EXECUTIVE FUNCTIONING IN ADOLESCENCE: RELATION TO BILINGUALISM AND EXTERNALIZING BEHAVIORS

Dissertation

by

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ABSTRACT

The purpose of this study is three-fold. First, it investigated the evidence of a three-factor model of executive functioning (EF), which includes inhibition, shift, and working memory, using ratings on the Behavior Rating Inventory of Executive Functioning and the Comprehensive Executive Functioning Inventory. Additionally, it compared monolingual and bilingual adolescents on EF measures used in the three-factor model. Lastly, it examined the relationship between EF and externalizing behavior, as well as the relationship between EF and personal adjustment. A sample of 9 bilingual adolescents and 11 monolingual adolescents, ages 12-17, were included in the study. The bilingual adolescents varied in language use and exposure. Evidence of a three-factor model was evident in adolescent self-reports, however in parent reports only two factors were evident (inhibition and working memory). Multiple Analysis of Variance tests determined no significant differences between groups ($p>.05$) on any of inhibition, working memory, and shift measures. Alternatively, multiple regression analyses found significant relationships between parent reported externalizing behavior and parent rated inhibition ($p= .04$), adolescent rated inhibition ($p<.01$), and adolescent rated working memory ($p<.01$). Furthermore, self-reported personal adjustment was significantly related to self-reported shift ($p<.01$). Although this study does not provide evidence that bilingual and monolingual adolescents differ in EF, it did provide evidence for a relationship between EF and behavior for monolingual and bilingual adolescents.

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NOMENCLATURE

EF	Executive Functioning
ESL	English as a Second Language
SES	Socio-economic Status

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CHAPTER I

INTRODUCTION

Although there are many different definitions of executive functioning (EF) and controversies on which higher order processes are involved with EF, it is generally agreed that EF is associated with several cognitive processes that are subserved by the prefrontal cortex (Miller & Cohen, 2001). These components often include planning, inhibition, shifting, attention, and working memory (Barkley, 1997; Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005). EF has been studied from early childhood to older adulthood with developmental trends identified. Research also has examined EF across cultures and languages, including bilingual or multilingual individuals. EF is important to both academic and social-behavioral outcomes with increasing interest in EF development and status in children and youth, and its role on adult outcomes.

Academic Outcomes and EF

Childhood EF skills predict adolescent academic and young adult academic outcomes (Miller & Hinshaw, 2010; Miller, Nevado-Montenegro, & Hinshaw, 2012b). Working memory, inhibition, and shift have been found to correlate with academic performance (Aronen, Vuontela, Steenari, Salmi, & Carlson, 2005; Colom, Escorial, Shih, & Privado, 2007; Vuontela et al., 2013; Yeniad, Malda, Mesman, van Ijzendoorn, & Pieper, 2013), specifically in the areas of reading (Alloway & Alloway, 2010; Carretti, Borella, Cornoldi, & De Beni, 2009; Nevo & Breznitz, 2011) and mathematics (Bull, Espy, & Wiebe, 2008; De Smedt et al., 2009; Swanson, 1994). These relationships have been observed from preschool (Fuhs, Nesbitt, Farran, & Dong, 2014b;

Lan, Legare, Ponitz, Li, & Morrison, 2011) through adolescence (Best, Miller, & Naglieri, 2011; Gathercole, Pickering, Knight, & Stegmann, 2004b). Furthermore, these relationships have been found across cultures (Thorell, Veleiro, Siu, & Mohammadi, 2013).

Social/Behavioral Outcomes and EF

Additionally, many components of EF are positively correlated with social functioning (Hughes, Dunn, & White, 1998; Kochanska, Murray, & Harlan, 2000) and negatively correlated with externalizing problems (Riccio, Hewitt, & Blake, 2011). For example, inhibition has been related to hyperactivity (Berlin & Bohlin, 2002), aggression (Dennis & Brotman, 2003; Raaijmakers et al., 2008), behavior/conduct problems (Espy, Sheffield, Wiebe, Clark, & Moehr, 2011; Herba, Tranah, Rubia, & Yule, 2006), and alcohol use (Nigg et al., 2006). In addition, working memory deficits are associated with delinquency (Syngelaki, Moore, Savage, Fairchild, & Van Goozen, 2009), hyperactivity (Rapport et al., 2008), alcohol use (Peeters, Monshouwer, Janssen, Wiers, & Vollebergh, 2014), and aggression (McQuade, Murray-Close, Shoulberg, & Hoza, 2013). Poor shifting capabilities also are related to externalizing behaviors (Schoemaker, Mulder, Dekovic, & Matthys, 2013) with delinquents performing more poorly on measures of cognitive shifting compared to typical controls (Syngelaki et al., 2009). There is a paucity of research on the relationship between shift capabilities and social/behavioral outcomes. Although multiple studies provide evidence of a relationship between EF and behavioral outcomes, others have found no evidence of this relationship (Aronen et al., 2005; Jonsdottir, Bouma, Sergeant, & Scherder, 2006; Vuontela et al., 2013).

Models of EF

Not all studies between EF and social/behavioral outcomes yield the same results; this may reflect a difference in the models of EF utilized. There are multiple models and conceptualizations of EF. Depending on the model, the emphasis is on a different component or components of EF. The Miyake et al. (2000) model will be used in this study. This model focuses on three dominant components of EF: shifting, updating, and inhibition. Shift is one's ability to shift attention between multiple mental tasks (Miyake et al., 2000; Monsell, 1996). Updating "requires monitoring and coding incoming information for relevance to the task at hand and then appropriately revising the items held in working memory by replacing old, no longer relevant information with newer, more relevant information" (Miyake et al., 2000, p. 57; Morris & Jones, 1990). As such, "updating" in this model is consistent in many ways with the construct of working memory. For the Miyake et al. (2000) model, inhibition refers to the inhibition of prepotent or dominant responses. This model was selected because its components have evidence of impact on children's academic and social functioning across studies regardless of the model used. Additionally, previous research on bilingualism and EF has focused on these components.

Development of Executive Functioning Through Adolescence

It is important to consider the developmental trajectory of EF. EF undergoes rapid changes during the preschool years (Clark et al., 2013; Willoughby, Wirth, Blair,

& Family Life Project, 2012). During childhood years, EF continues to increase considerably (Anderson, Anderson, Northam, Jacobs, & Catroppa, 2001). This includes components such as working memory (Gathercole, Pickering, Ambridge, & Wearing, 2004a) and cognitive shift (Anderson et al., 2001). These changes are believed to parallel the increased myelination of the brain, and particularly the frontal lobes (Blakemore & Choudhury, 2006; Boelema et al., 2014; Welsh, Pennington, & Groisser, 1991). In contrast to shift and working memory, there is less development in response inhibition from 7 to 12 years old (Johnstone et al., 2007). According to Huizinga, Dolan, and van der Molen (2006) inhibition plateaus at 11 years old; however, others argue that it does not plateau until mid-adolescence (Reynolds & Horton, 2008; Romine & Reynolds, 2005).

Most of the research on EF development has focused on children or adults, with earlier beliefs that frontal lobe development and EF were stable by age 12 or younger (Chelune & Baer, 1986; Welsh et al., 1991). Although it is now accepted that there is continued EF development through adolescence, there is a lack of consensus on the rate of EF development from childhood to adulthood. Some researchers argue that EF develops dramatically during adolescence (Romine & Reynolds, 2005), particularly in the area of working memory (Conklin, Luciana, Hooper, & Yarger, 2007; Huizinga et al., 2006). Yet others argue EF development plateaus in adolescence (Reynolds & Horton, 2008). Anderson (2002) suggested that shift slows in development during adolescence, but does not stop developing until adulthood; however, others argue that shift plateaus at 15 (Huizinga et al., 2006). Although this research does not specifically focus on EF development, it notes the importance and lack of research of EF during adolescence.

EF and Bilingualism

With consideration of EF across cultures, there have been studies conducted to establish the extent of universality in EF. It has been suggested that the development of EF may differ for children who are bilingual or multilingual. Many studies found that bilingual children show an altered trajectory of development from 7 months old (Kovács & Mehler, 2009) through adulthood (Wu & Thierry, 2013) in at least some aspects of EF. Multiple studies have found that preschool and school age bilinguals outperform their monolingual peers on inhibition tasks (Bialystok & Viswanathan, 2009; Kapa & Colombo, 2013; Yang, Yang, & Lust, 2011; Yoshida, Tran, Benitez, & Kuwabara, 2011), working memory tasks (Calvo & Bialystok, 2014; Morales, Calvo, & Bialystok, 2013; Nguyen & Astington, 2013), and shift (Barac & Bialystok, 2012; Bialystok, 2010; Bialystok, Barac, Blaye, & Poulin-Dubois, 2010). Notably, these relationships are not consistent across studies (Adi-Japha, Berberich-Artzi, & Libnawl, 2010; Bialystok, 2010; Bonifacci, Giombini, Bellocchi, & Contento, 2011; Engel de Abreu, 2011; Engel de Abreu, Cruz-Santos, Tourinho, Martin, & Bialystok, 2012).

Research also has evaluated other variables and factors that may affect the relationship between language status (i.e. bilingual, multilingual, or monolingual) and EF. The enhanced EF in bilinguals is believed to be separate from culture (Bialystok & Viswanathan, 2009) and socioeconomic status (Calvo & Bialystok, 2014). Alternatively language proficiency in both languages resulted in significant differences on EF tasks within groups of bilinguals (Iluz-Cohen & Armon-Lotem, 2013; Vega & Fernandez, 2011; Videsott, Della Rosa, Wiater, Franceschini, & Abutalebi, 2012), as well as verbal abilities related to EF performance (Okanda, Moriguchi, & Itakura, 2010). Nevertheless, sequential bilinguals (i.e., those who learn a second language after learning the first language) also have been found to outperform their monolingual peers on EF tasks (Esposito & Baker-Ward, 2013; Kalashnikova & Mattock, 2014; Nicolay & Poncelet, 2012).

Although there have been multiple studies on EF and bilingualism, across many different languages within early childhood, there is a paucity of studies on EF in bilingual adolescents. Mueller Gathercole et al. (2010) focused specifically on the differences between varying language abilities, socioeconomic status (SES), and cognitive abilities in children and adolescents. Performance on EF tasks varied by cognitive abilities, SES, and verbal skills. The language the individual was tested in also affected performance depending on the dominant language of the child (Mueller Gathercole et al., 2010). Further studies are needed to understand the developmental trajectory and status of working memory, inhibition, and shift in bilingual adolescents.

Statement of the Problem

There is increasing awareness and research on the development of EF and the relation between EF and both academic and social/behavioral outcomes. The majority of research on typically developing individuals focuses on childhood or adulthood. There have been multiple studies looking at EF in children who are bilingual; research has been unsuccessful in understanding how the development of EF may be influenced by bilingualism in general or in the bilingual adolescent. As previously noted, EF abilities in adolescence is correlated with the individual's academic and social functioning, as well as the long-term success. There is a lack of evidence on how the Miyake et al. (2000) model is related to behavioral outcomes in typically developing adolescents. Specifically, there is no research that considers behavioral outcomes as related to EF in bilingual adolescents. The purpose of this study is to add to the knowledge base for EF development in adolescence in association with bilingualism and behavioral outcomes. The theoretical orientation is grounded in Miyake et al. (2000) model of EF with inhibition, working memory, and shift considered as key components.

Significance and clinical implications. In 2011, over 21% of people over five years old spoke a language other than English in their home. These languages included Spanish, French, Italian, German, Chinese, and more ("National Center for Educational Statistics, U. S. Department of Education,"). Furthermore, in the 2011-2012 school year, 9.1% of students received English as a second language (ESL) services, an increase from the 8.7% in 2002-2003 (Ryan, 2013). With a growing use of languages other than English in the United States, it is important to consider the impact that language use has on individuals. Given the influence EF has on social and behavioral outcomes, it is important to consider how language use may affect the EF developmental trajectory. Understanding the relationship between EF and social/behavioral outcomes for bilingual and monolingual adolescents will help future research, as well as the development of intervention and prevention programs for middle and high school students.

CHAPTER II

LITERATURE REVIEW

Suchy (2009) defined executive functioning (EF) as a "construct consisting of a set of higher order neurocognitive processes that allow higher organisms to make choices and to engage in purposeful, goal-directed, and future-oriented behavior" (p. 106). This definition explains that EF essentially allows humans to think through and plan their behaviors rather than behave in a manner that brings short-term rewards. Although there are many different definitions of EF and controversies on which higher order processes are involved with EF, it is generally associated with several cognitive processes that are subserved by the prefrontal cortex (Miller & Cohen, 2001). These components often include planning, inhibition, shifting, attention, and working memory (Barkley, 1997; Willcutt et al., 2005). These components, and therefore EF, are important to both academic and social-behavioral outcomes.

Academic Outcomes and EF

Childhood EF skills predict adolescent academic, as well as young adult academic outcomes (Miller & Hinshaw, 2010; Miller et al., 2012b). Studies that have looked at EF and academic outcome are presented in Table 1. Several EF components have been found to predict academic functioning including organization, shift, working memory, and planning (Alloway, Banner, & Smith, 2010; Langberg, Dvorsky, & Evans, 2013). Research consistently indicates that working memory is predictive of academic performance (Aronen et al., 2005; Colom et al., 2007; Vuontela et al., 2013), specifically in the areas of reading (Alloway & Alloway, 2010; Carretti et al., 2009; Nevo &

Breznitz, 2011), mathematics (Bull et al., 2008; De Smedt et al., 2009; Swanson, 1994), language skills (Fuhs, Farran, & Nesbitt, 2014a; Thorell et al., 2013), and science (Latzman, Elkovitch, Young, & Clark, 2010). These relationships have been observed from preschool (Fuhs et al., 2014b; Lan et al., 2011) through adolescence (Best et al., 2011; Gathercole et al., 2004b; Latzman et al., 2010). Furthermore, Thorell et al. (2013) found the association with academic achievement and EF to be significant across different countries, particularly with regard to working memory.

Other studies have found inhibition to be related to academic achievement (Fuhs et al., 2014a; Vuontela et al., 2013). Similar to working memory, this relationship has been found in different developmental stages: preschool (Fuhs et al., 2014a; Lan et al., 2011) and school age children (Bull et al., 2008; Vuontela et al., 2013). Furthermore, shift has also been positively correlated with math (Yeniad et al., 2013), reading skills (Latzman et al., 2010; Yeniad et al., 2013), and science (Latzman et al., 2010). For example, St Clair-Thompson and Gathercole (2006) found that multiple measures of working memory and inhibition were positively related to English, math, and science achievement. Additionally, one shift measure was related to all three academic achievement areas.

Table 1

EF and Academic Outcomes

Study	*Age Range*	*Academic Areas*	*EF Components*	*Results*
Alloway and Alloway (2010)	School Age	Reading and Mathematics	Working Memory	Working memory predicts academic achievement in reading and mathematics across time; this relationship remains unique from IQ.
Aronen et al. (2005)	School Age	Overall Academic Performance	Working Memory	Poor working memory correlated with poor academic performance
Becker, Miao, Duncan, and McClelland (2014)	Pre-Kindergarten and Kindergarten	Literacy, Vocabulary, Mathematics	Working Memory and Inhibition	Working Memory and Inhibition were significantly correlated with Literacy. In addition, Inhibition was significantly related to mathematics and vocabulary. Working Memory was significantly related to mathematics.
Best et al. (2011)	School Age and Adolescence	Math and Reading	Complex EF	EF and academic achievement were significantly correlated across ages
Bryce, Whitebread, and Szűcs (2014)	School Age	Mathematics and Reading	Working Memory	Working Memory significantly correlated with both reading and math ability.

Table 1 Continued

EF and Academic Outcomes

Study	*Age Range*	*Academic Areas*	*EF Components*	*Results*
Borella and de Ribaupierre (2014)	School Age	Reading; specifically text comprehension	Working Memory and Inhibition	Working memory is related to text comprehension; inhibition is related to individual differences in text comprehension
Bull et al. (2008)	School Age	Reading and Mathematics	Working Memory, Inhibition, and Complex task	Working memory and inhibition were associated with reading and math achievement across time; Complex task performance related to math achievement across time, but only associated with reading for a short time span
Carretti et al. (2009)	School Age, Adolescence, Adult	Reading Comprehension	Working Memory	Working Memory tasks involving attentional control or verbal processing seem to be more correlated to reading comprehension than other Working Memory Tasks
Colom et al. (2007)	Adolescence	Overall (multiple subjects)	Working Memory	Academic performance relates to Working Memory

Table 1 Continued

EF and Academic Outcomes

Study	*Age Range*	*Academic Areas*	*EF Components*	*Results*
De Smedt et al. (2009)	School Age	Mathematics	Working Memory	Working memory predicts later mathematic achievement.
Fuhs et al. (2014a)	Preschool	Mathematics, Literacy, and Language	Working Memory, Complex Task and Inhibition	Working memory, Complex Task, and Inhibition were related to literacy, language, and mathematics
Fuhs et al. (2014b)	Preschool to School Age	Mathematics, Literacy, and Language	Working Memory, Complex Task, and Inhibition	Performance on working memory, a complex EF task, and inhibition during preschool predicted later literacy, language, and mathematics achievement.
Gathercole, Brown, and Pickering (2003)	School Age	Math, Reading, Writing, Spelling	Working Memory	Early working memory abilities predicted later literacy achievement scores, but not mathematics achievement

Table 1 Continued

EF and Academic Outcomes

Study	*Age Range*	*Academic Areas*	*EF Components*	*Results*
Gathercole et al. (2004b)	School Age and Adolescence	English, Math, and Science	Working Memory	Working memory scores were associated with English, Math, and Science abilities for the 7-year old group; however, for the 14-year old group, Working Memory was only significantly associated with Math and Science abilities.
Giofre, Mammarella, and Cornoldi (2014)	School Age	Geometry (Mathematics)	Working Memory	Working memory was associated to geometry achievement.
Lan et al. (2011)	Preschool	Math and Reading	Working Memory and Inhibition	Academic achievement was related to working memory and inhibition for both American and Chinese preschoolers
Latzman et al. (2010)	Adolescents	Reading, Science, Social Studies, Mathematics	Working Memory, Inhibition, and Flexibility	Working Memory was found to predict reading and social studies skills. Inhibition explained mathematics and science scores, and flexibility significantly predicted reading and science achievement.

Table 1 Continued

EF and Academic Outcomes

Study	*Age Range*	*Academic Areas*	*EF Components*	*Results*
Miller, Nevado-Montenegro, and Hinshaw (2012a)	School Age	Math and Reading	Working Memory	Childhood working memory predicted later math and reading achievement.
Nesbitt, Farran, and Fuhs (2015)	Pre-K	Reading and Math	Working Memory, Complex Task, Shift	The relationship between EF and academic achievement is mediated through learning-related behaviors.
Nevo and Breznitz (2011)	School Age	Reading	Working Memory	Working Memory predicted Reading achievement across time
Rhodes et al. (2014)	Adolescents	Biology	Working Memory, inhibition, and shift	Working Memory predicted conceptual understanding of biology, but inhibition and shift did not predict understanding of biology.
Rigoli, Piek, Kane, and Oosterlaan (2012)	Adolescents	Reading, Spelling, and Math	Working Memory	Working memory mediated the relationship between motor coordination and academic achievement

Table 1 Continued

EF and Academic Outcomes

Study	*Age Range*	*Academic Areas*	*EF Components*	*Results*
Rogers, Hwang, Toplak, Weiss, and Tannock (2011)	Adolescence	Reading and Math	Working Memory	Working memory mediated inattention and reading; working memory was related to both reading and math capabilities.
St Clair-Thompson and Gathercole (2006)	School Age	English, Math, and Science	Shift, inhibition, working memory	One measure of shift related to English, math, and science scores; Working memory and inhibition measures related to English, math, and science achievement.
Swanson (1994)	School Age and Adults	Reading and Mathematics	Working Memory	Working Memory is related to academic achievement in both learning disabled and non-learning disabled children and adults
Thorell et al. (2013)	School Age	Language Skills and Mathematics	Working Memory and Inhibition	Ratings of EF were related to academic achievement across 4 countries
Verdine, Irwin, Golinkoff, and Hirsh-Pasek (2014)	Preschool	Mathematics	Flexibility and Inhibition	EF predicts mathematics skills.

Table 1 Continued

EF and Academic Outcomes

Study	*Age Range*	*Academic Areas*	*EF Components*	*Results*
Vuontela et al. (2013)	School Age	Parent and Teacher ratings of Academic Performance	Working Memory and Inhibition	Inhibition was significantly associated with Academic Performance; Working Memory was not associated with Academic Performance
Yeniad et al. (2013)	School Age	Math and Reading	Shift	Shift was positively correlated with math and reading skills.

Social/Behavioral Outcomes and EF

EF not only is associated with academic outcomes, but many components of EF are positively correlated with social functioning (Hughes et al., 1998; Kochanska et al., 2000). Alternatively, deficits in these cognitive processes are associated with greater risks for negative behaviors, such as aggression (Diamantopoulou, Rydell, Thorell, & Bohlin, 2007; Giancola, Mezzich, & Tarter, 1998; Séguin, Boulerice, Harden, Tremblay, & Pihl, 1999), delinquency (Giancola et al., 1998), conduct problems (Speltz, DeKlyen, Calderon, Greenberg, & Fisher, 1999), and substance use (Aytaclar, Tarter, Kirisci, & Lu, 1999). Studies that have examined EF in relation to social and behavioral outcomes are presented in Table 2.

The relation between EF and social and/or behavioral outcomes has been seen preschool (Hughes et al., 1998; Kochanska et al., 2000), school age children (Diamantopoulou et al., 2007), and adolescence (Aytaclar et al., 1999; Séguin et al., 1999). Although some research has focused on broad measures of EF using composite scores, or measures that take into account more than one component of EF, fewer research has focused on individual EF components and their association with social and behavioral outcomes.

Inhibition has consistently been researched with regard to its relation to behavior and social functioning. In preschool, inhibition has been related to hyperactivity (Berlin & Bohlin, 2002), aggression (Dennis & Brotman, 2003; Raaijmakers et al., 2008), and behavior/conduct problems (Espy et al., 2011; Herba et al., 2006). Childhood inhibition deficits have been associated with externalizing behaviors (Utendale, Hubert, Saint-

Pierre, & Hastings, 2011) and as a predictor of multiple later negative outcomes. For example, White, Moffitt, Caspi, and Jeglum Bartusch (1994) found that inhibition levels in fourth grade predicted adolescent delinquency, particularly early onset delinquency and stable delinquency overtime. Furthermore, Nigg et al. (2006) found that poor inhibition scores predicted later drug and alcohol use independent of intelligence, socio-economic status, and parental alcohol use. Adolescent and childhood inhibition deficits also have been associated with conduct problems (Herba et al., 2006) and other externalizing behaviors (Bohlin, Eninger, Brocki, & Thorell, 2012; Schoemaker et al., 2013).

Externalizing behavior is defined differently depending on the researcher, but is generally used as a broad term to encompass behaviors such as aggression, delinquency, disruptive behaviors, conduct problems, and hyperactivity. Externalizing behavior problems are not only associated with inhibition, but also are associated with working memory deficits (Romer et al., 2011; Schoemaker et al., 2013). Specifically, working memory deficits have been related to delinquency (Syngelaki et al., 2009), hyperactivity (Rapport et al., 2008), alcohol use (Peeters et al., 2014), and aggression (McQuade et al., 2013). Romer et al. (2009) found a predictive relationship between poor working memory and later risk-taking behavior. Although there are multiple studies providing evidence for a relation between working memory and behavioral outcomes, there are other studies that did not find evidence of this relationship (Aronen et al., 2005; Jonsdottir et al., 2006; Vuontela et al., 2013).

There were fewer studies that investigated the relation between shift capabilities and social/behavioral outcomes. It was found that delinquents performed more poorly on measures of shift than typical controls (Syngelaki et al., 2009). Moreover, poor shifting capabilities have been related to other externalizing behaviors (Schoemaker et al., 2013). Despite the lack of research, it would seem likely that cognitive flexibility or the ability to shift would be critical in social problem solving.

Further research has focused on EF deficits in particular disorders characterized by different external behaviors such as aggression, defiance, impulsivity, hyperactivity, and inattention such as Attention-Deficit/Hyperactivity Disorder (ADHD; (Barkley, 1997; Berlin, Bohlin, Nyberg, & Janols, 2004; Biederman et al., 2004), and Oppositional Defiant Disorder and/or Conduct Disorder (Clark, Prior, & Kinsella, 2002; Fairchild et al., 2009; Oosterlaan, Scheres, & Sergeant, 2005). These disorders are associated with deficits in inhibition (Barkley, 1997; Geurts, Verté, Oosterlaan, Roeyers, & Sergeant, 2004; Hobson, Scott, & Rubia, 2011; Schoemaker, Bunte, Espy, Dekovic, & Matthys, 2014), working memory (Saarinen, Fontell, Vuontela, Carlson, & Aronen, 2014; Schoemaker et al., 2014; Thorell & Wåhlstedt, 2006), and shift (Rommelse et al., 2007; van Goozen et al., 2004).

Table 2

EF and Social/Behavioral Outcomes

Study	*Age Range*	*Social/ Behavioral Areas*	*EF Components*	*Results*
Aronen et al. (2005)	School Age	Aggression and delinquency	Working Memory	Working memory was not related to a composite score that included aggression and delinquency
Aytaclar et al. (1999)	Adolescence	Substance use	Complex EF tasks	Adolescence at high risk for substance use performed poorly EF task performance compared to low risk peers.
Berlin and Bohlin (2002)	Preschool	Hyperactivity and Conduct Problems	Inhibition	Inhibition was significantly correlated to hyperactivity and conduct problems; however the relationship with conduct problems did not remain when controlling for hyperactivity.
Bohlin et al. (2012)	School Age	Externalizing Behaviors	Inhibition	Poor inhibition was related to externalizing problem behaviors.
Dennis and Brotman (2003)	Preschool	Aggression	Inhibition	Poor inhibition was related to mother reported aggressive behaviors.
Diamantopoulou et al. (2007)	School Age	Aggression and Prosocial Behavior	EF composite	EF deficits were related to aggression and low levels of prosocial behavior.

Table 2 Continued

EF and Social/Behavioral Outcomes

Study	*Age Range*	*Social/ Behavioral Areas*	*EF Components*	*Results*
Espy et al. (2011)	Preschool	Problem Behaviors	Inhibition and Working Memory	Inhibition and working memory were significantly correlated with problem behaviors.
Fatima and Sheikh (2014)	Adolescent	Aggression	Inhibition and Shift	The relationship between socioeconomic status and aggression is mediated by EF.
Ellis, Weiss, and Lochman (2009)	School Age	Aggression	Inhibition	Inhibition deficits are related to reactive aggression, but not to proactive aggression.
Giancola et al. (1998)	Adolescence	Aggression, Delinquency, and Disruptive behavior	EF composite	EF abilities were related to aggressive, delinquent, and disruptive behavior, despite SES, age, and drug use.
Herba et al. (2006)	Adolescence	Conduct Problems	Inhibition	Motor inhibition, but not cognitive or verbal inhibition was related to conduct problems.
Hughes et al. (1998)	Preschool	Social functioning	Inhibition and complex EF task	Impaired inhibition and EF is related to poor social functioning.

Table 2 Continued

EF and Social/Behavioral Outcomes

Study	*Age Range*	*Social/ Behavioral Areas*	*EF Components*	*Results*
Jonsdottir et al. (2006)	School Age	Hyperactivity, Conduct Problems, and Aggression	Working Memory	Working memory was not related to hyperactivity, conduct problems, or aggression.
Kerr, Tremblay, Pagani, and Vitaro (1997)	School Age to adolescence	Delinquency	Inhibition	Inhibition abilities at school age predicted later adolescent delinquency; higher inhibition predicted less delinquency.
Kochanska et al. (2000)	Preschool	Social functioning	EF composite	EF was related to social development.
McQuade et al. (2013)	School Age	Aggression, and social competence	Working memory	Working memory abilities were directly related to aggression, and indirectly related to social competence.
Nigg et al. (2006)	Adolescence	Alcohol and drug use	Inhibition	Inhibition scores predicted later drug and alcohol use, independent of multiple factors such as IQ, and parental alcohol use.
Nigg, Quamma, Greenberg, and Kusche (1999)	School Age	Externalizing Behavior	Inhibition	Poor inhibition was predictive of increased externalizing behaviors.

Table 2 Continued

EF and Social/Behavioral Outcomes

Study	*Age Range*	*Social/ Behavioral Areas*	*EF Components*	*Results*
Peeters et al. (2014)	Adolescence	Alcohol Use	Working Memory	Poor working memory predicts later alcohol use in adolescence.
Raaijmakers et al. (2008)	Preschool	Aggression	Inhibition	Aggression was related to impairments in inhibition, even when controlling for attention problems.
Rapport et al. (2008)	School Age	Hyperactivity	Working Memory	Hyperactivity relates to Working Memory demands.
Riccio et al. (2011)	School Age	Aggression	Complex task	EF tasks and ratings negatively correlated with aggression
Riggs, Blair, and Greenberg (2003)	School Age	Externalizing behavior	Inhibition	Inhibition predicted externalizing behavior.
Romer et al. (2011)	Adolescence	Risk-taking behavior	Working Memory	Poor working memory predicted later risk-taking behavior
Romer et al. (2009)	School Age	Externalizing behavior, and risk-taking behaviors	Working memory, and inhibition	Working memory and inhibition were not related to externalizing behaviors, but were both associated with risk-taking behaviors.

Table 2 Continued

EF and Social/Behavioral Outcomes

Study	*Age Range*	*Social/ Behavioral Areas*	*EF Components*	*Results*
Schoemaker et al. (2013)	Preschool	Externalizing behaviors	Working Memory, Shift, and Inhibition	Inhibition, Working Memory, and shift were related to externalizing behaviors. Working memory and shift had small effect sizes, while inhibition had a medium effect size.
Schoemaker et al. (2014)	Preschool	ADHD & DBD	Working Memory and Inhibition	ADHD and DBD preschoolers performed worse than a control group on inhibition over three time periods. Additionally, ADHD preschoolers performed worse than control on working memory tasks.
Séguin et al. (1999)	Adolescence	Aggression	EF composite	EF deficits relate to aggression apart from ADHD status.
Speltz et al. (1999)	Preschool	Conduct Problems	EF composite	The group with conduct problems performed poorly on EF measures compared to the control group.
Syngelaki et al. (2009)	Adolescence	Delinquency	Working Memory and Shift	Adolescent offenders performed poorer on working memory and shift tasks than controls.

Table 2 Continued

EF and Social/Behavioral Outcomes

Study	*Age Range*	*Social/ Behavioral Areas*	*EF Components*	*Results*
Tarter et al. (2003)	School Age	Substance use	Inhibition	Poor inhibition predicts early onset substance use.
Tarter, Kirisci, Reynolds, and Mezzich (2004)	School Age	Suicide potential	Inhibition	Poor inhibition predicts later suicide potential.
Utendale et al. (2011)	Preschool to School Age	Externalizing behaviors	Inhibition	Poor inhibition related to elevated externalizing behavior problems.
Verlinden et al. (2014)	School Age	Bullying	Working Memory, Inhibition, Shift	Poor inhibition related to increased bullying behavior. Working memory and shift were not significantly correlated with bullying behavior.
Vuontela et al. (2013)	School Age	Delinquency and Aggression	Working Memory and Inhibition	Inhibition was significantly related to Delinquency and Aggression; not for Working Memory
White et al. (1994)	School Age and Adolescence	Delinquency	Inhibition	Poor inhibition was related to later delinquency, particularly early onset and stable delinquency over time.

Models of EF

Not all studies yield the same results; as noted earlier, this likely reflects a difference in the models of EF utilized, as well as the measures used. Depending on the model, the emphasis is on a different component or components of EF. For example, in the Anderson (2002) model, the emphasis is on cognitive flexibility, attentional control, goal setting, and information processing. These broad categories then encompass components such as working memory, self-regulation, and speed of processing. Alternatively, (Zelazo, Carter, Reznick, & Frye, 1997)focus on explaining EF through a problem solving construct and consider representation, planning, execution, and evaluation. Furthermore, Denckla (1996) focused on EF being non-hierarchical and including constructs such as inhibition, planning, attention, memory, and fluency. There are many other models of EF with differing components processes.

For the purpose of this study, the Miyake et al. (2000) model will be utilized. This model is focused on three dominant components of EF: Shifting, Updating, and Inhibition. This model was selected because its components have evidence of impact on children's academic and social functioning across studies. Additionally, previous research on bilingualism and EF has focused on these components and used this model (Barac & Bialystok, 2012; Bialystok, 2011; Iluz-Cohen & Armon-Lotem, 2013). The components of this model will be discussed in greater detail.

Shifting is sometimes referred as "attention switching," "task switching," or "cognitive flexibility" (Anderson, 2002, p. 74; Miyake et al., 2000, p. 55). It includes the ability to shift one's attention between multiple mental tasks or make a change in one's response set (Miyake et al., 2000; Monsell, 1996). As an everyday function, shifting is involved in transitions between activities, such as going between subjects at school, or being able to shift attention while driving to the different cars surrounding the driver. Deficits in the ability to shift may affect one's ability to attend to new and relevant information that may be necessary for learning or safety. In order to measure shifting, some researchers used the plus-minus task (Jersild, 1927), the number-letter task (Rogers & Monsell, 1995), and the local-global task (Miyake et al., 2000).

The second component of the Miyake et al. (2000) model is updating, and more specifically, updating in working memory. Updating is the process of obtaining information that is relevant, and continuously monitoring and revising this information for relevance within working memory (Miyake et al., 2000; Morris & Jones, 1990). Other studies simply have called this component working memory (Bialystok, 2011; Calvo & Bialystok, 2014; Engel de Abreu, 2011). For the purposes of this study, the term working memory will be used to reflect the updating processes consistent with prevalent use. Working memory is needed for comprehending readings and driving a car. When reading, one must consistently hold on to information relevant for comprehension while letting go of more irrelevant information or words. Additionally, while driving one must continue updating the known surroundings in order to react appropriately. In social situations, one needs to not only attend to the relevant cues, but also to consider how the situation is similar to past situations and what behaviors led to what consequences. To assess working memory within the Miyake et al. (2000) model, researchers have used the keep track task (Yntema, 1963), the letter memory task

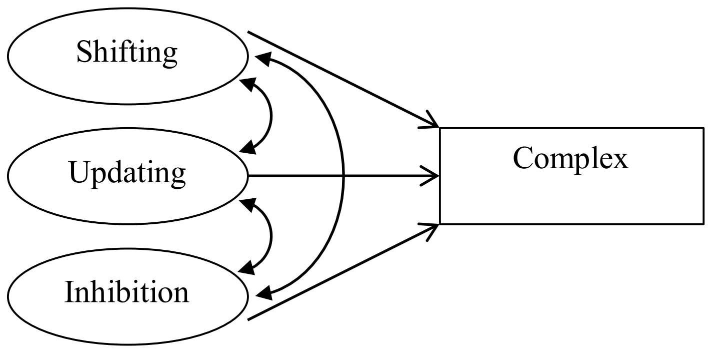
(Morris & Jones, 1990), and the tone monitoring task (Miyake et al., 2000) as performance based measures.

The third component that (Miyake et al., 2000) examined was inhibition. Inhibition is considered in many EF models, but may include an array of behaviors depending on the model. In the context of the (Miyake et al., 2000), inhibition refers specifically to the inhibition of prepotent or dominant responses. For example, when a child is angered by another person, the child may want to react in a maladaptive way; however, in consideration of social norms, inhibits that response in favor of a more adaptive reaction. In order to measure inhibition, researchers have used the Stroop task (Stroop, 1935), the stop-signal task (Logan, 1994), and the antisaccade task (Hallett, 1978) as performance based measures.

The Miyake et al. (2000) model is not limited to the three components separately. In the model, the performance in each individual component is correlated with the others, as well as with the performance on complex executive tasks that require the integration of shifting, working memory, and inhibition. The model proposed can be seen in Figure 1. This model was tested and goodness of fit was confirmed with children and adolescents (Lee, Bull, & Ho, 2013; Lehto, Juujärvi, Koistra, & Pulkkinen, 2003; Wu et al., 2011).

Miyake et al. (2000) found that each component was distinguishable, but also related with the others. Additionally, all but one of the complex executive tasks was related with each of the three components. They further noted that each complex task was related to one component more than the others, meaning there were no tasks that used all components equally. This is true of many of the performance measures used in evaluation of EF. It is difficult to find a measure that only considers a single EF component.

Figure 1



Miyake et al. (2000) Model of EF

Development of Executive Functioning Through Adolescence

EF matures over the course of development with many researchers suggesting differential maturation of the differing components over time. Development of EF parallels neurological maturation and myelination of the prefrontal, along with selective synaptic pruning cortex (Blakemore & Choudhury, 2006; Welsh et al., 1991). This neurological maturation associated with EF begins in early childhood and continues through adolescence during which time there is increased myelination and decreased synaptic density (Boelema et al., 2014; Choudhury, Charman, & Blakemore, 2009). This maturation is affected by both biological (Casey, Getz, & Galvan, 2008) and social factors such as socioeconomic status (SES) and sex (Choudhury et al., 2009; Luciana, 2013). Furthermore, EF is not only associated with the frontal brain region, but other brain regions as well (Alvarez & Emory, 2006), including the parietal cortex (Blakemore & Choudhury, 2006), in the execution of EF components (Wendelken, Munakata, Baym, Souza, & Bunge, 2012). This is not only seen in relation to EF performance based tasks, but EF ratings as well (Mahone, Martin, Kates, Hay, & Horska, 2009).

Preschool. There are some who would argue that EF is not developed in early childhood or may be unidimensional (Wiebe et al., 2011). Yet others have looked at the emergence of EF in early childhood and the relation between EF and academic outcomes (Epsy et al., 2004; Shaul & Schwartz, 2013; Verdine et al., 2014). Espy, Kaufmann, and Glisky (2001) championed the development of procedures to assess EF in preschoolers. With the recent increase of EF measures created for preschool aged children, studies have been able to investigate the development of EF in young children. For example, Willoughby et al. (2012) found that EF undergoes rapid changes from age 3 to 5; similar results were found by Clark et al. (2013) and Wiebe et al. (2011).

Childhood. Early theories suggested that EF plateaued by age six (Luria, 1966). It is now understood that this is not the case. During childhood, executive function continues to increase considerably (Anderson et al., 2001), with each EF component developing at different rates (Romine & Reynolds, 2005).Cognitive flexibility or shift goes through a critical period of development from age 7 to 9 years of age (Anderson, 2002). Similarly, working memory is believed to continue developing with increased capacity throughout childhood (Carriedo, Corral, Montoro, Herrero, & Rucian, 2016; Lee et al., 2013). Alternatively, there is minor development in response inhibition after

7 years of age (Johnstone et al., 2007; Macdonald, Beauchamp, Crigan, & Anderson, 2014). Huizinga et al. (2006) suggested inhibition plateaus at 11 years old, but that shift and working memory continue to develop; however others argue that inhibition does not plateau until mid-adolescence (Reynolds & Horton, 2008; Romine & Reynolds, 2005).

Adolescence. There is a lack of consensus on EF development during adolescence. Some researchers argue EF develops dramatically during adolescents (Boelema et al., 2014; Romine & Reynolds, 2005), while others argue that it plateaus (Reynolds & Horton, 2008). Anderson (2002) suggested that shift slows in development during adolescence but does not stop developing until adulthood; however, others have suggested that it plateaus at 15 (Huizinga et al., 2006). Working memory continues to steadily develop throughout adolescence (Carriedo et al., 2016; Conklin et al., 2007; Huizinga et al., 2006); however, depending on the task the development may look slightly different (Gathercole et al., 2004a). Furthermore, as mentioned earlier, inhibition is argued to continue to develop until mid-adolescence (Reynolds & Horton, 2008; Romine & Reynolds, 2005). Most of the research on EF in adolescence, however, is with clinical populations and focuses on negative social/behavioral outcomes. There is limited research on the developmental level of shift, working memory, and inhibition during adolescence or in association with bilingualism in adolescence. Although this research does not specifically focus on EF development, it notes the importance and lack of research of EF during adolescence.

EF and Bilingualism

It has been suggested that development of EF may differ for children and adults who are bilingual or multilingual. Studies that have considered bilingualism in relation to EF are presented in Table 3. Many studies found that bilingual children show an altered cognitive development from infancy (Kovács & Mehler, 2009; Singh et al., 2015) through adulthood (Wu & Thierry, 2013) in at least some aspects of EF. For instance, bilinguals demonstrated better performance on tasks such as the Dimensional Change Card Sort (DCCS; (Zelazo, 2006) and other card sorting tasks as compared to monolingual peers (Bialystok, 1999; Bialystok & Martin, 2004). In addition, complex tasks (i.e., tasks that involve an integration of multiple executive components) like the DCCS, are often performed better by bilingual children compared to their monolingual peers (Bialystok, 2010, 2011). These tasks involve inhibition, shifting, and working memory, often within a single task.

Not only have studies investigated the performance of bilingual children on complex tasks, but have investigated their performance on individual executive functioning components of inhibition, shift, and working memory. Multiple studies have found that preschool and school age bilinguals outperform their monolingual peers on inhibition tasks (Bialystok & Viswanathan, 2009; Kapa & Colombo, 2013; Yang et al., 2011; Yoshida et al., 2011); however, other studies did not yield similar results (Bonifacci et al., 2011; Dunabeitia et al., 2014; Nguyen & Astington, 2013).

Martin-Rhee and Bialystok (2008) conducted two studies that utilized two different inhibition tasks. The first study compared 17 French-English bilingual preschoolers and 17 monolingual preschoolers on an inhibition task that requires the child to attend to one stimulus for response and inhibit response to another stimulus. The second study compared 21 bilingual preschoolers to 20 monolingual preschoolers on a task that requires replacement of a natural response with an atypical response. The authors found that bilinguals demonstrated better EF than monolinguals on the first study's inhibition task, but not on the second. It is thought that the first inhibition task replicates the experience bilinguals have when inhibiting one language and activating the other (Martin-Rhee & Bialystok, 2008).

Table 3

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Abdelgafar and Moawad (2015)	School Age	Inhibition	No differences between monolingual and bilingual children.
Adi-Japha et al. (2010)	Preschool	Shift	Bilingual individuals performed similarly to monolingual individuals
Barac and Bialystok (2012)	School Age	Shift	All bilingual groups (different languages and cultures) performed similarly. Bilingual groups outperformed monolingual group
Bialystok (1999)	Preschool	Complex Task, Working Memory	Bilinguals outperformed monolinguals on the complex task, but did not outperform them on working memory
Bialystok (2006)	Adults	Inhibition	Bilinguals performed faster than monolinguals on conditions requiring executive control.

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Bialystok (2010)	School age	Complex Task, Working Memory, Shift	Bilinguals outperformed monolinguals on the shift task and complex task that both involved speed, and performed similarly to monolinguals on the working memory task
Bialystok (2011)	School age	Complex Task	Bilinguals outperformed monolinguals
Bialystok and Barac (2012)	School age	Inhibition and Shift	Children's performance on executive functioning measures were positively related to years spent in bilingual education
Bialystok et al. (2010)	Preschool	Inhibition, Shift, and Complex task	Bilingual children outperformed monolingual children on the shift task, complex task, and one inhibition task. There were no group differences on the other inhibition task.
Bialystok, Craik, and Luk (2008)	Adults	Working Memory and cognitive control	Bilinguals outperformed monolinguals on a cognitive control task, but not on a working memory task.

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Bialystok, Craik, and Ryan (2006)	Adults	Inhibition, and conflict resolution	Bilinguals did not outperform monolinguals on inhibition, but did outperform them in a conflict resolution task. This finding continued through development.
Bialystok and Feng (2009)	School age	Working Memory	Bilingual children performed better than monolingual children
Bialystok and Majumder (1998)	School Age	Problem-Solving	Balanced bilinguals outperformed both partial bilinguals and monolinguals on a problem-solving task.
Bialystok and Martin (2004)	Preschool	Inhibition	Bilinguals outperformed monolinguals on the inhibitory aspect of a complex task
Bialystok and Senman (2004)	Preschool	Inhibition	Bilingual preschoolers outperformed monolingual peers on inhibition tasks

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Bialystok and Shapero (2005)	School Age	Working Memory, Shift	Bilingual and monolinguals performed similarly on the working memory task; however, bilinguals outperformed monolinguals in a shift task.
Bialystok and Viswanathan (2009)	Preschool	Complex task, Inhibition	Bilinguals outperformed monolinguals on both complex task and inhibition
Bogulski, Rakoczy, Goodman, and Bialystok (2014)	Young Adults	Working Memory	Full bilinguals outperformed monolinguals on working memory tasks. Lapsed bilinguals performed between the two groups and displayed no significant differences to neither monolinguals nor full bilinguals.
Bonifacci et al. (2011)	School Age	Inhibition and Working Memory	Bilinguals performed similarly to monolingual peers

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Calvo and Bialystok (2014)	School Age	Inhibition and Working Memory	Bilingual children outperformed monolingual peers on EF tasks. Higher SES also had an independent effect on EF performance. No interaction effect was observed.
Carlson and Meltzoff (2008)	School Age	Inhibition and Complex Task	Bilingual children outperformed children in a bilingual immersion program and monolingual peers on complex task, but not inhibition tasks. There was no significant difference between the immersion and control groups' performances.
Chen, Zhou, Uchikoshi, and Bunge (2014)	School Age	Cognitive Flexibility & Inhibition	Children with higher degrees of proficiency in both languages were associated with better on cognitive flexibility and inhibition tasks.

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Coderre and van Heuven (2014)	Adults	Inhibition and Shift	There was not a significant difference in performance of EF between bilinguals and monolinguals. Lower EF was associated with different-script bilinguals compared to same-script bilinguals.
Colzato et al. (2008)	Adults	Inhibition	Bilinguals did not outperform monolinguals on inhibition tasks, but seem to do well with inhibition tasks requiring working memory.
Costa, Hernández, Costa-Faidella, and Sebastian-Galles (2009)	Adults	Inhibition and conflict resolution	Bilinguals outperformed monolinguals on tasks requiring inhibition and conflict resolution.

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Costa, Hernandez, and Sebastian-Galles (2008)	Adults	Attentional control	Bilinguals outperformed monolinguals on the attentional control task.
Crivello et al. (2016)	Toddlers	Inhibition, Cognitive Flexibility, and Working Memory	Bilinguals only outperformed monolingual peers on Inhibition tasks. However, increased translational equivalents (knowledge of a word in two or more languages) predicted increased performance on inhibition tasks, cognitive flexibility task, and working memory task.
Dunabeitia et al. (2014)	School Age	Inhibition	Bilingual and monolingual children performed similarly on inhibition tasks.
Engel de Abreu (2011)	School Age	Working Memory	Bilingual and monolingual children performed similarly on working memory tasks.

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Engel de Abreu et al. (2012)	Preschool	Shift	Bilinguals performed similarly to monolinguals.
Esposito and Baker-Ward (2013)	School Age	Inhibition, Complex task	Within a low SES sample, children within a dual-language program outperformed traditional students on the complex task, but not the inhibition task.
Esposito, Baker-Ward, and Mueller (2013)	Preschool	Inhibition	Bilingual preschoolers outperformed their monolingual peers on interference suppression.
Fernandez, Tartar, Padron, and Acosta (2013)		Inhibition	Greater inhibition evident on event related potentials for bilinguals; however, no significant between group differences on actual task performance.

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Foy and Mann (2013)	School Age	Complex task	Bilingual children outperformed monolingual children in a non-verbal complex task, but performed similarly to monolingual children in a verbal complex task.
Garratt and Kelly (2008)	School Age	Complex task	There was no significant difference between bilingual and monolingual children's performance on the complex task.
Greenberg, Bellana, and Bialystok (2013)	School Age	Complex task	Bilingual children outperformed monolingual children on a spatial complex task.
Gutiérrez-Clellen and Calderón (2004)	School Age	Working Memory	No differences were found between varying degrees of bilinguals and monolinguals

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Hernández, Costa, Fuentes, Vivas, and Sebastián-Gallés (2010)	Adult	Inhibition and attention	Bilinguals outperformed monolinguals in tasks requiring inhibition and attention.
Hernández, Costa, and Humphreys (2012)	Adult	Working memory and attention	Bilinguals outperformed monolingual on tasks involving working memory and attention.
Hernández, Martin, Barceló, and Costa (2013)	Adult	Complex task	Results on task-switching task as measure of executive control did not result yield between group differences; however, differences were found for type of cue provided.

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Iluz-Cohen and Armon-Lotem (2013)	Preschool	Inhibition and Shift	Bilinguals with high language proficiency outperformed bilinguals with low language proficiency on tasks involving inhibition and shift.
Kalashnikova and Mattock (2014)	Preschool	Complex task	Sequential bilinguals outperformed monolingual peers on a complex task.
Kapa and Colombo (2013)	School Age	Inhibition	Early bilinguals outperformed monolinguals on the inhibition task, but did not outperform late bilinguals. Late bilinguals and monolinguals did not significantly differ on the inhibition task.
Kaushanskaya, Gross, and Buac (2014)	School Age	Shift and Working Memory	Children whom have been in a bilingual classroom for two years performed equally to monolingual peers on shifting tasks. However, the bilingual children outperformed their monolingual peers on working memory tasks.

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Kazemeini and Fadardi (2015)	Adults	Inhibition and Working Memory	Early Bilingual university students outperformed monolingual university students on tasks involving Inhibition and Working Memory.
Kovács and Mehler (2009)	Infant	Shift	Bilingual infants outperformed monolingual infants.
Leikin (2012)	Preschool	Creativity	Bilinguals showed more flexibility in mathematical problem solving.
Martin-Rhee and Bialystok (2008)	Preschool	Inhibition	Bilingual children outperformed monolingual peers on inhibition tasks that require inhibiting one response while attending to another natural response; however, bilingual children did not outperform monolingual peers on an inhibition task that required inhibiting a habitual response and using an atypical response.

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Morales et al. (2013)	School Age	Working Memory	Bilingual children outperformed monolingual peers on working memory tasks.
Mueller Gathercole et al. (2010)	School Age and Adolescence	Inhibition	Bilingual school age and adolescent groups that had more balanced use of the two languages outperformed the monolingual group on one measure of inhibition. The other inhibition task, showed advantageous for one school age bilingual group. Performances on tasks were also correlated with SES, cognitive abilities, and linguistic abilities.
Nguyen and Astington (2013)	Preschool	Inhibition and Working Memory	Bilingual children outperformed monolingual children on the working memory task, but not the inhibition task.
Nicolay and Poncelet (2012)	School Age	Shift and Inhibition	Children in an immersion program outperformed monolingual peers on the shift task, but not on the inhibition task.

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Nicolay and Poncelet (2015)	School Age	Shift	Children in an immersion program continued to outperform monolingual peers on a shift task.
Okanda et al. (2010)	Preschool	Complex Task	Bilingual children outperformed monolingual children on the complex task. Performance was also related to verbal abilities.
Paap and Greenberg (2013)	Adult	Inhibition and Shift	No significant differences in the performance of bilingual and monolingual adults
Pelham and Abrams (2014)	Adult	Inhibition,	Cognitive effects (deficits in lexical access and benefits in EF) are result of proficient use of two languages

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Poarch and van Hell (2012)	School Age	Inhibition	Bilingual and trilingual children outperformed monolingual children on the first inhibition task. Additionally, on the first task, second language learners did not significantly differ from any other group. On the second task, bilingual and trilingual children outperformed second language learners. Bilingual and trilingual groups performed similarly on both tasks.
Poulin-Dubois, Blaye, Coutya, and Bialystok (2011)	Preschool	Inhibition and Complex task	The bilingual group showed advanced performance on the inhibition tasked compared to the monolingual group, but not on the complex task.
Prior and Macwhinney (2009)	Adult	Shift	Bilinguals outperformed monolingual peers on the shift task.

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Ransdell, Barbier, and Niit (2006)	Adult	Working Memory	Bilinguals and multilinguals outperform monolingual adults on working memory task.
Ratiu and Azuma (2014)	Adult	Working Memory	Bilinguals did not outperform monolinguals on verbal and nonverbal working memory tasks.
Riggs, Shin, Unger, Spruijt-Metz, and Pentz (2014)	School Age	Working Memory and Inhibitory control	Working memory, but not inhibitory control was predicted by bilingual status. Additionally, biculturalism was not significantly related to EF.
(Singh et al., 2015)	Infant	Visual Habituation	Bilingual infants performed better on a visual habituation task compared to monolingual infants.
Soliman (2014)	School Age	Working Memory	Comparing monolingual and bilingual (Arabic-English) on four measures of working memory, results favored the bilinguals, but supported the construct of working memory in both groups.

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
Sullivan, Janus, Moreno, Astheimer, and Bialystok (2014)	Adult	Inhibition	After 6 months of completing a Spanish coarse, there were no behavioral differences in inhibition performance between Spanish learners and their monolingual peers. However, there were significant cognitive processing differences between groups.
Treccani, Argyri, Sorace, and Sala (2009)	Adult	Inhibition	Bilinguals performed better on an inhibition task compared to matched monolingual adults.
Vega and Fernandez (2011)	School Age	Inhibition and Complex Task	The bilingual group that displayed a more balanced proficiency in both languages outperformed the less-balanced bilingual group on the complex task, but not on the inhibition task.
Videsott et al. (2012)	School Age	Inhibition	High language proficient multilinguals outperformed their less proficient multilingual peers.

Table 3 Continued

EF and Bilingualism

Study	*Age Range*	*EF Components*	*Results*
von Bastian, Souza, and Gade (2016)	Adults	Inhibition, Working Memory, Shift	Bilinguals did not display advantages on EF compared to monolinguals.
Woumans, Ceuleers, Van der Linden, Szmalec, and Duyck (2015)	Adult	Inhibition	Interpreters outperformed unbalanced bilinguals on inhibition tasks. Additionally all bilingual groups (unbalanced, balanced, and interpreters) outperformed their monolingual peers on inhibition tasks.
Wu and Thierry (2013)	Adult	Inhibition	Bilinguals outperformed monolinguals in inhibition task.
Yang et al. (2011)	Preschool	Inhibition	Bilinguals outperformed monolinguals, despite a cultural advantage in one of the monolingual groups.
Yoshida et al. (2011)	Preschool	Inhibition	Bilinguals outperformed monolingual peers

Similarly, working memory has been found to be enhanced for preschool and school age bilinguals in many studies (Calvo & Bialystok, 2014; Morales et al., 2013; Nguyen & Astington, 2013), but not others (Bialystok, 2010; Bonifacci et al., 2011; Engel de Abreu, 2011). Morales et al. (2013) conducted two studies to compare school age bilingual and monolingual children on visual and visual-spatial working memory tasks. One study included 56 children, while the other included 125 children. Both studies found that the bilingual groups outperformed the monolingual groups. The authors attributed their findings to using low-verbally loaded tasks compared to other studies that used high verbally loaded working memory tasks.

The majority of studies found that bilingual children, both preschoolers and school age, outperformed their peers on tasks involving shift (Barac & Bialystok, 2012; Bialystok, 2010; Bialystok et al., 2010). For example, Bialystok (2010) reported on three studies that compared bilingual children to their monolingual peers on three conditions of shift. A total of 151 school age children were included. Results indicated that the bilingual children consistently outperformed their monolingual peers on shift tasks. It should be noted, however, a small number of studies found no difference between bilingual and monolingual preschoolers on shift tasks (Adi-Japha et al., 2010; Engel de Abreu et al., 2012; Kaushanskaya et al., 2014).

Research also has evaluated other variables and factors that may affect the relationship between language status (i.e. bilingual, multilingual, and monolingual) and EF. For instance, higher performance in executive functioning tasks by bilingual children is still present despite cultural differences (Bialystok & Viswanathan, 2009).

The Bialystok and Viswanathan (2009) study included three different groups: monolinguals from Canada, bilinguals from Canada, and bilinguals from India. They found the two bilingual groups performed equally as well and both outperformed the monolingual group. Furthermore, bilingual groups still outperform monolingual groups even when the monolingual culture seems to have an advantage in EF (Yang et al., 2011). Thus, enhanced EF in bilinguals is believed to be separate from culture. Alternatively, when investigating bilinguals of different languages, studies differ in results. (Barac & Bialystok, 2012) found that bilinguals of different languages perform similarly, while (Kalia, Wilbourn, & Ghio, 2014) found that script similarities between the bilingual's two languages may have an impact on EF performance.

Other studies have focused on language proficiency, translational equivalents, and vocabulary skills. Language proficiency in both languages was found to account for significant differences on EF tasks within groups of bilinguals (Bogulski et al., 2014; Iluz-Cohen & Armon-Lotem, 2013; Vega & Fernandez, 2011; Videsott et al., 2012), as well as verbal abilities relating to EF performance (Okanda et al., 2010), and the amount of equivalent words known in both languages (Crivello et al., 2016). Similarly, simultaneous bilinguals (i.e., those learning two languages simultaneously) have been shown to have advanced EF development compared to sequential bilinguals (Carlson & Meltzoff, 2008; Poarch & van Hell, 2012), with EF performance associated with the years spent in bilingual education for sequential bilinguals (Bialystok & Barac, 2012). Nevertheless, sequential bilinguals still have been found to outperform their monolingual peers on EF tasks (Esposito & Baker-Ward, 2013; Kalashnikova & Mattock, 2014;

Nicolay & Poncelet, 2012). Improved performance also was found among bilinguals with low SES (Engel de Abreu et al., 2012); however, level of SES seems to have an independent effect on EF tasks separate from bilingualism (Calvo & Bialystok, 2014).

Although there have been numerous studies on EF and bilingualism (see Table 3), across many different languages within early childhood, there is a paucity of studies on EF in bilingual adolescents. In one such study, Mueller Gathercole et al. (2010) looked specifically at the differences between varying language abilities, SES, and cognitive abilities. The study utilized multiple bilingual groups, covarying by use/proficiency in both languages. The bilingual groups (i.e., those considered most proficient in both languages) outperformed their monolingual peers on inhibition tasks. Performance on EF tasks varied by cognitive abilities, SES, and verbal skills. The language the individual was tested in also affected performance, depending on the dominant language of the child (Mueller Gathercole et al., 2010). Further studies are needed to understand the developmental trajectory and status of working memory, inhibition, and shift in bilingual adolescents. Although no studies examined the association between enhanced EF in bilinguals and social/behavioral functioning, Greenberg et al. (2013) found that not only did bilinguals outperform monolinguals on a complex EF task, but they also excelled on perspective taking tasks.

Statement of the Problem

There is increasing awareness about and research on the development of EF and its relation to both academic and social/behavioral outcomes. The majority of research on typically developing individuals focuses on childhood or adulthood. There is a lack of evidence on how the Miyake et al.'s (2000) model is related to behavioral outcomes in typically developing adolescents or to bilinguals who show enhanced EF performance in childhood. Additionally, although multiple studies have examined EF in children who are bilingual, it is still unclear how the development of EF may be influenced by bilingualism in general or be evidenced in the bilingual adolescent. As previously noted, EF abilities in adolescence are correlated with the individual's academic and social functioning, as well as the long-term success. The extent to which the association between EF and overall adjustment applies to adolescents who are bilingual is unknown.

The purpose of this study is to add to the knowledge base for EF in adolescence in association with bilingualism and behavioral outcomes. The theoretical orientation is grounded in Miyake et al.'s (2000) model of EF with inhibition, working memory, and shift considered as key components. Specifically, this study will address the following questions:

1. With the measures selected, is there evidence to support a three-factor (inhibition, working memory, and shift) model, allowing for intercorrelation for parent and child forms of measures selected? It is hypothesized that the Comprehensive Executive Function Inventory (CEFI; (Naglieri & Goldstein, 2013) Inhibitory Control will be highly related to the Behavior Rating Inventory of Executive Function (BRIEF; (Gioia, Isquith, Guy, & Kenworthy, 2000) Inhibition scale; The CEFI Flexibility scale will be highly related to the BRIEF Shift scale; and the CEFI Working Memory scale will be highly related to the

BRIEF Working Memory scale thus yielding three observed variables with internal consistency.

2. Do bilingual adolescents perform better than monolingual peers on tasks that involve inhibition, working memory, and shift? Are differences evident on individual EF components as measured by the CEFI parent rating scale (Inhibitory Control, Flexibility, and Working Memory) and/or the BRIEF parent rating scale (Inhibition, Shift, and Working Memory)? It is hypothesized that the bilingual adolescents will perform significantly higher than their monolingual peers on Inhibition, Shift, and Working Memory.
3. Do adolescents' ratings of Inhibition, Shift, and Working Memory relate to external behavior problems, such as hyperactivity, aggression and conduct problems? Is there evidence that adolescents' ratings of Inhibition, Shift, and Working Memory are significantly associated to the ratings on the Parent Report Behavior Assessment System for Children, Second Edition (BASC-2(Reynolds & Kamphaus, 2004) Externalizing Problems scale? Is there evidence that adolescents' ratings of Inhibition, Shift, and Working Memory are significantly associated to the adolescent self-report (BASC 2) Personal Adjustment scale?

CHAPTER III

METHODS

The current study utilized cross-sectional information to examine EF abilities in bilingual adolescents compared to their monolingual peers through multiple rating scales. First, an intercorrelational analysis was employed to determine if the three variables intended to measure shift, working memory, and inhibition evidenced sufficient internal consistency to represent the intended constructs for the three-factor model of executive functioning. Analysis of Variance (ANOVA) was utilized to compare the two independent groups of adolescents on rating scale measures of Inhibition, Shift, and Working Memory; covariates related to demographic factors were included as needed. Additionally, a regression analysis was used to determine the relationship between the EF factors (Inhibition, Shift, and Working Memory) and the externalizing behavior construct, which accounts for hyperactivity, aggression, and conduct problems. In addition, the regression analysis was used to determine the relation between the EF factors and the personal adjustment construct, which accounts for self-reliance, self-esteem, relation with parents, and interpersonal relationships. For a 2-group design with a moderate effect size of .60, alpha set at p=.05, and power of .80, a sample size of 32 per group was desired. Unfortunately, the desired sample size was not obtained.

Participants

The sample includes 20 adolescents, ages 12-17, and their caregivers. Bilingual adolescents were defined as those individuals who have received English as Second

Language (ESL) services, have participated in bilingual education, whose primary language at home is one other than English, and/or who report to speak two languages. Adolescents with a history of neurological disorder, special education services, chronic illness or other condition that could confound the results and were excluded from analyses.

After exclusions, 11 monolingual and 9 bilingual adolescents were included in the sample. The sample was predominantly female in both groups. As anticipated, the bilingual group was predominantly Hispanic, while the monolingual group was predominantly white non-Hispanic. For the monolingual group, only 18.2% received free/reduced lunch; for the bilingual group, 44.4% received free/reduced lunch. A chi-square test was conducted for group with gender, and with free/reduced lunch status. There were no statistical differences for gender [$\chi^2(1) = 1.17$, $p = .28$] or free/reduced lunch status [$\chi^2(1) = 1.63$, $p = .20$]. Parent educational level was used as a second proxy for socioeconomic status. For the monolingual group, parent education ranged from community college/tech school to graduate degree; for the bilingual group, parent education ranged from some high school to graduate degree.

For the monolingual group age ranged from 12 years old to 17 years old with a mean of 14.73 years (SD=1.93); for the bilingual group age ranged from 12 years old to 17 years old with a mean of 15.11 (SD=2.15). For grade, the monolingual group ranged from 7th grade to 12th grade with a mean of 8.36 (SD=3.36). The bilingual group ranged from 6th grade to 12th grade with a mean of 9.67 (SD=2.40). One-way analysis of variance (ANOVA) was conducted to determine if significant differences existed between groups for age and grade. Groups did not significantly differ on age [$F(1,18)=.175$, $p=.68$] or grade [$F(1,18)=.954$, $p=.34$]. The following table provides the percentages of the following information about each group: race/ethnicity, mother education, father education, and free/reduced lunch status, as well as the mean and standard deviation for age and grade.

Table 4

Demographic Information

	Monolingual (N=11)		Bilingual (N=9)	
	N	%	N	%
Gender[1]				
Male	5	45.5%	2	22.2%
Female	6	54.5%	7	77.8%
Ethnicity				
White non-Hispanic	7	70%	3	33.3%
Hispanic	1	10%	6	66.7%
Biracial	2	20%	0	0%
Mother Education Level				
High School Diploma/GED	0	0%	2	22.2%
Community College/Tech School	0	0%	2	22.2%
Some College	1	10%	1	11.1%
4 year degree completed	3	30%	2	22.2%
Completed graduate degree	6	60%	2	22.2%
Father Education Level				
Some High School	0	0%	1	11.1%
Community College/Tech School	1	10%	3	33.3%
Some College	2	20%	1	11.1%
4 year degree completed	2	20%	2	22.2%
Completed graduate degree	5	50%	2	22.2%
Free/Reduced Lunch[2]				
Qualifies	2	18.2%	4	44.4%
Does not qualify	9	81.8%	5	55.6%
		Mean (SD)		Mean (SD)
Age[3]	11	14.73 (1.95)	9	15.11 (2.15)
Grade[4]	11	8.36 (3.36)	9	9.67 (2.40)

Notes. [1]Chi-square=1.17, p =.28; [2]Chi-square= 1.63, p = .20; [3]Analysis of Variance=.175, p=.681; [4]Analysis of Variance=.954, p=.342

Language Proficiency within the Bilingual Group

Within the bilingual group, participants reported a variety of language exposures and usage. It should be noted that only five of the nine participants completed the language proficiency survey. According to self-reports, 40% of the participants' first language was Spanish, and the other 60% reported English as their primary language. Their second language was reported as the reverse (40% English as a second language, 60% Spanish as a second language). Of the four participants who reported the age of second language acquisition, all reported to learn their second language between 3 and 6 years of age. Furthermore, bilingual adolescents were provided a sliding scale of the percentage of Spanish to English exposure/use in various settings. Overall, the group reported being predominantly exposed to English and reported using predominantly English when reading, speaking to other bilinguals, watching TV, speaking with friends, and thinking. Alternatively, the group reported to predominantly use Spanish when speaking with parents, speaking with siblings, and language use overall. Table 5 describes the mean and standard deviation of the percentage of English used in each setting (questions 6-14 on the Language Proficiency Survey, see Appendix B).

Table 5

English Use Percentage

Setting	Mean	SD
Average Exposure	62%	21.68
Reading	82.22%	12.64
Speaking with other bilinguals	83.16%	21.18
Speak with Parents	44.98%	37.09
Speak with Siblings	47.95%	52.57
Speak with friends	68.15%	39.59
TV use	87.24%	12.55
Thinking	78.18%	25.99
Overall use	42.51%	23.10

Procedure

Approval was obtained from the Institutional Review Board (IRB) for data collection. Adolescents and their caregivers were recruited through flyers and distribution of packets to the community through various groups and organizations such as Catholic Charities, The Conocillo, English as a Second language classes, other places of worship, and the Counseling and Assessment Center at Texas A&M University, as well as through the TAMU Bilingual Education Program. Additionally, brief presentations were provided to over fifteen ESL classes within the Fort Worth adult education program, and Literacy Instruction for Texas. Furthermore, several classes allowed additional time for the researcher to assist with packet completion. Multiple other meetings were scheduled for presentations at ESL classes, but were cancelled by ESL teachers. Additional participants were recruited through word of mouth. Packets were provided to the adolescents and/or their caregivers. The packet contained a consent form, permission form, assent form, demographic information form, Behavior Rating Inventory of Executive Functioning (BRIEF; Gioia et al., 2000) self-report and parent forms, Comprehensive Executive Functioning Inventory (CEFI; Naglieri & Goldstein, 2013) self-report and parent forms, Behavioral Assessment Scale for Children, Second Edition (BASC-2; Reynolds & Kamphaus, 2004), adolescent and parent forms of a language proficiency survey, and two business-return envelopes.

Data collection was conducted jointly with others; an additional form was included in the packet but was not considered in this study. With difficulty in recruitment, compensation through a $10 donation to their choice of charitable organization was added to the initial optional placement in a drawing for $100. This was approved by IRB before being implemented. Altogether, 107 packets were distributed with a focus on bilingual participants. An additional, 100 packets were distributed for the monolingual group.

Packets were available in both English (adolescent and parent) and Spanish (parent forms only). The researcher and a bilingual doctoral student translated the demographic information form, consent form, language proficiency survey, and permission form into Spanish. These were verified and approved by the IRB prior to data collection with Spanish speakers. A parent or guardian was asked to complete a consent form, permission form, language proficiency survey, demographic information sheet, BRIEF parent form, CEFI parent form, and BASC-2 parent form. The adolescent was asked to complete an assent form, BRIEF self-report, CEFI youth form, language proficiency survey, and BASC-2 adolescent form.

Instruments

To obtain basic descriptive information on all participants, a demographic information form was used (see Appendix A). In addition, also for descriptive purposes, an omnibus measure of adjustment was included with an emphasis on specific behavioral considerations. In order to measure inhibition, shift, and working memory, scales from the Behavior Rating Inventory of Executive Function BRIEF and CEFI were utilized, as seen in Table 6. All instruments for the caregivers were available in both English and Spanish.

Table 6

Executive Functioning Components and Measures

Inhibit	Shift	Working Memory
CEFI Inhibitory Control Parent Report	CEFI Flexibility Parent Report	CEFI Working Memory Parent Report
BRIEF Inhibition Parent Report	BRIEF Shift Parent Report	BRIEF Working Memory Parent Report
CEFI Inhibitory Control Youth Report	CEFI Flexibility Youth Report	CEFI Working Memory Youth Report
BRIEF Inhibition Self Report	BRIEF Shift Self Report	BRIEF Working Memory Self Report

Note. CEFI=Comprehensive Executive Functioning Inventory; BRIEF= Behavior Rating Inventory of Executive Functioning

Demographic information form. This information form provided information on the age, ethnicity, and gender of the adolescent. It also asked about mother and father educational level, as well as whether they received free/reduced lunch (as a proxy for

SES). There were also questions about the child's language, including the primary language at home, what language the child speaks, and if the child received English as a Second Language (ESL) services and/or bilingual education. Other information collected is specific to the child's educational and medical history (see Appendix A).

Language proficiency survey. A parent and adolescent form was created to assess the language use and proficiency of the bilingual adolescents. These information forms provided information on the bilingual adolescent's first language, age of second language acquisition, frequency of translation, and language usage/exposure in various settings. Copies of these forms are provided in Appendix B and C.

Comprehensive executive functioning inventory (Naglieri & Goldstein, 2013). The Comprehensive Executive Functioning Inventory (CEFI) is a broad-based measure of executive functioning in children 5 to 18 years old. It measures a variety of executive functioning components, including Attention, Emotion Regulation, Flexibility, Inhibitory Control, Initiation, Organization, Planning, Self-Monitoring, and Working Memory. All scales are standardized to a standard score (SS) with a mean of 100 and standard deviation of 15. The higher the score signifies more advanced executive functioning; whereas lower scores signify executive functioning deficits.

These scales may be measured through a Youth form (self-rating), Parent form, and a Teacher form. In this study, the Flexibility scale, Inhibitory Control scale, and Working Memory scale were used from the Youth and Parent forms. For the purpose of this study, the Flexibility scale was used as a measure of Shift; the Inhibitory Control scale was used as a measure of inhibition; Working Memory reflected working memory.

According to the CEFI manual, internal consistency for these scales ranges from an alpha of .72 to .90 on the parent and self-reports for the scales of interest. Additionally, the test-retest reliability ranged from a corrected *r* of .79 to .89. The correlation between ratings on the parent and self-report was corrected $r = .71$. CEFI scores also significantly correlated with ratings of clinical populations that typically display EF deficits (e.g., Attention-Deficit/Hyperactivity Disorder, Autism Spectrum Disorder). Furthermore, the CEFI full-scale score was found to be correlated with the BRIEF composite score for the parent (corrected $r = .78$) and self-report (corrected $r = .63$). Specific scales on the CEFI also were correlated with specific scales of the BRIEF. Shift and Flexibility were significantly correlated (corrected $r = .39$), Inhibition and Inhibition were significantly correlated (corrected $r = .55$), and Working Memory was significantly correlated with Working Memory (corrected $r = .72$). It should be further noted that the standardization sample did not indicate use with bilingual individuals.

Behavior rating inventory of executive function (Gioia et al., 2000). The Behavior Rating Inventory of Executive Function (BRIEF) is a comprehensive measure of executive functioning for individuals aged 5 to 18 years old. It is available as a Self-Report form, Parent form, and Teacher form. It measures executive functioning components in two categories: Behavioral Regulation, which includes Inhibit, Shift, Emotional Control, and Monitor, and Metacognition, which includes Working Memory, Plan/Organize, Organization of Materials, and Task Completion. All scales are standardized to a mean of 50 and standard deviation of 10. Higher scores are indicative of greater level of deficit within the executive functioning component, and scores that are 65 or above are considered significantly elevated. For this study, the researcher used the Inhibit, Shift, and Working Memory scales on the Self-Report and Parent forms. According to the BRIEF manual, internal consistency for these scales ranges from an alpha of .81 to .94 on the parent report, and .71 to .85 on the self-report. Additionally, the test-retest reliability for both reports ranged from *r* of .71 to .85. The level of agreement between parent and self-report on the scales of interest ranged from a *r* of .43 to .46. BRIEF scores also significantly correlated with ratings of Attention-Deficit/Hyperactivity Disorder, traumatic brain injury, Tourette's disorder, reading disorder, and high functioning autism. Furthermore, BRIEF scores significantly correlated with other measures of EF.

Behavior assessment system for children – second edition (Reynolds & Kamphaus, 2004). The Behavior Assessment System for Children- Second Edition, (BASC-2) is a comprehensive measure that assesses children's (ages 2-21) behaviors and emotions at home and school. Behaviors and emotions of the child may be assessed through Child/Adolescent/College forms, Parent form, and Teacher form. The BASC-2 contains scales measuring maladaptive and undesirable characteristics or behaviors (clinical scales), as well as positive and desirable characteristics or behaviors (adaptive scales). The clinical scales include internalizing behaviors, externalizing behaviors, and other behavioral symptoms. For clinical scales, the higher the score the more there is clinical concern. Obtained scores of 60-69 are considered "at-risk," and scores of 70+ are considered "clinically significant." All scales are standardized to a mean of 50 and standard deviation of 10. For the purpose of this study, the Externalizing Problems scale, which encompasses the Hyperactivity, Aggression, and Conduct Problems subscales, from the Parent forms was utilized. According to the BASC-2 manual, the Externalizing Problems scale and its subscales, on the parent form, internal consistency ranged from .92-.95. Externalizing Problems ratings correlated with ratings of ADHD, Bipolar disorder, Depression, and Emotional/Behavioral Disorders (Reynolds & Kamphaus, 2004). On the self-report the scale of interest was Personal Adjustment, which encompasses the Interpersonal Relations, Relations with Parents, Self-Esteem, and Self-Reliance. The internal consistency for the Personal Adjustment scale, including its subscales, was .73 to .94. There was a test-retest reliability of .81 for parent report, and test-retest reliability of .74 for the self-report.

CHAPTER IV

RESULTS

Using the criteria explained within the methods chapter, 20 adolescents and their caregivers were included within this study: 11 monolingual adolescents with their caregivers, and 9 bilingual adolescents with their caregivers. Data were checked for completeness. One adolescent form did not include a CEFI inhibitory control score because the respondent did not complete the entirety of the form and omitted items were needed for that scale. For 6 cases, only the parent forms were returned. As such, the sample size for each analysis will be included.

Additionally, data was checked to meet the assumptions of normality. These were met for the majority of measures; however, there was a flat distribution on parent ratings. This includes: BRIEF Shift, CEFI Inhibitory Control, CEFI Working Memory, as well as on the parent rating on the BASC-2 Externalizing Behavior. This suggests that the sample is homogenous on these variables, likely a factor of the small size. Analyses proceeded despite these results. Table 7 includes mean, standard deviation, skewness and kurtosis statistics for all measures of EF, externalizing behavior, and personal adjustment.

Table 7

Descriptive Statistics: Executive Functioning, Externalizing Behavior, and Personal Adjustment

Variable	N	Mean	Std. Deviation	Skewness		Kurtosis	
				Statistic	Std. Error	Statistic	Std. Error
P BRIEF Inh	20	49.10	7.31	.63	.51	-.70	.99
P BRIEF Sh	20	47.65	8.43	1.57	.51	4.03	.99
P BRIEF WM	20	46.95	7.04	1.46	.51	2.23	.99
A BRIEF Inh	15	45.27	9.53	.84	.58	-.15	1.21
A BRIEF Sh	15	53.27	12.65	.20	.58	-.61	1.21
A BRIEF WM	15	52.53	11.73	-.20	.58	-1.42	1.21
P CEFI Inh	19	106.26	14.64	-2.17	.52	7.01	.99
P CEFI Fl	19	100.53	14.64	.22	.52	-.20	.99
P CEFI WM	19	108.26	12.20	-1.55	.52	4.52	.99
A CEFI Inh	15	107.07	13.66	.51	.58	-.36	1.12
A CEFI Fl	16	102.88	15.79	-1.28	.56	2.13	1.09
A CEFI WM	16	102.50	16.13	.18	.56	-.80	1.09
P Ext Beh	20	46.90	8.17	1.30	.51	2.71	.99
A Per Adj	16	54.81	7.72	-.70	.56	-.21	1.09

Note. CEFI=Comprehensive Executive Functioning Inventory; BRIEF= Behavior Rating Inventory of Executive Functioning; A=Adolescent report; P=Parent Report; Inh=Inhibition/Inhibitory Control; WM=Working Memory; Sh=Shift; Fle=Flexibility; Ext Beh=Externalizing Behavior; Per Adj=Personal Adjustment

Question 1: Executive Functioning Model

With the measures selected (BRIEF, CEFI) and all participants is there evidence to support a three-factor (inhibition, working memory, and shift) model, allowing for intercorrelation? It was hypothesized that the measures within each construct would be significantly correlated with the other measures within the same construct. It also was hypothesized that correlations would be significant across components as depicted in the Miyake et al. (2000) model.

A correlation matrix was created for both parent and adolescent ratings on the BRIEF and the CEFI (See Table 8 and 9). As hypothesized several correlations were statistically significant, but did not yield a three-factor structure. For the parent ratings, all three of the BRIEF scales were significantly correlated with CEFI Inhibition (r= -.76- to r= -.70, p< .01), as well as for CEFI Working Memory (r= -.78 to r= -.65, p<.01). Notably, for the parent ratings, none of the BRIEF scales correlated significantly with the CEFI Flexibility. As a result, for the parent form, the six scales were considered individually when conducting further analyses.

For the adolescent report, all three of the BRIEF scales were significantly correlated with CEFI Inhibition (r= -.69; p< .01 to r= -.55, p< .05), but the two inhibition scales had the highest and more significant correlation; these were combined as a observed variable. Similarly, the BRIEF Working Memory and CEFI Working Memory had the highest significant correlation (r= -.72; p< .01). Finally, the BRIEF Shift and CEFI Flexibility were significantly correlated with each other and not the other scales

(r = -.74; $p < .01$). As such, for the adolescent form the two measures for each of the observed variables were combined.

In order to create a composite score between the CEFI and the BRIEF for the adolescent form, the standardized scores from the BRIEF were converted to have a mean of 100 and standard deviation of 15, as well as reversed in direction (i.e. higher scores will indicate more advanced EF) consistent with the CEFI. The two scores were averaged together (e.g. (BRIEF working memory adolescent rating + CEFI working memory adolescent rating)/2) to produce a composite score. Table 10 displays the descriptive results for the adolescent composite scores.

Table 8

Executive Functioning Parent Ratings Correlation Matrix

	P CEFI Inhibitory Control	P CEFI Working Memory	P CEFI Flexibility
P BRIEF Inhibition	-.76**	-.65**	-.37
P BRIEF Working Memory	.-.70**	.78**	-.26
P BRIEF Shift	-.76**	-.72**	-.24

Note. CEFI=Comprehensive Executive Functioning Inventory; BRIEF= Behavior Rating Inventory of Executive Functioning; P=Parent report; *p< .05, two-tailed; **p<.01 two-tailed

Table 9

Executive Functioning Adolescent Ratings Correlation Matrix

	A CEFI Inhibitory Control	A CEFI Flexibility	A CEFI Working Memory
A BRIEF Inhibition	-.69**	-.62*	-.55*
A BRIEF Working Memory	-.50	-.53*	-.72**
A BRIEF Shift	-.50	-.74**	-.49

Note. CEFI=Comprehensive Executive Functioning Inventory; BRIEF= Behavior Rating Inventory of Executive Functioning; A=Adolescent report; *p<.05, two-tailed; **p<.01 two-tailed

In order to create a composite score between the CEFI and the BRIEF for the adolescent form, the standardized scores from the BRIEF were converted to have a mean of 100 and standard deviation of 15, as well as reversed in direction (i.e. higher scores will indicate more advanced EF). Afterwards, the two scores were added together (e.g. BRIEF working memory parent rating + CEFI working memory parent rating) to produce a composite score. Table 10 displays the descriptive results for the adolescent factors.

Table 10

Descriptive Statistics: Executive Functioning Factors

	Monolingual (N=7)		Bilingual (N=7)	
Variable	Mean	SD	Mean	SD
Adolescent (n=7)				
Inhibition	105.32	13.86	109.00	13.41
Working Memory	96.71	14.37	102.36	19.06
Shift	101.64	10.48	100.89	19.68

Question 2: Monolingual vs. Bilingual

Do bilingual adolescents perform better than monolingual peers on tasks that involve inhibition, working memory, and shift? Are differences evident on individual EF components as measured by the CEFI (Inhibitory Control, Flexibility, and Working Memory) and the BRIEF (Inhibition, Shift, and Working Memory)? It was hypothesized that the bilingual adolescents will perform significantly higher than their monolingual peers on Inhibition, Shift, and Working Memory. To test the hypothesis, the mean factor scores derived for the adolescent report, and the six EF components on the parent report were compared using separate multivariate analysis of variance (MANOVA).

The first MANOVA tested the difference between monolingual and bilingual adolescents on parent reported executive functioning using the six scales. There were no significant differences between monolingual and bilingual groups on individual parent rated executive functioning measures [$F(6,12) = .98$, $p = .48$; Wilks' $\Lambda = .67$; partial $\eta^2 = .33$]. The second MANOVA compared monolingual and bilingual adolescents on the three variables derived from the adolescent report for Inhibition, Working Memory and, Shift. Like the previous MANOVA, no significant differences between monolingual and bilingual adolescents were found on adolescent reported EF measures [$F(3,10) = .39$, $p = .76$; Wilks' $\Lambda = .90$; partial $\eta^2 = .10$].

Question 3: Externalizing Behavior and Personal Adjustment

Do adolescents' ratings of Inhibition, Shift, and Working Memory relate to external behavior problems? Using a regression analysis, is there evidence that adolescents' ratings of inhibition, shift, and working memory predict the ratings on the BASC-2 Externalizing Problems scale (parent report)? It was hypothesized that the more deficits seen in inhibition, shift, and working memory, the more elevated the rating of Externalizing Problems. Also using multiple regression, to what extent do adolescents' ratings of inhibition, shift, and working memory predict the self-reported BASC-2 Personal Adjustment index? It was hypothesized that the better abilities seen in inhibition, shift, and working memory, the more elevated rating of Personal Adjustment. The following multiple regression analyses were created to determine the relationship between executive functioning, and Externalizing Behavior and Personal Adjustment: parent report executive functioning and Externalizing Behavior, parent report executive functioning with Personal Adjustment, adolescent report executive functioning with Externalizing Behavior, and adolescent report executive functioning with Personal Adjustment. As noted previously, parent reports and adolescent reports were separated to prevent multicollinearity.

When a multiple regression analysis was run to predict Externalizing Behavior through parent report of inhibition, working memory, and shift, the model significantly predicted Externalizing Behavior [$F(6,12) = 4.74$, $p = .01$, adj. $R^2 = .70$]; however, no individual parent rated scale significantly predicted Externalizing Behavior alone. Table 11 provides the regression coefficients and standard errors.

When a multiple regression analysis was run to predict Externalizing Behavior through adolescent report of inhibition, working memory, and shift, the model significantly predicted Externalizing Behavior [$F(3, 10) = 20.69$, $p < .01$, adj. $R^2 = .82$]. Specifically, the inhibition ($p<.01$) and working memory ($p<.01$) composites significantly predicted Externalizing Behavior. Table 12 provides the regression coefficients and standard errors.

Table 11

Multiple Regression Analysis: Parent Reported EF as Predictor of Externalizing Behavior

Variable	Externalizing Behavior						
	B	SE_B	B	t	*p*	95% CI-L	95% CI-U
Constant	116.76	15.73		7.43		82.50	151.03
BRIEF Inhibition	-.345	.21	-.45	-1.69	.12	-.79	.10
BRIEF Shift	.04	.20	.06	.20	.85	-.40	.48
BRIEF Working Memory	-.02	.23	-.30	-.10	.93	-.53	.49
CEFI Inhibitory Control	-.13	.28	-.19	-.45	.66	-.75	.49
CEFI Cognitive Flexibility	.18	.15	.31	1.17	.27	-.16	.51
CEFI Working Memory	-.37	.34	-.46	-1.12	.28	.29	.36

Note. EF=Executive Functioning; BRIEF=Behavior Rating Inventory of Executive Function; CEFI= Comprehensive Executive Functioning Inventory; CI=Confidence Interval for B; L=Lower bound; U=Upperbound

Table 12

Multiple Regression Analysis: Adolescent Reported EF as Predictor of Externalizing Behavior

Variable	Externalizing Behavior						
	B	SE_B	B	t	*p*	95% CI-L	95% CI-U
Constant	66.59	5.64		11.817		54.04	79.15
Inhibition	-.246	.03	-1.14	-7.17	<.01	-.32	-.17
Shift	-.006	.03	-.03	-.157	.88	-.08	.07
Working Memory	.158	.03	-91	5.00	<.01	.09	.23

Note. EF=Executive Functioning; CI=Confidence Interval for B; L=Lower bound; U=Upperbound

Further multiple regression analyses were conducted to predict Personal Adjustment through parent and adolescent report of inhibition, shift, and working memory. The regression model using parent ratings did not significantly predict Personal Adjustment [$F(6,9) = .81$, $p = .59$, adj. $R^2 = -.08$]. Table 13 provides the regression coefficients and standard errors.

Lastly, a multiple regression analysis was conducted to predict Personal Adjustment through adolescent report of inhibition, working memory, and shift using the composite scores. The regression model significantly predicted Personal Adjustment [$F(3, 10) = 11.54$, $p < .01$, adj. $R^2 = .71$]. Specifically, shift significantly predicted Personal Adjustment ($p < .01$). Table 18 provides the regression coefficients and standard errors.

Table 13

Multiple Regression Analysis: Parent Reported EF as Predictor of Personal Adjustment

Variable	Personal Adjustment *B*	SE_B	Β	t	*p*	95% CI-L	95% CI-U
Constant	-12.12	39.54		-.31		-101.56	77.32
BRIEF Inhibition	.21	.33	.26	.65	.53	-.53	.95
BRIEF Shift	.47	.36	.50	1.30	.23	-.35	1.29
BRIEF Working Memory	-.22	-.36	-.25	-.62	.55	-1.05	.59
CEFI Inhibitory Control	-.14	.52	-.13	-.26	.80	-1.31	1.04
CEFI Cognitive Flexibility	.25	.26	.45	.99	.35	-.32	.83
CEFI Working Memory	-.14	.58	.07	.15	.89	-1.22	1.39

Note. EF=Executive Functioning; BRIEF=Behavior Rating Inventory of Executive Function; CEFI= Comprehensive Executive Functioning Inventory; CI=Confidence Interval for B; L=Lower bound; U=Upperbound

Table 14

Multiple Regression Analysis: Adolescent Reported EF as Predictor of Personal Adjustment

Variable	Personal Adjustment *B*	SE_B	Β	t	*p*	95% CI-L	95% CI-U
Constant	27.50	7.92		3.47		9.84	45.16
Inhibition	-.05	.05	-.22	-1.08	.31	-.16	.06
Shift	.25	.05	1.19	5.02	<.01	.14	.36
Working Memory	-.058	.04	-.30	-1.31	.22	-.16	.04

Note. EF=Executive Function; CI=Confidence Interval for B; L=Lower bound; U=Upperbound

CHAPTER V

DISCUSSION AND CONCLUSION

Research continues to provide evidence of a relationship between EF development and behavioral outcomes, as well as academic success; however, the majority of research examines typically developing individuals in childhood or adulthood. There is a lack of evidence on the relationship between behavioral outcomes and the Miyake et al. (2000), particularly for typically developing adolescence and bilingual adolescence. Although multiple studies have examined EF in bilingual children, it is still unclear how the development of EF may be influenced by bilingualism, particularly within adolescence. Furthermore, the association between EF and overall adjustment for bilingual adolescents is unknown. Research focusing on the relationship between relationship between EF and behavioral outcomes for monolingual and bilingual adolescence may provide knowledge for future academic and behavioral interventions.

Ratings and the Miyake et al. (2000) Model

This study provides new information as most previous research on the (Miyake et al., 2000) model was based on assessment tasks (e.g. Lee et al. (2013)). As hypothesized, within adolescent self-report rating scales, relationships between BRIEF and CEFI ratings on the same factor (i.e. inhibition, working memory, and shift) were highly correlated and statistically significant. Consequently, this study provides evidence to support the idea of a three-factor EF model using the self-report from two different rating scales. Interestingly, the same was not true for the parent report of EF.

For parent ratings, Working Memory and Inhibition of the two scales were highly inter-correlated while the Flexibility scale of the CEFI was not significantly correlated with any of the BRIEF scales. Ravizza and Carter (2008) provided evidence of distinct forms of cognitive flexibility/shift. They indicate that not only are there behavioral differences, but neurological differences that occur between different switching tasks. Differences in performances on the BRIEF Shift and CEFI Flexibility scale may be due to these differences. Further, shift may be more easily observed by oneself than by parents as this flexibility may not be required in the home setting. Similarly, parents may not have the opportunity to observe some of the behaviors associated with working memory in the home context. It was also noted that the BRIEF Shift scale was significantly correlated with the CEFI Working Memory and Inhibition scale. This is consistent with Miyake et al. (2000) model, which suggests inter-relation between EF components.

Bilingual – Monolingual Comparison

As mentioned earlier, research has suggested that bilingual children and adults, outperform their monolingual peers on tasks requiring shift or cognitive flexibility (Barac & Bialystok, 2012; Bialystok, 2010), working memory (Calvo & Bialystok, 2014; Morales et al., 2013), and inhibition (Martin-Rhee & Bialystok, 2008). Yet there have been minimal studies examining the impact of bilingualism on adolescent EF. In contrast to prior research and the hypotheses posed, this study found no evidence to support that bilingual adolescents display advanced EF on any factor compared to monolingual adolescents. It is possible that bilinguals develop EF before monolinguals, but reach the same developmental plateau in EF development as their monolingual peers. Nevertheless, due to a small sample size, the evidence provided by this study should be interpreted with caution.

EF and Outcome Measures

Within relation to behavior and EF, it was hypothesized that all EF factors (i.e. inhibition, working memory, and shift) would be significantly related to both parent reports of externalizing behavior and self reports of personal adjustment. Previous research, provided evidence for the relation between EF and social and/or behavioral outcomes during preschool (Hughes et al., 1998; Kochanska et al., 2000), primary school (Diamantopoulou et al., 2007), and adolescence (Aytaclar et al., 1999; Séguin et al., 1999). Minimal research has investigated the relationship between the Miyake et al. (2000) model and behavioral outcomes, particularly with monolingual and bilingual adolescents.

This study, like Espy et al. (2011), found evidence that working memory and inhibition are related to externalizing behaviors, such as aggression, hyperactivity, and conduct problems. For this study, no specific parent reported EF measure was related to externalizing behaviors, but rather the combination of EF measures. For adolescent self-report, working memory and inhibition emerged as significant predictors. This provides supporting evidence for the relationship between Miyake et al. (2000) proposed EF measures (i.e. inhibition, shift, and working memory) and multiple behavior problems.

Furthermore, self-reported shifting abilities were significantly related to self-reported personal adjustment; however, parent ratings did not account for significant variance. With minimal studies focusing on shifting abilities and behavior, this provides support of the importance of self-reported shift with relational skills, and social problem solving. Overall, each factor within the Miyake et al. (2000) model appears to have a key role in an adolescent's social and behavioral functioning.

Clinical Implications

With a growing use of languages other than English in the United States, it is important to consider the impact that language use has on individual development. Given the results of this study in conjunction with the existing research, it is possible that bilinguals may have a different EF developmental trajectory compared to monolinguals. For instance, it is possible that bilinguals develop EF more quickly than their monolingual peers throughout childhood, and reach their peak in EF before their monolingual peers. With the rise in ESL services (Ryan, 2013), understanding how bilingualism affects the brain and development may impact future policies within education, as well as future interventions.

This study provides evidence that the Miyake et al. (2000) model may be appropriate used within self-report rating scales, as well as performance-based measures of EF. Although it would appear that parent-rating scales also would be appropriate; based on the results of this study, parent rating scales did not provide the same level of information on the factors of the Miyake et al. (2000) model as the adolescent self-report. This may suggest that parent-rating scales may measure distinct shift/cognitive flexibility skills or that parents have limited opportunity to observe the shift behaviors. Furthermore, there is support for the relationship between the Miyake et al. (2000)

model and behavioral outcomes, particularly for externalizing behavior and personal adjustment.

These results suggest that interventions focused on the development of working memory and inhibition have the potential to impact an adolescent's level of externalizing behavior. Additionally, interventions concentrated on development of shift may affect an adolescent's personal adjustment for both monolingual and bilingual individuals.

Limitations and Future Research

As mentioned above, this study lacked in sample size and statistical power. Assumptions of normality were also not met for parent ratings. The sample was considered too homogenous, possibly due to the small sample size. A larger sample size would have provided greater confidence in results. Additionally, this study did not control for language proficiency and vocabulary empirically, but rather by reported contexts and language usage. Previous research has suggested that differences in EF performance have been linked with proficiency (Iluz-Cohen & Armon-Lotem, 2013; Vega & Fernandez, 2011; Videsott et al., 2012), as well as verbal abilities (Okanda et al., 2010). Further, there may be a bidirectional influence between language acquisition and executive functioning (Kapa & Colombo, 2014). The bilingual group in this study displayed various language capabilities, usages, and exposures. Additionally, language abilities were not considered for the monolingual group. Language in both the monolingual and bilingual group should be considered and ideally controlled in future studies.

Furthermore, even though EF tasks and EF ratings are theorized to measure the same construct. Studies have found that EF tasks do not always relate to EF measures (Enticott, Ogloff, & Bradshaw, 2006), and/or share little variance with each other (Enticott et al., 2006). Generally, studies have utilized EF tasks to investigate the relationship between EF and bilingualism. Therefore, the current study may not be consistent with previous research due to the differences in measurement.

Overall there is a lack of research on bilingual adolescence in regards to EF development. To gather a better understanding, future research should continue to test for the bilingual advantage within adolescents across various cultures and EF measures. Future research should use both rating scales and assessment measures. Further, a meta-analysis may be conducted with current research looking at bilingual children and adults compared to monolingual peers on measures of executive functioning.

Finally, no conclusions on EF trajectory may be made from this study due to a small sample and the use of cross-sectional data. To better understand the trajectory of development for bilingual individuals, following individuals from early childhood to young adult hood, with a large sample size, and control for proficiency may be helpful.

Conclusion

Previous research suggests that bilingual children have higher EF abilities compared to their monolingual peers, especially in younger years. In contrast, this study found no evidence to support the hypothesis that bilingual adolescence display higher levels of inhibition, shift, or working memory than their monolingual peers. Nonetheless, both monolingual and bilingual EF ratings on inhibition, working memory, and shift were significantly related to two outcome measures of behavior and adjustment - externalizing behavior and personal adjustment. Continued research investigating the relationship between EF and bilingualism, and behaviors will continue to be important for future educational policies and interventions.

REFERENCES

Abdelgafar, G. M., & Moawad, R. A. (2015). Executive Function Differences Between Bilingual Arabic-English and Monolingual Arabic Children. *J Psycholinguist Res, 44*(5), 651-667. doi: 10.1007/s10936-014-9309-3

Adi-Japha, A., Berberich-Artzi, J., & Libnawl, A. (2010). Cognitive Flexibility in Drawings of Bilingual Children. *Child Development, 81*(5), 1356-1366.

Alloway, T. P., & Alloway, R. G. (2010). Investigating the predictive roles of working memory and IQ in academic attainment. *Journal of Experimental Child Psychology, 106*(1), 20-29. doi: 10.1016/j.jecp.2009.11.003

Alloway, T. P., Banner, G. E., & Smith, P. (2010). Working memory and cognitive styles in adolescents' attainment. *British Journal of Educational Psychology, 80*(4), 567-581. doi: http://dx.doi.org/10.1348/000709910X494566

Alvarez, J. A., & Emory, E. (2006). Executive function and the frontal lobes: a meta-analytic review. *Neuropsychol Rev, 16*(1), 17-42. doi: 10.1007/s11065-006-9002-x

Anderson, P. (2002). Assessment and development of executive function (EF) during childhood. *Child Neuropsychology, 8*(2), 71-82. doi: 10.1076/chin.8.2.71.8724

Anderson, V. A., Anderson, P., Northam, E., Jacobs, R., & Catroppa, C. (2001). Development of Executive Functions Through Late Childhood and Adolescence in an Australian Sample. *Developmental Neuropsychology, 20*(1), 385-406.

Aronen, E. T., Vuontela, V., Steenari, M. R., Salmi, J., & Carlson, S. (2005). Working memory, psychiatric symptoms, and academic performance at school. *Neurobiology of Learning and Memory, 83*(1), 33-42. doi: 10.1016/j.nlm.2004.06.010

Aytaclar, S., Tarter, R. E., Kirisci, L., & Lu, S. (1999). Association between hyperactivity and executive cognitive functioning in childhood and substance use in early adolescence. *Journal of American Academy of Child and Adolescent Psychiatry, 38*(2), 172-178.

Barac, R., & Bialystok, E. (2012). Bilingual effects on cognitive and linguistic development: role of language, cultural background, and education. *Child Development, 83*(2), 413-422. doi: 10.1111/j.1467-8624.2011.01707.x

Barkley, R. A. (1997). Behavioral Inhibition, Sustained Attention, and Executive Functions: Constructing a Unifying Theory of ADHD. *Psychological Bulletin, 121*(1), 65-94.

Becker, D. R., Miao, A., Duncan, R., & McClelland, M. M. (2014). Behavioral self-regulation and executive function both predict visuomotor skills and early academic achievement. *Early Childhood Research Quarterly, 29*(4), 411-424. doi: 10.1016/j.ecresq.2014.04.014

Berlin, L., & Bohlin, G. (2002). Response inhibition, hyperactivity, and conduct problems among preschool children. *Journal of Clinical Child and Adolescent Psychology, 31*(2), 242-251.

Berlin, L., Bohlin, G., Nyberg, L., & Janols, L. (2004). How well do measures of inhibition and other executive functions discriminate between children with ADHD and controls? *Child Neuropsychology, 10*(1), 1-13.

Best, J. R., Miller, P. H., & Naglieri, J. A. (2011). Relations between Executive Function and Academic Achievement from Ages 5 to 17 in a Large, Representative National Sample. *Learning and Individual Differences, 21*(4), 327-336. doi: 10.1016/j.lindif.2011.01.007

Bialystok, E. (1999). Cognitive complexity and attentional control in the bilingual mind. *Child Development, 70*(3), 636-644.

Bialystok, E. (2006). Effect of bilingualism and computer video game experience on the simon task. *Canadian Journal of Experimental Psychology, 60*(1), 68-79.

Bialystok, E. (2010). Global-local and trail-making tasks by monolingual and bilingual children: beyond inhibition. *Developmental Psychology, 46*(1), 93-105. doi: 10.1037/a0015466

Bialystok, E. (2011). Coordination of executive functions in monolingual and bilingual children. *Journal of Experimental Child Psychology, 110*(3), 461-468. doi: 10.1016/j.jecp.2011.05.005

Bialystok, E., & Barac, R. (2012). Emerging bilingualism: dissociating advantages for metalinguistic awareness and executive control. *Cognition, 122*(1), 67-73. doi: 10.1016/j.cognition.2011.08.003

Bialystok, E., Barac, R., Blaye, A., & Poulin-Dubois, D. (2010). Word Mapping and Executive Functioning in Young Monolingual and Bilingual Children. *Journal of*

Cognition and Development, 11(4), 485-508. doi: 10.1080/15248372.2010.516420

Bialystok, E., Craik, F., & Luk, G. (2008). Cognitive control and lexical access in younger and older bilinguals. *Journal of Experimental Psychology, 34*(4), 859-873. doi: 10.1037/0278-7393.34.4.859

Bialystok, E., Craik, F. I., & Ryan, J. (2006). Executive control in a modified antisaccade task: Effects of aging and bilingualism. *Journal of Experimental Psychology, 32*(6), 1341-1354. doi: 10.1037/0278-7393.32.6.1341

Bialystok, E., & Feng, X. (2009). Language proficiency and executive control in proactive interference: evidence from monolingual and bilingual children and adults. *Brain and Language, 109*(2-3), 93-100. doi: 10.1016/j.bandl.2008.09.001

Bialystok, E., & Majumder, S. (1998). The relationship between bilingualism and the development of cognitive processes in problem solving. *Applied Psycholinguistics, 19*(1), 69-85. doi: http://dx.doi.org/10.1017/S0142716400010584

Bialystok, E., & Martin, M. M. (2004). Attnetion and inhibition in bilingual children: evidence from the dimensional change card sort task. *Developmental Science, 7*(3), 325-339.

Bialystok, E., & Senman, L. (2004). Executive Processes in Appearance-Reality Tasks: The Role of Inhibition of Attention and Symbolic Representation. *Child Development, 75*(2), 562-579.

Bialystok, E., & Shapero, D. (2005). Ambiguous benefits: the effect of bilingualism on reversing ambiguous figures. *Developmental Science, 8*(6), 595-604.

Bialystok, E., & Viswanathan, M. (2009). Components of executive control with advantages for bilingual children in two cultures. *Cognition, 112*(3), 494-500. doi: 10.1016/j.cognition.2009.06.014

Biederman, J., Monuteaux, M. C., Doyle, A. E., Seidman, L. J., Wilens, T. E., Ferrero, F., Morgan, C. L., & Faraone, S. V. (2004). Impact of executive function deficits and attention-deficit/hyperactivity disorder (ADHD) on academic outcomes in children. *Journal of Consulting and Clinical Psychology, 72*(5), 757-766. doi: 10.1037/0022-006X.72.5.757

Blakemore, S. J., & Choudhury, S. (2006). Development of the adolescent brain: implications for executive function and social cognition. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 47*(3-4), 296-312. doi: 10.1111/j.1469-7610.2006.01611.x

Boelema, S. R., Harakeh, Z., Ormel, J., Hartman, C. A., Vollebergh, W. A., & van Zandvoort, M. J. (2014). Executive functioning shows differential maturation from early to late adolescence: longitudinal findings from a TRAILS study. *Neuropsychology, 28*(2), 177-187. doi: 10.1037/neu0000049

Bogulski, C. A., Rakoczy, M., Goodman, M., & Bialystok, E. (2014). Executive control in fluent and lapsed bilinguals. *Bilingualism: Language and Cognition, 18*(03), 561-567. doi: 10.1017/s1366728914000856

Bohlin, G., Eninger, L., Brocki, K. C., & Thorell, L. B. (2012). Disorganized attachment and inhibitory capacity: predicting externalizing problem behaviors. *Journal of Abnormal Child Psychology, 40*(3), 449-458. doi: 10.1007/s10802-011-9574-7

Bonifacci, P., Giombini, L., Bellocchi, S., & Contento, S. (2011). Speed of processing, anticipation, inhibition and working memory in bilinguals. *Developmental Science, 14*(2), 256-269. doi: 10.1111/j.1467-7687.2010.00974.x

Borella, E., & de Ribaupierre, A. (2014). The role of working memory, inhibition, and processing speed in text comprehension in children. *Learning and Individual Differences, 34*, 86-92. doi: 10.1016/j.lindif.2014.05.001

Bryce, D., Whitebread, D., & Szűcs, D. (2014). The relationships among executive functions, metacognitive skills and educational achievement in 5 and 7 year-old children. *Metacognition and Learning, 10*(2), 181-198. doi: 10.1007/s11409-014-9120-4

Bull, R., Espy, K. A., & Wiebe, S. A. (2008). Short-term memory, working memory, and executive functioning in preschoolers: longitudinal predictors of mathematical achievement at age 7 years. *Dev Neuropsychol, 33*(3), 205-228. doi: 10.1080/87565640801982312

Calvo, A., & Bialystok, E. (2014). Independent effects of bilingualism and socioeconomic status on language ability and executive functioning. *Cognition, 130*(3), 278-288. doi: 10.1016/j.cognition.2013.11.015

Carlson, S. M., & Meltzoff, A. N. (2008). Bilingual experience and executive functioning in young children. *Developmental Science, 11*(2), 282-298. doi: 10.1111/j.1467-7687.2008.00675.x

Carretti, B., Borella, E., Cornoldi, C., & De Beni, R. (2009). Role of working memory in explaining the performance of individuals with specific reading comprehension difficulties: A meta-analysis. *Learning and Individual Differences, 19*(2), 246-251. doi: 10.1016/j.lindif.2008.10.002

Carriedo, N., Corral, A., Montoro, P. R., Herrero, L., & Rucian, M. (2016). Development of the updating executive function: From 7-year-olds to young adults. *Developmental Psychology, 52*(4), 666-678. doi: 10.1037/dev0000091

Casey, B. J., Getz, S., & Galvan, A. (2008). The adolescent brain. *Developmental Review, 28*(1), 62-77. doi: 10.1016/j.dr.2007.08.003

Chelune, G. J., & Baer, R. A. (1986). Developmental norms for the Wisconsin Card Sorting Test. *Journal of Clinical and Experimental Neuropsychology, 8*(3), 219-228. doi: http://dx.doi.org/10.1080/01688638608401314

Chen, S. H., Zhou, Q., Uchikoshi, Y., & Bunge, S. A. (2014). Variations on the bilingual advantage? Links of Chinese and English proficiency to Chinese American children's self-regulation. *Developmental Psychology, 5*, 1069. doi: 10.3389/fpsyg.2014.01069

Choudhury, S., Charman, T., & Blakemore, S. J. (2009). Development of the teenage brain. *Mind, Brain, and Education, 2*(3), 142-147.

Clark, C., Prior, M., & Kinsella, G. (2002). The relationship between executive function abilities, adaptive behaviour, and academic achievement in children with externalising behaviour problems. *Journal of Child Psychology and Psychiatry, 43*(6), 785-796.

Clark, C. A., Sheffield, T. D., Chevalier, N., Nelson, J. M., Wiebe, S. A., & Espy, K. A. (2013). Charting early trajectories of executive control with the shape school. *Developmental Psychology, 49*(8), 1481-1493. doi: 10.1037/a0030578

Coderre, E. L., & van Heuven, W. J. (2014). The effect of script similarity on executive control in bilinguals. *Developmental Psychology, 5*, 1070. doi: 10.3389/fpsyg.2014.01070

Colom, R., Escorial, S., Shih, P. C., & Privado, J. (2007). Fluid intelligence, memory span, and temperament difficulties predict academic performance of young adolescents. *Personality and Individual Differences, 42*(8), 1503-1514. doi: 10.1016/j.paid.2006.10.023

Colzato, L. S., Bajo, M. T., van den Wildenberg, W., Paolieri, D., Nieuwenhuis, S., La Heij, W., & Hommel, B. (2008). How does bilingualism improve executive control? A comparison of active and reactive inhibition mechanisms. *Journal of Experimental Psychology, 34*(2), 302-312. doi: 10.1037/0278-7393.34.2.302

Conklin, H. M., Luciana, M., Hooper, C. J., & Yarger, R. S. (2007). Working memory performance in typically developing children and adolescents: Behavioral evidence of protracted frontal lobe development. *Developmental Neuropsychology, 31*(1), 103-128.

Costa, A., Hernández, M., Costa-Faidella, J., & Sebastian-Galles, N. (2009). On the bilingual advantage in conflict processing: now you see it, now you don't. *Cognition, 113*(2), 135-149. doi: 10.1016/j.cognition.2009.08.001

Costa, A., Hernandez, M., & Sebastian-Galles, N. (2008). Bilingualism aids conflict resolution: evidence from the ANT task. *Cognition, 106*(1), 59-86. doi: 10.1016/j.cognition.2006.12.013

Crivello, C., Kuzyk, O., Rodrigues, M., Friend, M., Zesiger, P., & Poulin-Dubois, D. (2016). The effects of bilingual growth on toddlers' executive function. *Journal of Experimental Child Psychology, 141*, 121-132. doi: 10.1016/j.jecp.2015.08.004

De Smedt, B., Janssen, R., Bouwens, K., Verschaffel, L., Boets, B., & Ghesquiere, P. (2009). Working memory and individual differences in mathematics achievement: a longitudinal study from first grade to second grade. *Journal of Experimental Child Psychology, 103*(2), 186-201. doi: 10.1016/j.jecp.2009.01.004

Denckla, M. B. (1996). A theory and model of executive function: A neuropsychological perspective *Attention, memory, and executive function.* (pp. 263-278): Paul H Brookes Publishing, Baltimore, MD.

Dennis, T. A., & Brotman, L. M. (2003). Effortful control, attention, and aggressive behavior in preschoolers at risk for conduct problems. *Annals of the New York Academy of Sciences, 1008*, 252-255.

Diamantopoulou, S., Rydell, A., Thorell, L. B., & Bohlin, G. (2007). Impact of executive functioning and symptoms of attention deficit hyperactivity disorder on children's peer relations and school performance. *Developmental Neuropsychology, 32*(1), 521-542.

Dunabeitia, J. A., Hernandez, J. A., Anton, E., Macizo, P., Estevez, A., Fuentes, L. J., & Carreiras, M. (2014). The inhibitory advantage in bilingual children revisited: myth or reality? *Experimental Psychology, 61*(3), 234-251. doi: 10.1027/1618-3169/a000243

Ellis, M. L., Weiss, B., & Lochman, J. E. (2009). Executive functions in children: associations with aggressive behavior and appraisal processing. *Journal of Abnormal Child Psychology, 37*(7), 945-956.

Engel de Abreu, P. M. (2011). Working memory in multilingual children: is there a bilingual effect? *Memory, 19*(5), 529-537. doi: 10.1080/09658211.2011.590504

Engel de Abreu, P. M., Cruz-Santos, A., Tourinho, C. J., Martin, R., & Bialystok, E. (2012). Bilingualism enriches the poor: enhanced cognitive control in low-income minority children. *Psychological Science, 23*(11), 1364-1371. doi: 10.1177/0956797612443836

Enticott, P. G., Ogloff, J. R. P., & Bradshaw, J. L. (2006). Associations between laboratory measures of executive inhibitory control and self-reported impulsivity. *Personality and Individual Differences, 41*(2), 285-294. doi: 10.1016/j.paid.2006.01.011

Epsy, K. A., McDiarmid, M. M., Cwik, M. F., Stalets, M. M., Hamby, A., & Senn, T. E. (2004). The contribution of executive functions to emergent mathematic skills in preschool children. *Developmental Neuropsychology, 26*, 465-486.

Esposito, A. G., & Baker-Ward, L. (2013). Dual-Language Education for Low-Income Children: Preliminary Evidence of Benefits for Executive Function. *Bilingual Research Journal, 36*(3), 295-310. doi: 10.1080/15235882.2013.837848

Esposito, A. G., Baker-Ward, L., & Mueller, S. (2013). Interference Suppression vs. Response Inhibition: An Explanation for the Absence of a Bilingual Advantage in Preschoolers' Stroop Task Performance. *Cognitive Development, 28*(4), 354-363. doi: 10.1016/j.cogdev.2013.09.002

Espy, K. A., Kaufmann, P. M., & Glisky, M. L. (2001). New procedures to assess executive functions in preschool children. *Clin Neuropsychol, 15*(1), 46-58. doi: 10.1076/clin.15.1.46.1908

Espy, K. A., Sheffield, T. D., Wiebe, S. A., Clark, C. A., & Moehr, M. J. (2011). Executive control and dimensions of problem behaviors in preschool children. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 52*(1), 33-46. doi: 10.1111/j.1469-7610.2010.02265.x

Fairchild, G., van Goozen, S. H., Stollery, S. J., Aitken, M. R., Savage, J., Moore, S. C., & Goodyer, I. M. (2009). Decision making and executive function in male adolescents with early-onset or adolescence-onset conduct disorder and control subjects. *Biological Psychiatry, 66*(2), 162-168. doi: 10.1016/j.biopsych.2009.02.024

Fatima, S., & Sheikh, H. (2014). Socioeconomic Status and Adolescent Aggression: The Role of Executive Functioning as a Mediator. *The American Journal of Psychology, 127*(4), 419-430.

Fernandez, M., Tartar, J. L., Padron, D., & Acosta, J. (2013). Neurophysiological marker of inhibition distinguishes language groups on a non-linguistic executive function test. *Brain and Cognition, 83*(3), 330-336. doi: 10.1016/j.bandc.2013.09.010

Foy, J. G., & Mann, V. A. (2013). Bilingual children show advantages in nonverbal auditory executive function task. *International Journal of Bilingualism*. doi: 10.1177/1367006912472263

Fuhs, M. W., Farran, D. C., & Nesbitt, K. T. (2014a). Prekindergarten Children's Executive Functioning Skills and Achievement Gains: The Utility of Direct Assessments and Teacher Ratings. *Journal of Educational Psychology*. doi: 10.1037/a0037366

Fuhs, M. W., Nesbitt, K. T., Farran, D. C., & Dong, N. (2014b). Longitudinal associations between executive functioning and academic skills across content areas. *Developmental Psychology, 50*(6), 1698-1709. doi: 10.1037/a0036633

Garratt, L. C., & Kelly, T. P. (2008). To what extent does bilingualism affect children's performance on the NEPSY? *Child Neuropsychology, 14*(1), 71-81. doi: 10.1080/09297040701218405

Gathercole, S. E., Brown, L., & Pickering, S. J. (2003). Working memory assessments at school entry as longitudinal predictors of National Curriculum attainment levels. *Educational and Child Psychology, 20*(3), 109-122.

Gathercole, S. E., Pickering, S. J., Ambridge, B., & Wearing, H. (2004a). The structure of working memory from 4 to 15 years of age. *Developmental Psychology, 40*(2), 177-190. doi: 10.1037/0012-1649.40.2.177

Gathercole, S. E., Pickering, S. J., Knight, C., & Stegmann, Z. (2004b). Working memory skills and educational attainment: evidence from national curriculum assessments at 7 and 14 years of age. *Applied Cognitive Psychology, 18*(1), 1-16. doi: 10.1002/acp.934

Geurts, H. M., Verté, S., Oosterlaan, J., Roeyers, H., & Sergeant, J. A. (2004). How specific are executive functioning deficits in attention deficit hyperactivity disorder and autism? *Journal of Child Psychology and Psychiatry, 45*(4), 836-854. doi: http://dx.doi.org/10.1111/j.1469-7610.2004.00276.x

Giancola, P. R., Mezzich, A. C., & Tarter, R. E. (1998). Disruptive, delinquent and aggressive behavior in female adolescents with a psychoactive substance use disorder: Relation to executive cognitive functioning. *Journal of Studies on Alcohol, 59*(5), 560-567.

Giofre, D., Mammarella, I. C., & Cornoldi, C. (2014). The relationship among geometry, working memory, and intelligence in children. *Journal of Experimental Child Psychology, 123*, 112-128. doi: 10.1016/j.jecp.2014.01.002

Gioia, G. A., Isquith, P. K., Guy, S. C., & Kenworthy, L. (2000). *Behavior rating inventory of executive functions*. Odessa, FL: Psychological Assessment Resources.

Greenberg, A., Bellana, B., & Bialystok, E. (2013). Perspective-Taking Ability in Bilingual Children: Extending Advantages in Executive Control to Spatial Reasoning. *Cognitive Development, 28*(1), 41-50. doi: 10.1016/j.cogdev.2012.10.002

Gutiérrez-Clellen, V. F., & Calderón, J. (2004). Verbal working memory in bilingual children. *Journal of Speech, Language, and Hearing Research, 47*(4), 863-876.

Hallett, P. E. (1978). Primary and secondary saccades to goals defined by instructions. *Vision Research, 18*(10), 1279-1296.

Herba, C. M., Tranah, T., Rubia, K., & Yule, W. (2006). Conduct problems in adolescence: Three domains of inhibition and effect of gender. *Developmental Neuropsychology, 30*(2), 659-695.

Hernández, M., Costa, A., Fuentes, L. J., Vivas, A. B., & Sebastián-Gallés, N. (2010). The impact of bilingualism on the executive control and orienting networks of attention. *Bilingualism: Language and Cognition, 13*(03), 315-325. doi: 10.1017/s1366728909990010

Hernández, M., Costa, A., & Humphreys, G. W. (2012). Escaping capture: bilingualism modulates distraction from working memory. *Cognition, 122*(1), 37-50. doi: 10.1016/j.cognition.2011.08.002

Hernández, M., Martin, C. D., Barceló, F., & Costa, A. (2013). Where is the bilingual advantage in task-switching? *Journal of Memory and Language, 69*(3), 257-276. doi: 10.1016/j.jml.2013.06.004

Hobson, C. W., Scott, S., & Rubia, K. (2011). Investigation of cool and hot executive function in ODD/CD independently of ADHD. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 52*(10), 1035-1043. doi: 10.1111/j.1469-7610.2011.02454.x

Hughes, C., Dunn, J., & White, A. (1998). Trick or treat?: Uneven understanding of mind and emotion and executive dysfunction in "hard-to-manage" preschoolers. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 39*(7), 981-994.

Huizinga, M., Dolan, C. V., & van der Molen, M. W. (2006). Age-related change in executive function: developmental trends and a latent variable analysis. *Neuropsychologia, 44*(11), 2017-2036. doi: 10.1016/j.neuropsychologia.2006.01.010

Iluz-Cohen, P., & Armon-Lotem, S. (2013). Language proficiency and executive control in bilingual children. *Bilingualism: Language and Cognition, 16*(04), 884-899. doi: 10.1017/s1366728912000788

Jersild, A. T. (1927). Mental set and shift. *Archives of Psychology*.

Johnstone, S. J., Dimoska, A., Smith, J. L., Barry, R. J., Pleffer, C. B., Chiswick, D., & Clarke, A. R. (2007). The development of stop-signal and Go/Nogo response inhibition in children aged 7-12 years: performance and event-related potential indices. *International Journal of Psychophysiology : Official Journal of the International Organization of Psychophysiology, 63*(1), 25-38. doi: 10.1016/j.ijpsycho.2006.07.001

Jonsdottir, S., Bouma, A., Sergeant, J. A., & Scherder, E. J. (2006). Relationships between neuropsychological measures of executive function and behavioral measures of ADHD symptoms and comorbid behavior. *Archives of Clinical Neuropsychology : The Official Journal of the National Academy of Neuropsychologists, 21*(5), 383-394. doi: 10.1016/j.acn.2006.05.003

Kalashnikova, M., & Mattock, K. (2014). Maturation of executive functioning skills in early sequential bilingualism. *International Journal of Bilingual Education and Bilingualism, 17*(1), 111-123. doi: 10.1080/13670050.2012.746284

Kalia, V., Wilbourn, M. P., & Ghio, K. (2014). Better early or late? Examining the influence of age of exposure and language proficiency on executive function in early and late bilinguals. *Journal of Cognitive Psychology, 26*(7), 699-713. doi: 10.1080/20445911.2014.956748

Kapa, L. L., & Colombo, J. (2013). Attentional Control in Early and Later Bilingual Children. *Cognitive Development, 28*(3), 233-246. doi: 10.1016/j.cogdev.2013.01.011

Kapa, L. L., & Colombo, J. (2014). Executive function predicts artificial language learning. *Journal Of Memory And Language, 76*, 237-252. doi:10.1016/j.jml.2014.07.004

Kaushanskaya, M., Gross, M., & Buac, M. (2014). Effects of classroom bilingualism on task-shifting, verbal memory, and word learning in children. *Developmental Science, 17*(4), 564-583. doi: 10.1111/desc.12142

Kazemeini, T., & Fadardi, J. S. (2015). Executive Function: Comparing Bilingual and Monolingual Iranian University Students. *J Psycholinguist Res*. doi: 10.1007/s10936-015-9403-1

Kerr, M., Tremblay, R. E., Pagani, L., & Vitaro, F. (1997). Boys' behavioral inhibition and the risk of later delinquency. *Archives of General Psychiatry, 54*(9), 809-816.

Kochanska, G., Murray, K. T., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology, 36*(2), 220-232.

Kovács, A. M., & Mehler, J. (2009). Cognitive gains in 7-month-old bilingual infants. *Proceedings of the National Academy of Sciences of the United States of America, 106*(16), 6556-6560. doi: 10.1073/pnas.0811323106

Lan, X., Legare, C. H., Ponitz, C. C., Li, S., & Morrison, F. J. (2011). Investigating the links between the subcomponents of executive function and academic achievement: a cross-cultural analysis of Chinese and American preschoolers. *Journal of Experimental Child Psychology, 108*(3), 677-692. doi: 10.1016/j.jecp.2010.11.001

Langberg, J. M., Dvorsky, M. R., & Evans, S. W. (2013). What specific facets of executive function are associated with academic functioning in youth with attention-deficit/hyperactivity disorder? *Journal of Abnormal Child Psychology, 41*(7), 1145-1159. doi: 10.1037/a0029648 . http://dx.doi.org/10.1007/s10802-013-9750-z

Latzman, R. D., Elkovitch, N., Young, J., & Clark, L. A. (2010). The contribution of executive functioning to academic achievement among male adolescents. *J Clin Exp Neuropsychol, 32*(5), 455-462. doi: 10.1080/13803390903164363

Lee, K., Bull, R., & Ho, R. M. (2013). Developmental changes in executive functioning. *Child Development, 84*(6), 1933-1953. doi: 10.1111/cdev.12096

Lehto, J. E., Juujärvi, P., Koistra, L., & Pulkkinen, L. (2003). Dimensions of executive functioning: Evidence from children. *The British Journal of Developmental Psychology, 21*, 59-80.

Leikin, M. (2012). The effect of bilingualism on creativity: Developmental and educational perspectives. *International Journal of Bilingualism, 17*(4), 431-447. doi: 10.1177/1367006912438300

Logan, G. D. (1994). On the ability to inhibit thought and action: A users' guide to the stop signal paradigm *Inhibitory processes in attention, memory, and language.* (pp. 189-239): Academic Press, San Diego, CA.

Luciana, M. (2013). Adolescent brain development in normality and psychopathology. *Development and Psychopathology, 25*(4 Pt 2), 1325-1345. doi: 10.1017/S0954579413000643

Luria, A. R. (1966). Higher cortical functions in man.

Macdonald, J. A., Beauchamp, M. H., Crigan, J. A., & Anderson, P. J. (2014). Age-related differences in inhibitory control in the early school years. *Child Neuropsychology, 20*(5), 509-526. doi: 10.1080/09297049.2013.822060

Mahone, E. M., Martin, R., Kates, W. R., Hay, T., & Horska, A. (2009). Neuroimaging correlates of parent ratings of working memory in typically developing children. *J Int Neuropsychol Soc, 15*(1), 31-41. doi: 10.1017/S1355617708090164

Martin-Rhee, M. M., & Bialystok, E. (2008). The development of two types of inhibitory control in monolingual and bilingual children. *Bilingualism: Language and Cognition, 11*(01). doi: 10.1017/s1366728907003227

McQuade, J. D., Murray-Close, D., Shoulberg, E. K., & Hoza, B. (2013). Working memory and social functioning in children. *Journal of Experimental Child Psychology, 115*(3), 422-435. doi: 10.1016/j.jecp.2013.03.002

Miller, E. K., & Cohen, J. D. (2001). An Integrative Theory of Prefrontal Cortex Function. *Annual Review of Neuroscience, 24*, 167-202.

Miller, M., & Hinshaw, S. P. (2010). Does childhood executive function predict adolescent functional outcomes in girls with ADHD? *Journal of Abnormal Child Psychology, 38*(3), 315-326. doi: http://dx.doi.org/10.1007/s10802-009-9369-2

Miller, M., Nevado-Montenegro, A. J., & Hinshaw, S. P. (2012a). Childhood executive function continues to predict outcomes in young adult females with and without childhood-diagnosed ADHD. *Journal of Abnormal Child Psychology, 40*(5), 657-668. doi: 10.1007/s10802-011-9599-y

Miller, M., Nevado-Montenegro, A. J., & Hinshaw, S. P. (2012b). Childhood executive function continues to predict outcomes in young adult females with and without childhood-diagnosed ADHD. *Journal of Abnormal Child Psychology, 40*(5), 657-668. doi: http://dx.doi.org/10.1007/s10802-011-9599-y

Miller, M. R., Müller, U., Giesbrecht, G. F., Carpendale, J. I., & Kerns, K. A. (2013). The contribution of executive function and social understanding to preschoolers' letter and math skills. *Cognitive Development, 28*(4), 331-349. doi: 10.1016/j.cogdev.2012.10.005

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "Frontal Lobe" tasks: a latent variable analysis. *Cognitive Psychology, 41*(1), 49-100. doi: 10.1006/cogp.1999.0734

Monsell, S. (1996). Control of mental processes. *Unsolved mysteries of the mind: Tutorial essays in cognition*, 93-148.

Morales, J., Calvo, A., & Bialystok, E. (2013). Working memory development in monolingual and bilingual children. *Journal of Experimental Child Psychology, 114*(2), 187-202. doi: 10.1016/j.jecp.2012.09.002

Morris, N., & Jones, D. M. (1990). Memory updating in working memory: The role of the central executive. *British Journal of Psychology, 81*(2), 111-121.

Mueller Gathercole, V. C., Thomas, E. M., Jones, L., Guasch, N. V., Young, N., & Hughes, E. K. (2010). Cognitive effects of bilingualism: digging deeper for the contributions of language dominance, linguistic knowledge, socio-economic status and cognitive abilities. *International Journal of Bilingual Education and Bilingualism, 13*(5), 617-664. doi: 10.1080/13670050.2010.488289

Naglieri, J. A., & Goldstein, S. (2013). *Comprehensive executive function inventory*. North Tonawanda, NY: Multi-Health Systems Inc.

National Center for Educational Statistics, U. S. Department of Education. (May 2014). *English Language Learners.* Retrieved August 23, 2014, from http://nces.ed.gov/programs/coe/indicator_cgf.asp

Nesbitt, K. T., Farran, D. C., & Fuhs, M. W. (2015). Executive function skills and academic achievement gains in prekindergarten: Contributions of learning-related behaviors. *Developmental Psychology, 51*(7), 865-878. doi: 10.1037/dev0000021

Nevo, E., & Breznitz, Z. (2011). Assessment of working memory components at 6years of age as predictors of reading achievements a year later. *Journal of Experimental Child Psychology, 109*(1), 73-90. doi: 10.1016/j.jecp.2010.09.010

Nguyen, T.-K., & Astington, J. W. (2013). Reassessing the bilingual advantage in theory of mind and its cognitive underpinnings. *Bilingualism: Language and Cognition, 17*(02), 396-409. doi: 10.1017/s1366728913000394

Nicolay, A.-C., & Poncelet, M. (2012). Cognitive advantage in children enrolled in a second-language immersion elementary school program for three years. *Bilingualism: Language and Cognition, 16*(03), 597-607. doi: 10.1017/s1366728912000375

Nicolay, A.-C., & Poncelet, M. (2015). Cognitive benefits in children enrolled in an early bilingual immersion school: A follow up study. *Bilingualism: Language and Cognition, 18*(04), 789-795. doi: 10.1017/s1366728914000868

Nigg, J. T., Quamma, J. P., Greenberg, M. T., & Kusche, C. A. (1999). A Two-Year Longitudinal Study of Neuropsychological and Cognitive Performance in

Relation to Behavioral Problems and Competencies in Elementary School Children. *Journal of Abnormal Child Psychology, 27*(1), 51-63.

Nigg, J. T., Wong, M. M., Martel, M. M., Jester, J. M., Puttler, L. I., Glass, J. M., Adams, K. M., Fitzgerald, H. E., & Zucker, R. A. (2006). Poor response inhibition as a predictor of problem drinking and illicit drug use in adolescents at risk for alcoholism and other substance use disorders. *Journal of the American Academy of Child and Adolescent Psychiatry, 45*(4), 468-475. doi: 10.1097/01.chi.0000199028.76452.a9

Okanda, M., Moriguchi, Y., & Itakura, S. (2010). Language and Cognitive Shifting: Evidence from Young Monolingual and Bilingual Children1,2. *Psychological Reports, 107*(1), 68-78. doi: 10.2466/03.10.28.pr0.107.4.68-78

Oosterlaan, J., Scheres, A., & Sergeant, J. A. (2005). Which Executive Functioning Deficits Are Associated With AD/HD, ODD/CD and Comorbid AD/HD+ODD/CD? *Journal of Abnormal Child Psychology, 33*(1), 69-85. doi: 10.1007/s10802-005-0935-y

Paap, K. R., & Greenberg, Z. I. (2013). There is no coherent evidence for a bilingual advantage in executive processing. *Cognitive Psychology, 66*(2), 232-258. doi: 10.1016/j.cogpsych.2012.12.002

Peeters, M., Monshouwer, K., Janssen, T., Wiers, R. W., & Vollebergh, W. A. (2014). Working memory and alcohol use in at-risk adolescents: a 2-year follow-up. *Alcoholism, Clinical and Experimental Research, 38*(4), 1176-1183. doi: 10.1111/acer.12339

Pelham, S. D., & Abrams, L. (2014). Cognitive advantages and disadvantages in early and late bilinguals. *Journal of Experimental Psychology, 40*(2), 313-325. doi: 10.1037/a0035224

Poarch, G. J., & van Hell, J. G. (2012). Executive functions and inhibitory control in multilingual children: evidence from second-language learners, bilinguals, and trilinguals. *Journal of Experimental Child Psychology, 113*(4), 535-551. doi: 10.1016/j.jecp.2012.06.013

Poulin-Dubois, D., Blaye, A., Coutya, J., & Bialystok, E. (2011). The effects of bilingualism on toddlers' executive functioning. *Journal of Experimental Child Psychology, 108*(3), 567-579. doi: 10.1016/j.jecp.2010.10.009

Prior, A., & Macwhinney, B. (2009). A bilingual advantage in task switching. *Bilingualism: Language and Cognition, 13*(02), 253. doi: 10.1017/s1366728909990526

Raaijmakers, M. A. J., Smidts, D. P., Sergeant, J. A., Maassen, G. H., Posthumus, J. A., van Engeland, H., & Matthys, W. (2008). Executive functions in preschool children with aggressive behavior: impairments in inhibitory control. *Journal of Abnormal Child Psychology, 36*, 1097-1107. doi: 10.1007/s10802-008-9235-7

Ransdell, S., Barbier, M.-L., & Niit, T. (2006). Metacognitions about Language Skill and Working Memory among Monolingual and Bilingual College Students: When Does Multilingualism Matter? *International Journal of Bilingual Education and Bilingualism, 9*(6), 728-741. doi: 10.2167/beb390.0

Rapport, M. D., Bolden, J., Kofler, M. J., Sarver, D. E., Raiker, J. S., & Alderson, R. M. (2008). Hyperactivity in boys with Attention-Deficit/Hyperactivity Disorder (ADHD: A ubiquitous core symptom or manifestation of working memory deficits? *Journal of Abnormal Child Psychology, 37*(6), 521-534.

Ratiu, I., & Azuma, T. (2014). Working memory capacity: Is there a bilingual advantage? *Journal of Cognitive Psychology, 27*(1), 1-11. doi: 10.1080/20445911.2014.976226

Ravizza, S. M., & Carter, C. S. (2008). Shifting set about task switching: behavioral and neural evidence for distinct forms of cognitive flexibility. *Neuropsychologia, 46*(12), 2924-2935. doi: 10.1016/j.neuropsychologia.2008.06.006

Reynolds, C. R., & Horton, J., Arthur MacNeill. (2008). Assessing Executive Functions: A Life-Span Perspective. *Psychology in the Schools, 45*(9), 875-892. doi: 10.1002/pits

Reynolds, C. R., & Kamphaus, R. W. (2004). *Behavior assessment system for children-Second edition*. Circle Pines, MN: AGS.

Rhodes, S. M., Booth, J. N., Campbell, L. E., Blythe, R. A., Wheate, N. J., & Delibegovic, M. (2014). Evidence for a Role of Executive Functions in Learning Biology. *Infant and Child Development, 23*(1), 67-83. doi: 10.1002/icd.1823

Riccio, C. A., Hewitt, L. L., & Blake, J. J. (2011). Relation of measures of executive function to aggressive behavior in children. *Applied Neuropsychology, 18*(1), 1-10. doi: 10.1080/09084282.2010.525143

Riggs, N. R., Blair, C. B., & Greenberg, M. T. (2003). Concurrent and 2-year longitudinal relations between executive function and the behavior of 1st and 2nd grade children. *Child Neuropsychology, 9*(4), 267-276. doi: 10.1076/chin.9.4.267.23513

Riggs, N. R., Shin, H. S., Unger, J. B., Spruijt-Metz, D., & Pentz, M. A. (2014). Prospective associations between bilingualism and executive function in Latino children: sustained effects while controlling for biculturalism. *J Immigr Minor Health, 16*(5), 914-921. doi: 10.1007/s10903-013-9838-0

Rigoli, D., Piek, J. P., Kane, R., & Oosterlaan, J. (2012). Motor coordination, working memory, and academic achievement in a normative adolescent sample: testing a mediation model. *Archives of Clinical Neuropsychology : The Official Journal of the National Academy of Neuropsychologists, 27*(7), 766-780. doi: 10.1093/arclin/acs061

Rogers, M., Hwang, H., Toplak, M., Weiss, M., & Tannock, R. (2011). Inattention, working memory, and academic achievement in adolescents referred for attention deficit/hyperactivity disorder (ADHD). *Child Neuropsychology, 17*(5), 444-458. doi: 10.1080/09297049.2010.544648

Rogers, R. D., & Monsell, S. (1995). Costs of a predictible switch between simple cognitive tasks. *Journal of Experimental Psychology, 124*(2), 207.

Romer, D., Betancourt, L., Giannetta, J. M., Brodsky, N. L., Farah, M., & Hurt, H. (2009). Executive cognitive functions and impulsivity as correlates of risk taking and problem behavior in preadolescents. *Neuropyshologia, 47*, 2916-2926.

Romer, D., Betancourt, L. M., Brodsky, N. L., Giannetta, J. M., Yang, W., & Hurt, H. (2011). Does adolescent risk taking imply weak executive function? A prospective study of relations between working memory performance, impulsivity, and risk taking in early adolescence. *Developmental Science, 14*(5), 1119-1133. doi: 10.1111/j.1467-7687.2011.01061.x

Romine, C. B., & Reynolds, C. R. (2005). A model of the development of frontal lobe functioning: findings from a meta-analysis. *Applied Neuropsychology, 12*(4), 190-201. doi: 10.1207/s15324826an1204_2

Rommelse, N. N., Altink, M. E., de Sonneville, L. M., Buschgens, C. J., Buitelaar, J., Oosterlaan, J., & Sergeant, J. A. (2007). Are motor inhibition and cognitive flexibility dead ends in ADHD? *Journal of Abnormal Child Psychology, 35*(6), 957-967. doi: 10.1007/s10802-007-9146-z

Ryan, C. (2013). Language Use in the United States: 2011. Retrieved from United States Census Bureau website: https://www.census.gov/content/dam/Census/library/publications/2013/acs/acs-22.pdf

Saarinen, S., Fontell, T., Vuontela, V., Carlson, S., & Aronen, E. T. (2014). Visuospatial working memory in 7- to 12-year-old children with disruptive behavior disorders. *Child Psychiatry Hum Dev*. doi: http://dx.doi.org/10.1007/s10578-014-0449-3

Schoemaker, K., Bunte, T., Espy, K. A., Dekovic, M., & Matthys, W. (2014). Executive functions in preschool children with ADHD and DBD: an 18-month longitudinal study. *Dev Neuropsychol, 39*(4), 302-315. doi: 10.1080/87565641.2014.911875

Schoemaker, K., Mulder, H., Dekovic, M., & Matthys, W. (2013). Executive functions in preschool children with externalizing behavior problems: a meta-analysis. *Journal of Abnormal Child Psychology, 41*(3), 457-471. doi: 10.1007/s10802-012-9684-x

Séguin, J. R., Boulerice, B., Harden, P. W., Tremblay, R. E., & Pihl, R. O. (1999). Executive functions and physical aggression after controlling for attention deficit hyperactivity disorder, general memory, and IQ. *Journal of Child Psychology and Psychiatry, 40*(8), 1197-1208.

Shaul, S., & Schwartz, M. (2013). The role of the executive functions in school readiness among preschool-age children. *Reading and Writing, 27*(4), 749-768. doi: 10.1007/s11145-013-9470-3

Singh, L., Fu, C. S., Rahman, A. A., Hameed, W. B., Sanmugam, S., Agarwal, P., Jiang, B., Chong, Y. S., Meaney, M. J., Rifkin-Graboi, A., & Team, G. R. (2015). Back to basics: a bilingual advantage in infant visual habituation. *Child Dev, 86*(1), 294-302. doi: 10.1111/cdev.12271

Soliman, A. M. (2014). Bilingual advantages of working memory revisited: A latent variable examination. *Learning and Individual Differences, 32*, 168-177. doi: 10.1016/j.lindif.2014.02.005

Speltz, M., DeKlyen, M., Calderon, R., Greenberg, M. T., & Fisher, P. A. (1999). Neuropsychological characteristics and test behaviors of boys with early onset conduct problems. *Journal of Abnormal Psychology, 108*(2), 315-325.

St Clair-Thompson, H. L., & Gathercole, S. E. (2006). Executive functions and achievements in school: Shifting, updating, inhibition, and working memory. *Quarterly Journal of Experimental Psychology, 59*(4), 745-759. doi: 10.1080/17470210500162854

Stroop, J. R. (1935). Studies of Interference in Serial Verbal Reactions. *Journal of Experimental Psychology, 18*(6), 643.

Suchy, Y. (2009). Executive functioning: Overview, assessment, and research issues for non-neuropsychologists. *Annals of Behavioral Medicine, 37*(2), 106-116. doi: http://dx.doi.org/10.1007/s12160-009-9097-4

Sullivan, M. D., Janus, M., Moreno, S., Astheimer, L., & Bialystok, E. (2014). Early stage second-language learning improves executive control: evidence from ERP. *Brain and Language, 139*, 84-98. doi: 10.1016/j.bandl.2014.10.004

Swanson, H. L. (1994). Short-term memory and working memory: do both contribute to our understanding of academic achievement in children and adults with learning disabilities? *Journal of Learning Disabilities, 27*(1), 34-50.

Syngelaki, E. M., Moore, S. C., Savage, J. C., Fairchild, G., & Van Goozen, S. H. M. (2009). Executive Functioning and Risky Decision Making in Young Male Offenders. *Criminal Justice and Behavior, 36*(11), 1213-1227. doi: 10.1177/0093854809343095

Tarter, R. E., Kirisci, L., Mezzich, A., Cornelius, J. R., Pajer, K., Vanyukov, M., Gardner, W., Blackson, T., & Clark, D. (2003). Neurobehavioral disinhibition in childhood predicts early age at onset of substance use disorder. *The American Journal of Psychiatry, 160*(6), 1078-1085.

Tarter, R. E., Kirisci, L., Reynolds, M., & Mezzich, A. (2004). Neurobehavior disinhibition in childhood predicts suicide potential and substance use disorder by young adulthood. *Drug Alcohol Depend, 76 Suppl*, S45-52. doi: 10.1016/j.drugalcdep.2004.08.006

Thorell, L. B., Veleiro, A., Siu, A. F., & Mohammadi, H. (2013). Examining the relation between ratings of executive functioning and academic achievement: findings from a cross-cultural study. *Child Neuropsychology, 19*(6), 630-638. doi: 10.1080/09297049.2012.727792

Thorell, L. B., & Wåhlstedt, C. (2006). Executive functioning deficits in relation to symptoms of ADHD and/or ODD in preschool children. *Infant and Child Development, 15*(5), 503-518. doi: 10.1002/icd.475

Treccani, B., Argyri, E., Sorace, A., & Sala, S. D. (2009). Spatial negative priming in bilingualism. *Psychon Bull Rev, 16*(2), 320-327. doi: 10.3758/PBR.16.2.320

Utendale, W. T., Hubert, M., Saint-Pierre, A. B., & Hastings, P. D. (2011). Neurocognitive development and externalizing problems: the role of inhibitory control deficits from 4 to 6 years. *Aggressive Behavior, 37*(5), 476-488. doi: 10.1002/ab.20403

van Goozen, S. H. M., Cohen-Kettenis, P. T., Snoek, H., Matthys, W., Swaab-Barneveld, H., & van Engeland, H. (2004). Executive functioning in children: a comparison of hospitalised ODD and ODD/ADHD children and normal controls.

Journal of Child Psychology and Psychiatry, 45(2), 284-292. doi: http://dx.doi.org/10.1111/j.1469-7610.2004.00220.x

Vega, C., & Fernandez, M. (2011). Errors on the WCST correlate with language proficiency scores in Spanish-English bilingual children. *Archives of Clinical Neuropsychology : The Official Journal of the National Academy of Neuropsychologists, 26*(2), 158-164. doi: 10.1093/arclin/acq097

Verdine, B. N., Irwin, C. M., Golinkoff, R. M., & Hirsh-Pasek, K. (2014). Contributions of executive function and spatial skills to preschool mathematics achievement. *Journal of Experimental Child Psychology, 126*, 37-51. doi: 10.1016/j.jecp.2014.02.012

Verlinden, M., Veenstra, R., Ghassabian, A., Jansen, P. W., Hofman, A., Jaddoe, V. W., Verhulst, F. C., & Tiemeier, H. (2014). Executive functioning and non-verbal intelligence as predictors of bullying in early elementary school. *Journal of Abnormal Child Psychology, 42*(6), 953-966. doi: 10.1007/s10802-013-9832-y

Videsott, G., Della Rosa, P. A., Wiater, W., Franceschini, R., & Abutalebi, J. (2012). How does linguistic competence enhance cognitive functions in children? A study in multilingual children with different linguistic competences. *Bilingualism: Language and Cognition, 15*(04), 884-895. doi: 10.1017/s1366728912000119

von Bastian, C. C., Souza, A. S., & Gade, M. (2016). No evidence for bilingual cognitive advantages: A test of four hypotheses. *Journal of Experiential Psychology General, 145*(2), 246-258. doi: 10.1037/xge0000120

Vuontela, V., Carlson, S., Troberg, A. M., Fontell, T., Simola, P., Saarinen, S., & Aronen, E. T. (2013). Working memory, attention, inhibition, and their relation to adaptive functioning and behavioral/emotional symptoms in school-aged children. *Child Psychiatry Hum Dev, 44*(1), 105-122. doi: 10.1007/s10578-012-0313-2

Welsh, M. C., Pennington, B. F., & Groisser, D. B. (1991). A normative-developmental study of executive function: A window on prefrontal function in children. *Developmental Neuropsychology, 7*(2), 131-149. doi: http://dx.doi.org/10.1080/87565649109540483

Wendelken, C., Munakata, Y., Baym, C., Souza, M., & Bunge, S. A. (2012). Flexible rule use: common neural substrates in children and adults. *Dev Cogn Neurosci, 2*(3), 329-339. doi: 10.1016/j.dcn.2012.02.001

White, J. L., Moffitt, T. E., Caspi, A., & Jeglum Bartusch, D. (1994). Measuring impulsivity and examining its relationship to delinquency. *Jounal of Abnormal Psychology, 103*(2), 192-205.

Wiebe, S. A., Sheffield, T., Nelson, J. M., Clark, C. A., Chevalier, N., & Espy, K. A. (2011). The structure of executive function in 3-year-olds. *Journal of Experimental Child Psychology, 108*(3), 436-452. doi: 10.1016/j.jecp.2010.08.008

Willcutt, E. G., Doyle, A. E., Nigg, J. T., Faraone, S. V., & Pennington, B. F. (2005). Validity of the executive function theory of attention-deficit/hyperactivity disorder: a meta-analytic review. *Biological Psychiatry, 57*(11), 1336-1346. doi: 10.1016/j.biopsych.2005.02.006

Willoughby, M. T., Wirth, R. J., Blair, C. B., & Family Life Project, I. (2012). Executive function in early childhood: longitudinal measurement invariance and developmental change. *Psychological Assessessment, 24*(2), 418-431. doi: 10.1037/a0025779

Woumans, E., Ceuleers, E., Van der Linden, L., Szmalec, A., & Duyck, W. (2015). Verbal and nonverbal cognitive control in bilinguals and interpreters. *Journal of Experimental Psychology, 41*(5), 1579-1586. doi: 10.1037/xlm0000107

Wu, K. K., Chan, S. K., Leung, P. W., Liu, W. S., Leung, F. L., & Ng, R. (2011). Components and developmental differences of executive functioning for school-aged children. *Dev Neuropsychol, 36*(3), 319-337. doi: 10.1080/87565641.2010.549979

Wu, Y. J., & Thierry, G. (2013). Fast modulation of executive function by language context in bilinguals. *The Journal of Neuroscience, 33*(33), 13533-13537. doi: 10.1523/JNEUROSCI.4760-12.2013

Yang, S., Yang, H., & Lust, B. (2011). Early childhood bilingualism leads to advances in executive attention: Dissociating culture and language. *Bilingualism: Language and Cognition, 14*(03), 412-422. doi: 10.1017/s1366728910000611

Yeniad, N., Malda, M., Mesman, J., van Ijzendoorn, M. H., & Pieper, S. (2013). Shifting ability predicts math and reading performance in children: A meta-analytical study. *Learning and Individual Differences, 23*, 1-9. doi: 10.1016/j.lindif.2012.10.004

Yntema, D. B. (1963). Keeping track of several things at once. *Human Factors: The Journal of the Human Factors and Ergonomics Society, 5*(1), 7-17.

Yoshida, H., Tran, D. N., Benitez, V., & Kuwabara, M. (2011). Inhibition and adjective learning in bilingual and monolingual children. *Developmental Psychology, 2*, 210. doi: 10.3389/fpsyg.2011.00210

Zelazo, P. D. (2006). The dimensional change card sort (DCCS): A method of assessing executive function in children. *Nature Protocols, 1*(1), 297-301.

Zelazo, P. D., Carter, A., Reznick, J. S., & Frye, D. (1997). Early development of executive function: A problem-solving framework. *Review of General Psychology, 1*(2), 198-226. doi: http://dx.doi.org/10.1037/1089-2680.1.2.198

APPENDIX A

TAPSA Information Sheet

Case # __________

Age of Adolescent: _________years Gender of Adolescent: Male ________ Female _

Race/Ethnicity: African American____ Asian/Pacific Islander ____ Hispanic/Latino __

Native American _White non-Hispanic _______ Biracial _____

Other: ________________________

Mother's Highest Educational Level: 9^{th}-11^{th} grade _____________High School Diploma/GED _________

Community College or Technical School _______ Some College ____________

Completed 4 year degree ____ Completed Graduate Degree ________

Father's Highest Educational Level: 9^{th}-11^{th} grade ______________High School Diploma/GED _________

Community College or Technical School _______ Some College ___________

Completed 4 year degree ____ Completed Graduate Degree _______________

Is your child eligible for free/reduced lunch? Yes _______________ No ____________

What is the primary language in your home? English ____ Spanish _ Other: ________________

Does your child speak a language other than English? Yes _ No ___________

If yes, what language? _____________________

Educational History:

What grade is this child in currently? _______________

Has your child repeated a grade in school? Yes________________ No ___________

Has your child skipped a grade in school? Yes________________ No ___________

Did this child participate in a bilingual education program at school? Yes___________ No ____________

Does she or he currently receive ESL or LEP services? Yes______________ No ___________

Does your child receive Special Education services? Yes_______ No ___________

If yes, for what reason(s)? ____

Does your child receive 504 services or accommodations? Yes___________ No ___________

If yes, for what reason(s)? ____

Medical History:

Has your child had any of the following or been diagnosed with any of the following?

Loss of consciousness or coma _______________ Asthma _ Head Injury ______________

Seizure or Epilepsy ________________Concussion ______ Cancer ________

Cystic Fibrosis ________ Diabetes _ ADHD/ADD _____________

Sickle Cell Anemia ________ Cerebral Palsy ____ Learning Disability ________

Down Syndrome __________ Autism _________________Asperger Syndrome _______________

Intellectual Disability ______________ Stroke ___________

Other: ____

What medications is your child currently prescribed? ____

____

If you indicated that your child sustained a **head injury or concussion**, please answer the following questions:

To the best of your recollection, how many times did your child experience a head injury or concussion? ________________

In conjunction with a head injury, did your child experience dizziness or confusion?

Yes_____________ No ___________

Does your child participate in organized sports (e.g., soccer, football, basketball, baseball/softball)

Yes_____________ No ___________

If involved in sports, was your child held out from playing in the sport as a result of a head injury or concussion? Yes___________ No ___________

In conjunction with a head injury, did your child lose consciousness? Yes_____________ No ___

If they lost consciousness, for how long were they unconscious? ____________________

In conjunction with a head injury, was your child ever treated by a physician or neurologist?

Yes_____________ No ___________

In conjunction with a head injury, was your child hospitalized for 1 or more days? Yes___ No ___

In conjunction with a head injury, was your child ever in a coma? Yes________ No ___________

If you indicated that your child has **epilepsy**, please answer the following questions:

At what age was your child first diagnosed with epilepsy? _________

If you know, what type of epilepsy does your child have? _________

When was your child's last seizure (month and year)? ____________

Would you describe your child's epilepsy as "controlled"? Yes_____________ No ___________

How many medications is your child currently taking for epilepsy? __________

Is your child restricted from certain activities because of the epilepsy? Yes____ No ___________

Has your child had surgery to gain better control of the epilepsy? Yes________ No ___________

Is surgery being considered as an option for better control of your child's epilepsy? Yes__ No ___

How frequent are your child's seizures? Less than once a year ____ Once a year _____

A few times a year, but less than once a month ____ Once a month _____

Once a week ______ Once a day ______

If you indicated that your child has **asthma**, please answer the following questions:

At what age was your child first diagnosed with asthma? __________

When was your child's last asthma attack (month and year)? _______________

Would you describe your child's asthma as "controlled"? YES_____________ NO ___________

How many medications is your child currently taking on a daily basis for asthma control? ________

Is your child restricted from certain activities because of the asthma? YES_____________ NO ___________

APPENDIX B

Language Proficiency Questionnaire - Adolescent

1. What is your first language? English Spanish Other:____________

2. What is your second language? English Spanish Other:____________

3. What age did you begin learning your second language? _______ years old

4. How often do you translate for others?

Very often Often Sometimes Never

5. If you do translate for other, at what age did you begin translating? ______ years old

For the following questions place a point on the scale (does not have to be on markers):

6. How often are you currently and on average exposed to each language?

Spanish **English**
100%/0% 75%/25% 50%/50% 25%/75% 0%/100%

7. When choosing to read available in your languages, how often would you choose to read it in each of your languages?

Spanish **English**
100%/0% 75%/25% 50%/50% 25%/75% 0%/100%

8. When choosing a language to speak with a person who is equally fluent in both languages, how often would you chose to speak each language?

Spanish **English**
100%/0% 75%/25% 50%/50% 25%/75% 0%/100%

9. How often do you speak each language with your parents?

Spanish **English**
100%/0% 75%/25% 50%/50% 25%/75% 0%/100%

10. How often do you speak each language with your siblings?

Spanish **English**
100%/0% 75%/25% 50%/50% 25%/75% 0%/100%

11. How often do you speak each language with your friends?

Spanish				**English**
100%/0%	75%/25%	50%/50%	25%/75%	0%/100%

12. How often do you choose to watch TV in each language?

Spanish				**English**
100%/0%	75%/25%	50%/50%	25%/75%	0%/100%

13. How often do you think in each language?

Spanish				**English**
100%/0%	75%/25%	50%/50%	25%/75%	0%/100%

14. Overall, how often do you use each language?

Spanish				**English**
100%/0%	75%/25%	50%/50%	25%/75%	0%/100%

APPENDIX C

Language Proficiency Questionnaire - Parent

1. What is your child's first language?
English Spanish Other:____________

2. What is your child's second language?
English Spanish Other:____________

3. What age did your child begin learning his/her second language? _______ years old

4. How often does your child translate for others?

Very often Often Sometimes Never

5. If he/she does translate for others, at what age did he/she begin translating? ______ years old

For the following questions place a point on the scale (does not have to be on markers):

6. How often does your child currently and on average exposed to each language?

Spanish/Other Language **English**
100%/0% 75%/25% 50%/50% 25%/75% 0%/100%

7. How often does your child speak with you in each language?

Spanish/Other Language **English**
100%/0% 75%/25% 50%/50% 25%/75% 0%/100%

8. How often does your child speak with his/her siblings in each language?

Spanish/Other Language **English**
100%/0% 75%/25% 50%/50% 25%/75% 0%/100%

9. How often does your child prefer to watch TV in each language?

Spanish/Other Language **English**
100%/0% 75%/25% 50%/50% 25%/75% 0%/100%