conducted within the United States due to dominant parenting styles and cultural influences.

For example, Ihmeideh and Shawareb (2014) investigated the relationship between early elementary school students' internet use at home and their parents' parenting styles in a sample from Jordan. Participants ($N = 570$) completed a self-report questionnaire created by the authors of the study that measured internet use and internet parenting styles. The questionnaire included two scales (i.e., the Internet Parenting Style Scale and the Internet Usage Scale). Among the results, there was a significant relationship between the authoritative parenting style and children's internet use. The researchers explained that this relationship indicates that use of an authoritative parenting style predicts child internet use. The authors generally concluded that there is a relationship between children's internet use and parenting styles, specifically, authoritative parenting styles.

Furthermore, Cheung, Yue, and Wong (2014) researched the relationship between addictive internet use and patterns of parenting of secondary school children in Guangzhou and Hong Kong. Participants ($N = 1,747$) were administered a self-report questionnaire containing Young's (1998) Internet Addiction Test (IAT) and a scale measuring experienced parenting styles. Results indicated that of the five distinct parenting patterns that emerged, addictive internet use was experienced most frequently

by children who identified their parents' parenting style as being authoritarian. In general, Chueng et al. (2014) concluded that addictive internet use might be preventable through parents' use of a balanced parenting style (i.e., an authoritative parenting style).

Additionally, Xiuqin et al. (2010) investigated the relationship between internet addiction (IA), parenting styles, mental health, and personalities of adolescent males in Beijing, China. Of the total participants ($N = 304$), 204 participants were diagnosed with IAD and the 100 other participants were part of a typically developing control group. All participants completed a measure for parenting style, psychological distress, and personality. Findings from the study indicate that individuals with IA reported lower levels of paternal warmth in comparison to individuals without IA. However, paternal control was reported at higher levels for individuals with IA in comparison to those without IA. Similar patterns were measured for maternal parenting styles. In comparison to individuals without IA, individuals with IA reported lower levels of maternal warmth and understanding and higher levels of maternal control and punishment. In general, these results indicate that higher levels of parental control and lower levels of parental warmth are experienced by individuals with IA than those without, and this parenting profile is most associated with an authoritarian parenting style.

In terms of the three main variables of the current study, studies investigating whether PIU corresponds with both EF and parenting styles were not located. Of the limited studies focusing solely on PIU and EF, researchers tend to agree that PIU is related to deficits in EF, specifically inhibition and working memory, (e.g., Brand, Young, & Laier, 2014; Nie, Zhang, Chen, & Li, 2016). In this sense, PIU can be viewed as implicating the core EF skills of inhibition and working memory. However, there is far

less research that examines the relationship between children's and adolescents' PIU and their parents' parenting styles. Nonetheless, the minimal existing research suggests that authoritative parenting is related to lower rates of PIU. For example, Xiuqin et al. (2010) indicated that authoritarian parenting, characterized as setting high demands, rules and boundaries and low levels of warmth, is implicated in the occurrence of PIU in adolescents. Although research has demonstrated that there are specific relationships between authoritative and authoritarian parenting styles and PIU, there hasn't been a clear relationship outlined in available research regarding permissive parenting styles and PIU. However, in regards to a permissive parenting style, it could be hypothesized that there would be higher rates of PIU in individuals subjected to this kind of parenting because permissive parenting is typically characterized by higher rates of warmth and little to non-existent boundary setting. Therefore, because these children's parents are not setting limits or rules about their use of technology they are overusing it. This makes sense in that in terms of an authoritative parenting style, children exposed to this parenting style have parents who set reasonable demands, explain boundaries, and respond to the child with warmth and understanding. Therefore, it is hypothesized that parenting styles are related to an individual's development of PIU due to parents being external managers of their child's behavior, including their internet use behavior. From their parents' rules, children and adolescents are able to learn how to monitor their own internet use, a form of self-regulation. Therefore, the current study's goal is to investigate how and to what extent PIU is associated with EF skills and parenting styles.

Purpose and Hypotheses

This study's main purpose is to investigate how, and to what degree, children's and adolescents' problematic internet use (PIU) can be predicted by two core dimensions of executive functioning (EF), namely, inhibition and working memory and Baumrind's three parenting styles.

Hypothesis One. It is hypothesized that core EF dimensions (i.e., inhibition and working memory) will significantly predict PIU, as measured by the PCIAT.

Rationale. Theoretically, deficits in both inhibition and working memory are implicated as being related to PIU. Therefore, it is reasonable to assume that difficulties in an individual's ability to override prepotent responses and their ability to hold information within their own mind is related their PIU.

Hypothesis Two. It is hypothesized that the three parenting styles (i.e., authoritative, authoritarian, and permissive), as measured by the PSDQ-Short Version, will significantly predict PIU, as measured by the PCIAT.

Rationale. Theoretically, parents play a vital role in their child's life through utilizing patterns of parenting behaviors that vary in demandingness and responsiveness. Parenting styles are hypothesized as being important factors of parents' level of monitoring and control of their child's internet use. Therefore, it is hypothesized that there will be relationships between parenting styles and the degree in which children experience symptoms of PIU.

CHAPTER TWO

METHOD

Research Approval

Prior to recruiting participants and collecting data, research approval was granted by the Institutional Review Board (IRB) at Middle Tennessee State University. Before participating, all participants were provided information about the purpose of the study and provided consent. See IRB approval in Appendix A.

Participants

Parents ($N = 144$) completed online surveys pertaining to their child or adolescent's (ages 5 to 18) PIU, core EF skills, and their own parenting style. Of the 144 participants that completed the survey, 90.3 % were mothers ($n = 130$), 3.5% were fathers ($n = 5$), and 5% were step-mothers ($n = 5$). A majority of the parents were married or in a domestic partnership (87.5%; $n = 126$) or divorced (8.3%; $n = 12$). Of the 144 participants, 94.4% of parent respondents in this study attended at least one year of college, had graduated from college or technical school, or had a graduate degree (See Table 1).

Parent report indicated that 43.6% of students were between ages 5 to 8, 35.4% were between ages 9 to 12, 18.8% were between ages 13 to 15, 10.5% were between ages 16 to 18, and 0.7% preferred not to answer. Parents indicated that 62.5% of the children and adolescents in this study were male and 37.5% were female. Based on parental report of their child's ethnicity, 81.9% were Caucasian, 0.7% were American Indian or Alaskan Native, 2.8% were Asian, 2.1% were African American, 3.5% were Hispanic or Latino, 8.3% were other, and 0.7% preferred not to answer (see Table 2).

Table 1

Child Descriptive Statistics

Characteristic		<i>N</i>	%
Child Gender			
	Male	90	62.5
	Female	54	37.5
Child Age			
	5	13	9.0
	6	13	9.0
	7	14	9.7
	8	10	6.9
	9	16	11.1
	10	15	10.4
	11	9	6.3
	12	11	7.6
	13	15	10.4
	14	6	4.2
	15	6	4.2
	16	7	4.9
	17	3	2.1
	18	5	3.5
	Prefer not to answer	1	0.7
Race/ Ethnicity			
	American Indian or Alaskan Native	1	0.7
	Asian or Asian American	4	2.8
	Black or African American	3	2.1
	Hispanic or Latino	5	3.5
	Non-Hispanic White	118	81.9
	Other	12	8.3
	Prefer not to answer	1	0.7

Table 2

Parent Descriptive Statistics

Characteristic	<i>N</i>	%
Parent		
Mother	130	90.3
Father	5	3.5
Step-Mother	5	3.5
Grandmother	2	1.4
Guardian	1	0.7
Other	1	0.7
Marital Status		
Single, never married	4	2.8
Married or domestic partnership	126	87.5
Divorced	12	8.3
Separated	2	1.4
Parent Education		
Grades 1 through 8 (Elementary)	2	1.4
Grades 12 or GED (High school graduate)	5	3.5
College 1 year to 3 years (Some college)	16	11.1
Technical School	2	1.4
College 4 years (College Graduate)	28	19.4
Graduate School (Advanced degree)	90	62.5
Prefer not to answer	1	0.7

Measures

Measure of PIU. *Parent-Child Internet Addiction Test (PCIAT)*. The PCIAT was developed by Young (2016) as a 20-item parent-report measure to assess the internet use of children and adolescents. Although the measure is termed as being an addiction scale, it can also be utilized to assess general internet use in children and adolescents.

Therefore, for the purposes of this study, the PCIAT will be used to provide an overall measure of internet use behaviors. The PCIAT provides an overall severity index of an individual's PIU by totaling all question responses. Total scores less than 30 are classified as "none," or in other words, average. Total scores between 31- 49 are

indicative of mild PIU. Mild scores indicate that although a child may sometimes spend too much time online, overall, he/she is able to regulate their internet use. Moderate PIU is a result of total scores that are between 50 – 79 points. Moderate PIU indicates that a child is frequently having problems as a result of their internet use that is affecting themselves and their family. Total scores in the 80 – 100 range indicate severe PIU, which causes significant impairment in the individual’s life and the overall family system. Responses are based on a six-point Likert scale (0 = Not Applicable, 1 = Rarely, 2 = Occasionally, 3 = Frequently, 4 = Often, 5 = Always). Examples of items include “How often does your child spend time alone in his or her room playing on the computer?” and “How often does your child choose to spend more time online than going out with friends?” (Young, 2016).

Measure of EF. Childhood Executive Functioning Inventory (CHEXI) for Parents and Teachers. Thorell and Nyberg (2008) developed the CHEXI as a 24-question parent and teacher report rating scale to measure children and adolescents’ (ages 4 to 12) ability to control and regulate their own behaviors. This behavior questionnaire measures multiple EF areas, namely inhibition, regulation, planning, and working memory. Responses to the questionnaire can be totaled in order to have two overall index scores for Inhibition and Working Memory. The responses are based on a five- point Likert scale (1 = Definitely not True, 2 = Not True, 3 = Partially True, 4 = True, 5 = Definitely True). Therefore, the range of possible scores for the Inhibition index is 11 to 55, while the range is 13 to 65 for the Working Memory index. Sample Inhibition index items include: "Has difficulty holding back his/her activity despite being told to do so," and “When something needs to be done, he/she is often distracted by something more appealing.”

Sample Working Memory index items include: "Has difficulty remembering what he/she is doing in the middle of an activity," and "Has difficulty doing things that require mental effort, such as counting backwards."

The CHEXI parent report's reliability and validity were demonstrated with a sample of 242 French-speaking Belgian parents of typically developing eight to eleven year old children (Catale, Meulemans, & Thorell, 2015). Alpha coefficients demonstrated internal consistency for CHEXI subscales: Inhibit ($\alpha = .85$) and Working Memory ($\alpha = .89$). Additionally, test-retest reliability data revealed correlation coefficients for both subscales: Inhibit ($r = .87$) and Working Memory ($r = .74$). Within the same study, Catale, Meulemans, and Thorell (2015) also verified the reliability with a sample of parents of 25 children of various ages from Belgium and 62 children of various ages from Sweden diagnosed with ADHD according to DSM-IV criteria and their control groups. Logistic regression analyses were conducted to verify the CHEXI's specificity and sensitivity for identifying children with ADHD in comparison to children without ADHD. Analyses revealed specificity (range = .84 - .96) and sensitivity (range = .90 - .94) for the Inhibition and Working Memory scales were able to discriminate between children with and without ADHD through parent report.

Measure of Parenting Style. Parenting Styles and Dimensions Questionnaire-Short Version (PDSQ-Short Version). The PDSQ-Short Version is a 32-item self-report measure that assesses parenting style. The questionnaire measures three different parenting styles: authoritative (15 items), authoritarian (12 items), and permissive (5 items). The PDSQ-Short Version also measures subdimensions of each of the three parenting styles (Robinson et al., 2001). The following three subdimensions are measured

for the authoritative style: warmth and support (5 items), reasoning/induction (5 items), and democratic participation (5 items) (Robinson et al., 2001). The authoritarian style consists of the following three subdimensions: verbal hostility (4 items), physical coercion (4 items), and non-reasoning/punitive (4 items) (Robinson et al., 2001). Lastly, the permissive style measures one subdimension, the indulgent dimension (5 items) (Robinson et al., 2001). Parenting style types and their subdimensions can be calculated by averaging the items that correspond with each type and subdimension. Therefore, each parent that completes the PSDQ-Short Version receives scores for each of the three parenting styles as well as all seven parenting style subdimensions. The answer choices are based on a 5-point Likert scale (1 = Never, 2 = Once in Awhile, 3 = About Half of the Time, 4 = Very Often, 5 = Always). As a result, the range of possible scores for each parenting style is 1 to 5. Examples of items include "I emphasize the reasons for rules," and "I give comfort and understanding when our child is upset" (Robinson et al., 2001). A meta-analysis of studies about the psychometrics of the PSDQ indicated Cronbach alpha reliability coefficient ranges that demonstrated internal consistency for subscales across multiple studies including parents of participants of different ages, countries of origin, and gender: authoritative ($\alpha = .71-.97$), authoritarian ($\alpha = .62-.95$), and permissive ($\alpha = .38-.89$) parenting styles (Olivari, Taglibue, & Confalonieri, 2013).

CHAPTER THREE

RESULTS

Hypothesis One

The first main purpose of this study was to investigate how, and to what extent, each of the core EF dimensions, namely inhibition and working memory, were able to predict children and adolescents' PIU. Simple regression results indicate that CHEXI Inhibition Index scores significantly predict PIU, $R^2 = .04$, adjusted $R^2 = .04$, $F(1, 142) = 6.42$, $p < .05$ (see Table 3). The Inhibition index scores accounted for approximately 4% of the variance of PIU scores in the sample. Simple regression results additionally indicate that CHEXI Working Memory index scores also significantly predicted PIU, $R^2 = .07$, adjusted $R^2 = .06$, $F(1, 142) = 10.84$, $p < .01$ (see Table 4). The Working Memory index scores accounted for approximately 6% of the variance of PIU scores in the sample. Using hierarchical multiple regression, the Inhibition index scores were then added to the Working Memory regression equation and there was not a significant change in the prediction of PIU, $R^2 = .07$, adjusted $R^2 = .06$, $F(1, 141) = .05$, $p = .83$ (see Table 5).

Regarding each EF predictor's individual contribution, the Inhibition index scores were significantly correlated with PIU ($r = .21$, $p < .05$). Working Memory index scores were also significantly correlated with PIU ($r = .27$, $p < .01$). Further investigation of the CHEXI Inhibition index subscales indicated that scores on the Regulation subscale were significantly correlated with PIU scores, but Inhibition subscale scores were not (Regulation $r = .29$, $p < .01$; Inhibition $r = .09$, $p = .27$). Further analysis of the Working Memory index subscales revealed that both Working Memory and Planning, were

significantly correlated with PIU (Working Memory $r = .27, p < .01$; Planning $r = .23, p < .01$; see Table 6).

Hypothesis Two

The second main purpose of this study was to investigate how, and to what degree, each of Baumrind's three parenting styles, namely authoritative, authoritarian, and permissive, were able to predict children and adolescents' PIU. Multiple regression results indicated that Authoritative Parenting composite scores did not account for a significant proportion of the variance of PIU, $R^2 = .01$, adjusted $R^2 = -.001$, $F(1, 142) = .91, p = .34$. The Authoritarian Parenting composite was then added to the regression equation and there was no significant change in the model's ability to predict PIU scores, $R^2 = .01$, adjusted $R^2 = -.01$, $F(1, 141) = .10, p = .76$. Next, the Permissive Parenting composite was added to the regression equation and there was no significant change in the model's ability to predict PIU scores, $R^2 = .01$, adjusted $R^2 = -.01$, $F(1, 140) = .001, p = .97$ (see Table 7).

Regarding each parenting style predictor's individual contribution, the Authoritative Parenting composite scores were insignificantly correlated with PIU ($r = -.08, p = .34$). Authoritarian Parenting composite scores were also insignificantly correlated with PIU ($r = .05, p = .54$). Permissive Parenting composite scores were also insignificantly correlated with PIU ($r = .02, p = .81$). Further investigation of scores on the subdimensions of the three parenting style composites of the PSDQ-Short Version revealed that there were not any significant correlations between parenting style subdimension scores and scores on the PCIAT (see Table 8).

Table 3

Simple Regression Analysis of Inhibition Index Scores Predicting Problematic Internet Use Composite (N = 144)

Variable	<i>B</i>	<i>SEB</i>	<i>Beta</i>	<i>t</i>	<i>p</i>	Zero- Orde <i>r</i>	Partial	Part
Inhibition Index	.32	.13	.21	2.53	.01	.21	.21	.21
<i>R</i> ²	.04							

Table 4

Simple Regression Analysis of Working Memory Index Scores Predicting Problematic Internet Use Composite (N = 144)

Variable	<i>B</i>	<i>SEB</i>	<i>Beta</i>	<i>t</i>	<i>p</i>	Zero- Orde <i>r</i>	Partial	Part
Working Memory Index	.33	.10	.27	3.29	.001	.27	.27	.27
<i>R</i> ²	.07							

Table 5

Multiple Regression Analysis of Working Memory and Inhibition Indexes Predicting Problematic Internet Use Composite (N = 144)

Variables	<i>B</i>	<i>SEB</i>	<i>Beta</i>	<i>t</i>	<i>p</i>	Zero- Order <i>r</i>	Partial	Part
Working Memory	.36	.17	.29	2.06	.04	.27	.17	.17
Inhibition	-.05	.22	-.03	-.22	.83	.21	-.02	-.02

Table 6

Means, Standard Deviations, and Correlations for Problematic Internet Use Composite Score and Index and Individual Scales of EF (N = 144)

Executive Functioning Indexes and Scales	<i>M</i>	<i>SD</i>	Correlation
CHEXI Inhibition Index	30.03	8.12	.21*
Regulation	14.65	4.30	.29**
Inhibition	15.38	4.75	.09
CHEXI Working Memory Index	30.58	10.23	.27**
Working Memory	20.99	7.03	.27**
Planning	9.59	3.51	.23**

Note. * $p < .05$ ** $p < .01$

Table 7

Multiple Regression Analysis of Parenting Style Composites Predicting Problematic Internet Use Composite (N = 144)

Variables	<i>B</i>	<i>SEB</i>	<i>Beta</i>	<i>t</i>	<i>p</i>	Zero- Orde <i>r</i>	Partial	Part
Authoritative	-2.00	2.57	-.07	-.78	.44	-.08	-.07	-.07
Authoritarian	.96	3.57	.03	.27	.79	.05	.02	.02
Permissive	.08	2.05	.003	.04	.97	.02	.003	.003

Table 8

Means, Standard Deviations, and Correlations for Problematic Internet Use Composite Score and Index and Individual Scales of Parenting Style (N = 144)

Parenting Style Indexes and Scales	<i>M</i>	<i>SD</i>	Correlation
Authoritative	4.00	.44	-.08
Warmth and Support	4.35	.43	-.08
Reasoning and Induction	4.20	.58	-.10
Autonomy Granting	3.45	.69	-.02
Authoritarian	1.57	.34	.05
Physical Coercion	1.27	.36	.04
Verbal Hostility	1.95	.55	.08
Punitive	1.50	.42	-.01
Permissive	1.91	.56	.02

Note. * $p < .05$ ** $p < .01$

CHAPTER FOUR

DISCUSSION

Hypothesis One

This study first investigated how PIU was predicted by core EF skills, namely inhibition and working memory. As hypothesized, individually each of the two core EF skills successfully predicted parent-ratings of children and adolescents' PIU. That is, decreased EF skills predicted PIU. This supports one of the main premises of this study that using internet technology implicates core prefrontal control processes. This is feasible because internet use can be conceptualized theoretically as a Go/No-Go task. As children and adolescents manage their use of the internet, they must self-regulate through the strong “go” impulses of engaging in such a highly preferred and enjoyable activity. To do so, the skills needed to withhold responding (i.e., “no-go”) are taxed. Therefore, broadly, our study provides support for the importance of EF in successfully using internet technology. This is consistent with previous research (e.g., Brand et al., 2014; Nie et al., 2016; Zhou et al., 2016) that highlights the relationship between PIU and EF abilities.

First, regarding working memory, our findings support the notion that difficulty holding information mentally online predicts PIU. Conceptually, it is likely that working memory abilities support an individual's ability to plan, shift their attention, and monitor their online behavior. Therefore, individuals with decreased working memory abilities may be less likely to conform to internet use time restrictions, which can lead to internet overuse. This overuse may impact a variety of areas such as interpersonal relationships with family and friends. The inverse is also true; individuals with increased working

memory may be more likely to remember time limits imposed on internet usage and conform their behavior accordingly. Overall, these findings support previous research (e.g., Zhou et al. 2016), which links internet use problems with working memory deficits.

Second, regarding inhibition, findings from this study support the notion that difficulties controlling impulses predicts PIU. Theoretically, individuals with decreased inhibition abilities are less likely to be able to resist the urge to use the internet, which may impact participation in their daily life activities and hobbies as a result of internet overuse. Conversely, increased inhibitory control supports the ability to regulate impulses related to internet usage. For example, individuals with increased levels of inhibition are more likely to be able to resist the urge to use the internet. Generally, these findings are consistent with previous research that has indicated a relationship between decreased inhibitory control and PIU (e.g., Nie et al., 2016; Zhou et al., 2016).

In this study, it is noteworthy that combining inhibition and working memory together did not add to the prediction of PIU. When looking at the relationships between PIU and the two core EF skills, the correlation between working memory and PIU was stronger ($r = .27, p < .01$) than inhibition ($r = .21, p < .05$). Though both EF skills are important, the metacognitive ability to hold information in mind was slightly more related to PIU in comparison to the ability to stop prepotent responses. That is, in terms of predicting PIU, working memory was sufficient. This is a unique finding that had not been documented in the reviewed research. Prior research (e.g., Brand et al., 2014; Nie et al., 2014) has utilized performance tasks to establish patterns of EF functioning in individuals with PIU. However, the current study's findings suggest that PIU can be predicted by parent-rated working memory ability.

The current study has a number of distinct features in comparison to existing research. First, it is noteworthy that previous studies have mainly utilized clinical populations with existing PIU problems and diagnoses. However, our study was based on a non-clinical sample of children and adolescents. Regardless, the relationships between PIU and inhibition and working memory were documented. This suggests that there is a relationship between PIU and core EF processes that exists in both clinical and non-clinical samples of children and adolescents. Additionally, previous research has predominantly focused on adolescents. This study broadens PIU and EF research by including children. Furthermore, much of the previous PIU and EF research has been conducted outside of the US. The current study's US sample of children and adolescents expands the scope of international research.

Hypothesis Two

This study next explored the ability and extent in which parenting styles, namely authoritative, authoritarian, and permissive, predicted PIU. Contrary to the hypothesis, PIU was not predicted by any of the three parenting styles in this sample. Additionally, subdimensions of each parenting type did not predict PIU. Therefore, results from this study do not support a link between PIU and parenting style in children and adolescents. This is contrary to previous research. For example, Cheung et al. (2014) found that adolescents who received parenting through an authoritarian style were more likely to experience internet addiction. Similarly, Xiuqin et al. (2010) found a relationship between authoritarian parenting and higher levels of internet addiction. However, Ihmeideh and Shawareb (2014) found that an authoritative parenting style was able to

predict the occurrence internet addiction, but did not find any other significant relationships among the other parenting styles.

There are two potential explanations why this study did not find a link between PIU and parenting styles. First, a majority of parents, specifically, 99.3%, indicated that their predominant parenting style was authoritative. This lack of variability in parenting styles impeded the ability to investigate this hypothesis. Moreover, the PSDQ-Short Version question responses were based on a five-point Likert scale, which limited the scale of possible responses.

Limitations and Future Research

There are several noteworthy limitations within this study. First, EF is a multidimensional construct, and this study only considered two broad domains of EF, inhibition and working memory. There are multiple EF skills that were not included within this study, but should be considered for future research examining the relationship between PIU and EF in children and adolescents.

Another potential limitation of the current study is the measurement of PIU and EF. This study utilizes parent-report of their child's PIU and EF. However, much of the reviewed research within this study measured PIU and EF through a combination of clinical tasks in addition to self-report rating scales (e.g., Nie et al., 2016; Zhou et al., 2016). Therefore, future studies researching the relationship between PIU and EF might consider using a combination of clinical and self-report measures.

A third limitation of this study is that the sample of parent respondents consisted primarily of mothers. Therefore, future studies should consider examining the relationship between paternal parenting style and PIU. Another possible limitation of the

sample is the education level of the parents. The majority of parents reported that they received a graduate degree. This may impact parenting values and practices and may not be consistent in parents without a graduate degree.

Conclusion

Overall, parent-ratings of their child's PIU were predicted by their child's EF skills, namely inhibition and working memory. Both of these skills independently predicted children and adolescents' PIU. However, working memory predicted PIU to a greater degree. This supports the notion that core EF skills are involved in regulating internet behavior. Parent ratings of their own parenting style were not found to be predictive of their child's PIU within this study. Findings from this study extend previous PIU research by utilizing an EF dimensional approach with a non-clinical sample of US children and adolescents.

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APPENDICES

APPENDIX A

IRB APPROVAL

Tuesday, June 21, 2016

Investigator(s): Seth Marshall (PI) and Delia Clemmons
 Investigator(s) Email(s): seth.marshall@mtsu.edu
 Department: Psychology

Study Title: *Parent perceptions of school-aged students' executive functioning, sleep behaviors, technology use, academics and parenting styles*
 Protocol ID: 16-2265

Dear Investigator(s),

The above identified research proposal has been reviewed by the MTSU Institutional Review Board (IRB) through the EXPEDITED mechanism under 45 CFR 46.110 and 21 CFR 56.110 within the category (7) *Research on individual or group characteristics or behavior*. A summary of the IRB action and other particulars in regard to this protocol application is tabulated as shown below:

IRB Action	APPROVED for one year from the date of this notification	
Date of expiration	6/21/2017	
Sample Size	500 (FIVE HUNDRED)	
Participant Pool	Parents - Adult individuals who have school-aged children	
Exceptions	Online survey - signature waived and electronic consent is permitted	
Restrictions	Anonymous non-identifiable data	
Comments	NONE	
Amendments	Date	Post-approval Amendments
		NONE

This protocol can be continued for up to THREE years (6/21/2019) by obtaining a continuation approval prior to 6/21/2017. Refer to the following schedule to plan your annual project reports and be aware that you may not receive a separate reminder to complete your continuing reviews. Failure in obtaining an approval for continuation will automatically result in cancellation of this protocol. Moreover, the completion of this study MUST be notified to the Office of Compliance by filing a final report in order to close-out the protocol.

Continuing Review Schedule:

Reporting Period	Requisition Deadline	IRB Comments
First year report	5/21/2017	INCOMPLETE
Second year report	5/21/2018	INCOMPLETE
Final report	5/21/2019	INCOMPLETE

Institutional Review Board

Office of Compliance

Middle Tennessee State University

The investigator(s) indicated in this notification should read and abide by all of the post-approval conditions imposed with this approval. [Refer to the post-approval guidelines posted in the MTSU IRB's website.](#) Any unanticipated harms to participants or adverse events must be reported to the Office of Compliance at (615) 494-8918 within 48 hours of the incident. Amendments to this protocol must be approved by the IRB. Inclusion of new researchers must also be approved by the Office of Compliance before they begin to work on the project.

All of the research-related records, which include signed consent forms, investigator information and other documents related to the study, must be retained by the PI or the faculty advisor (if the PI is a student) at the secure location mentioned in the protocol application. The data storage must be maintained for at least three (3) years after study completion. Subsequently, the researcher may destroy the data in a manner that maintains confidentiality and anonymity. IRB reserves the right to modify, change or cancel the terms of this letter without prior notice. Be advised that IRB also reserves the right to inspect or audit your records if needed.

Sincerely,

Institutional Review Board
Middle Tennessee State University
Email: irb_information@mtsu.edu (for questions)
irb_submissions@mtsu.edu (for documents)

Quick Links:

[Click here](#) for a detailed list of the post-approval responsibilities.
More information on expedited procedures can be found [here](#).