

Play and Executive Functions in Early Childhood Education

The Importance of Play and Developing Executive Functions in Early Childhood Education:

A Meta-Synthesis

Jesse Riesenberger

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APPROVED: _____
Jill Burkert, Ph.D., Academic Advisor

APPROVED: _____
Heather Batchelder, Ph. D., Asst. Professor of Education

Date

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Abstract

This meta-synthesis reviews literature on the development of executive functions in early childhood education. This paper focuses on the use of play in the early childhood classroom and the research supporting the use of play as a teaching tool. The author included studies that addressed both typically developing children and children with developmental delays. Papers reviewed had a focus on ages 3-5 with the exception of longitudinal studies which included older participants. The author includes her professional view of this subject and how the literature included in this paper will be used to support her early childhood program.

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Introduction

1.1. Background

Play has been studied and researched in support of play therapy, increased playtime in school, play based interventions, and early childhood programs. Neurological studies show that play is an important part of the development of a child's brain and the development of their executive functions. When a child has strong executive functions they are better able to learn and function in their environment. In her research, Adele Diamond (2013) found that "Executive functions are skills essential for mental and physical health; success in school and in life; and cognitive, social, and psychological development" (p.136). Executive functions are not hardwired into our brain at birth and are best developed in early childhood, if not developed in early childhood delays in other areas may follow. Children that face disabilities or lack the opportunities to become proficient in executive functions will face difficulty in everyday routines in daily life (Center of Developing Child, 2011, p.3).

In this paper executive functions (EF) refer to working memory, mental flexibility, and inhibitory control. The Harvard University Center of the Developing Child (<http://developingchild.harvard.edu/>) describes EF as follows: Working memory is the ability to take in information, keep it stored in the mind and be able to use it correctly. Inhibitory control is, in short, self-control, or our ability to control our impulses and be able to think through our actions as well as manage the distractions around us. Cognitive flexibility (or mental flexibility) is the ability to change our thinking and reactions according to our environment and the demands of the situation. By creating strong executive functions we increase the success of a student in all

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areas of their life. If they are better able to control their impulses, adapt to situations, and retain information they will be better able to receive information in the classroom as well as apply that information in meaningful ways.

For a student with a disability their ability developing functional skills on their own through play may be very difficult. A speech delay or disorder may keep a child from participating in dramatic play or turn taking games, which decreases their opportunities to develop inhibitory control as well as memory skills. If a student experiences physical disabilities, the opportunities to join in fast paced games (tag, hide and seek, scooter play) or fine motor activities (doll play, block building, play-doh) may be limited, which impacts their opportunities to practice executive skills. Students with characteristics associated with the Autism Spectrum often miss opportunities to practice inhibitory control, as they may perseverate or self-stimulate rather than interact with peers and practice problem solving, sharing, turn taking, and empathy. By creating programs that support students with disabilities and creating age appropriate activities based on student abilities, we can increase their opportunities to strengthen executive skills.

Research has shown that by creating an environment that supports and generates structured play for students using both peer aged and adult play partners we can increase the development of executive functions. Through dramatic play we challenge students to use both inhibitory control and working memory as they play a role and allow other children to join in the play. By playing games like “red light green light”, “duck duck goose”, or “tag”, we practice inhibitory control and working memory as we must remember what the rules are as well as react quickly to those rules (freezing, running, tagging). When we play simple turn taking games, we

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challenge student's working memory as well as inhibitory control as they must remember when their turn is, must remain engaged while a peer takes their turn, remember the rules, and how to end the game. As we introduce different environments to students (gym, outside, cafeteria) or different times of a schedule (snack, group learning, story time) we also introduce how rules and expectations change. Through a structured play based program, young students are able to explore and enhance their executive functions.

As the focus on academics in early childhood education increases, we take away opportunities for students to practice and strengthen their executive functions skills that are essential in becoming a successful learner, and skills that are most successfully developed in the early childhood years. We, as educators, must respect the importance of play as well as the need to create opportunities for students to participate in meaningful play. If our focus is only on academic skills we may be emphasizing skills that are not developmentally appropriate for early learners. Early childhood programs, both for typically developing children and children with developmental needs, should be rich with structured play opportunities and adult play partners that encourage skill practice and access for all children. These programs should be focused on developing executive functioning skills so once the child does enter elementary school they are able to function in the classroom. As the Center of Developing Child (2011) states "these skills support the process of learning—focusing, remembering, planning—that enables children to effectively and efficiently master the content of learning" (p.5).

1.2. Author's beliefs and experiences

I became interested in early childhood education when I accepted an Integrated Preschool teaching position. At that time I had just received my endorsement in special education and had only worked in grades k through 6. My experience in early childhood education environments

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was fairly limited having only done observations in a preschool classroom and working briefly in a day care. I was excited to work in the integrated preschool program but had limited knowledge of what I would be teaching and what I should expect out of the students. While I began to learn about my students and what I would need to do in my classroom I also began to notice how people, both in and out of the education field, reacted when I said that I was a preschool teacher. I heard many people say “oh, that must be fun you get to play all day!” and “wow, how do you teach math to three and four year olds?” It was clear that I wasn’t the only one confused about early childhood education.

I am now in my second year as a special education preschool teacher. When people comment on playing at work I am able to quickly respond with information that accurately portrays what this play is and how I, as a teacher, am educating my early learners. Unfortunately early childhood education seems to be viewed as unimportant and is often not supported. Very few places make it a priority and most places have such a restricted budget that early childhood programs are not expanded enough to meet the needs of the community. It seems impossible that the abundance of research in early childhood education continues to be ignored in the public education program. Early childhood education continues to be described as “just playing” or “glorified babysitting”. I believe that early childhood education will not receive the support and respect that it deserves until we also understand and respect that play is learning. Through play, we learn functional skills, problem solving, how to work within a group, communication, cause and effect, natural consequences, and how to investigate our environment. Through play children learn and practice their executive functions: memory, flexibility, and impulse control. These are skills that we must have in order to access and function in the educational environment.

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I believe that all educators should be able to proudly say, “I play with my students”. Research shows that students need to move, explore, and socialize through out their day. However, we continue to push academics into early education classrooms, we cut free time such as choice (a time in the classroom that students are able to choose their activity) and recess for more controlled and structured times, and we see less access for gym, music, and art. And most alarming is how much time has to be devoted to teaching students how to take tests. Gwen Gordon (2014) writes, “play remains on the margins of the broader professional discourse about health and well-being and, as a result, has remained widely unappreciated, drastically underfunded, and tragically under-prioritized” (p.235). While at a kindergarten transition meeting in the spring of last year I had a teacher ask me how many letter sounds the preschooler knew. She was surprised when I said none. She continued to ask me about the student’s academic skills and when most of the answers were “not yet” or “no” she then asked me “Well what do you even do in preschool?” I began to answer with “we play” but quickly realized that this teacher simply did not know the importance of play or what play-based interventions were. My interest in this topic comes from the belief that early childhood intervention is key in special education as well as general education, that all students benefit from play based preschool programs, and that only with support can successful preschool programs be created.

In special education we are often working with students with delays in several areas. We know that delays in motor development impact communication as well as cognitive skills. Delays in communication are often paired with delays in social and emotional behavior and in some cases we have students that have significant global delays. In the integrated preschool program a team works together to meet the needs of a student as a whole. This team may include

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(depending on the needs of the student) the physical therapist, occupational therapist, speech language pathologist, special education teacher, school psychologist, and the student's guardians. In order to meet the student's needs we use play based interventions. We create goals and objectives in the student's education plan and it is through play that we can teach these goals. Through play, the natural language of children, we can support the development of executive functions, but this play needs to be structured and purposeful. While typically developing children will have an abundance of successful play sessions, a student with developmental delays will have more difficulties in taking part of a meaningful play session. As a special education teacher I seek ways to support my students in accessing their education environment and in early childhood that means supporting them in play. We need to use the research available to ensure that students with special needs will benefit from the early childhood intervention program. We, as early childhood educators, need to use the research available to show the importance of play in education.

In this thesis I will be researching and responding to the following questions:

1. In what ways does play support executive function development in early childhood, ages 3 to 5?
2. How do we create structured play that will support development of executive functions?
3. How does the development of executive functions support students in education and beyond?

1.3. The purpose of this meta-synthesis

This meta-synthesis with a focus on executive function in the preschool age and using play in the preschool classroom to support the growth of executive function has several purposes.

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One purpose was to review articles related to executive function in the preschool age group; how executive functions (EF) are developed in these ages and what outcomes can be predicted from the development of EF. Another purpose was to look at the link between structured play in the classroom and the development of EF. In this area I wanted to see specifically how symbolic play supported EF development. Additionally I looked at what was needed to create a preschool environment that supported the growth of EF. Another purpose was to classify articles according to publication type, identify research design, participants, data sources of each research study, and to summarize the findings of each study. The final purpose was to identify significant themes in the found articles and to connect those themes to my own preschool classroom.

2. Methods

2.1 Selection criteria

The 34 articles used in this meta-synthesis were chosen using the following criteria:

1. The articles discussed executive function in the early childhood development.
2. The articles looked at the development of executive function skills through play in early childhood education.
3. Articles were written between 1995 and 2014.
4. Articles reported on school success in elementary grades in connection with development of executive function.

2.2 Search procedures

Database searches, web searchers, and ancestral searches were conducted to locate articles for this metasynthesis.

2.2.1 Database searches

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I researched within the Educational Resources Information Center (ERIC, Ebscohost) using the following search terms:

1. “Executive function” + “Neuroscience”
2. “Executive function” + “Young Children” + “Play”
3. “Executive function” + “Early Childhood Development”
4. “Cognitive Function” + “Executive Functions”
5. “Executive Function” + “Preschool”

A total of 22 articles were found using the ERIC database (EBSCOhost) (Albertson & Shore, 2008; Berk & Meyers, 2013; Best & Miller, 2010; Blair & Razza, 2007; Bodrova, Germeroth, & Leong, 2013; Cartwright, 2012; Diamond, 2014; Diamond, 2014; Eberle, 2014; Frost, 1998; Fuhs & Day, 2010; Garon, Bryson, & Smith, 2008; Gordon, 2014; Hughes, 2011; Jamison, Forston, & Stanton-Chapman, 2012; Kelly & Hammond, 2011; Miller, Nevado-Montenegro, & Hinshaw, 2011; Myck-Wayne, 2010; Sasser & Bierman, 2012; Watson & Westby, 2003; Weiland, Barata, & Yoshikawa, 2013; Williford, Whittaker, Vitiello, & Downer, 2013).

I also researched within the Education Full Text (Wilson, EBSCOhost) using the following search terms:

1. “Executive Function” + “Childhood Development”
2. “Executive Function” + “Neuroscience”
3. “Executive Function” + “Play”

A total of 7 articles were found using the Wilson database (Davidson, Amso, Anderson, & Diamond, 2006; Ivrendi, 2011; Razza, Bergen-Cico, & Raymond, 2013; Rushton,

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Juola-Rushton, & Larkin, 2009; Rushton, 2011; Shoemaker, Mulder, Dekovic, & Matthys, 2012; Vuontela, Carlson, Troberg, Fontell, Simola, Saarinen, & Aronen, 2012).

2.2.2 Ancestral searches

I conducted ancestral searches using the references from previously retrieved articles. Conducting ancestral searches resulted in the inclusion of 3 articles which met my selection criteria (Berk & Meyers, 2013; Diamond, 2013; Diamond, 2012).

2.2.3 Web based searches

I conducted a web-based search using the following search terms:

1. Executive Function in Preschool

A total of 4 articles were found (Center on the Developing Child, 2011; Center on the Developing Child, 2011; Diamond, 2007; National Scientific Council on the Developing Child, 2007)

2.3 Coding procedures

I used a coding form to categorize the information presented in each of the 34 articles. This coding form was based on: (a) publication type; (b) research design; (c) participants; (d) data sources; and (e) finding of the studies.

2.3.1 Publication types

Each journal article was evaluated and classified according to publication type (e.g., research study, theoretical work, descriptive work, opinion piece/position paper, guide, annotated bibliography, review of the literature). *Research studies* use a formal research design to gather

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and/or analyze quantitative and/or qualitative data. *Theoretical works* use existing literature to analyze, expand, or further define a specific philosophical and/or theoretical assumption.

Descriptive works describe phenomena and experiences, but do not disclose particular methods for attaining data. *Opinion pieces/position papers* explain, justify, or recommend a particular course of action based on the author's opinion and/or beliefs. *Guides* give instructions or advice explaining how practitioners might implement a particular agenda. An *annotated bibliography* is a list of cited works on a particular topic, followed by a descriptive paragraph describing, evaluating, or critiquing the source. *Reviews of the literature* critically analyze the published literature on a topic through summary, classification, and comparison.

2.3.2 Research design

Each empirical study was further classified by research design (i.e., quantitative, qualitative, mixed methods research). *Quantitative* research utilizes numbers to convey information. Instead of numbers, *qualitative* research uses language to explore issues and phenomenon. *Mixed methods* research involves the use of both quantitative and qualitative methods to present information within a single study.

2.3.3 Participants, data sources, and findings

The participants in the study were identified (e.g., typically developing, atypically developing, age). The data sources of the studies were identified (e.g., studies, surveys, observations, clinical tests, battery tests). Each study has been summarized and the information presented in Table 2.

2.4 Data analysis

I used a modified version of the Stevick-Colaizzi-Keen method previously employed by Duke (2011) and Duke and Ward (2009) to analyze 34 articles that I included in this

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meta-synthesis. In this meta-synthesis significant statements were identified in each of the articles. For the purpose of this meta-synthesis the significant statements addressed the following issues: (a) symbolic play increases inhibitory control; (b) purposeful and quality programs are needed to increase EF skills in the preschool years, ages 3-5; (c) further studies/assessments are needed in the development of EF in early childhood; (d) quality among preschool programs varies greatly; (e) the development of EF skills is a predictor of later school success and positive life choices. I created a list of non-repetitive significant statements gathered from the included articles that represented each significant statement. The formulated meanings from all 34 articles were grouped into theme clusters, represented as emergent themes. These emergent themes represented the fundamental elements of the entire body of literature.

3. Results

3.1 Publication type

I located 34 articles that met my selection criteria. The publication type of each article is located in Table 1. 14 of the 34 articles (41.1%) included in this meta-synthesis were research studies (Albertson & Shore, 2008; Blair & Razza, 2007; Davidson et al., 2006; Diamond et al., 2007; Fuhs & Day, 2012; Ivrendi, 2011; Kelly & Hammond, 2011; Miller et al., 2011; Razza et al., 2013; Sasser & Bierman, 2012; Schoemaker, Mulder, Dekovic, & Matthys, 2009; Weiland et al., 2013; Williford et al., 2013; Vuontela et al., 2012). 13 of the 34 articles (38.2%) were reviews of the literature (Berk & Meyers, 2013; Best & Miller, 2010; Cartwright, 2012; Center on the Developing Child, 2011; Diamond, 2012; Eberle, 2014; Frost, 1998; Garon, Bryson, & Smith, 2008; Gordon, 2014; Hughes, 2011; National Scientific Council on the Developing Child, 2007; Rushton, Juola-Rushton, & Larkin, 2009; Rushton, 2011). 2 (5.9%) of the 34 articles are theoretical works (Bodrova, Germeroth, & Leong, 2013; Myck-Wayne, 2010). 5 of the 34

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articles (14.7) are guides (Center on the Developing Child, 2011; Diamond, 2007; Diamond, 2012; Jamison, Forston, & Stanton-Chapman, 2012; Watson & Westby, 2003)

Table 1

Author(s) & Year of Publications	Publication Type
Albertson & Shore, 2008	Research Study
Berk, & Meyers, 2013	Review of the Literature
Best & Miller, 2010	Review of the Literature
Blair & Razza, 2007	Research Study
Bodrova, Germeroth, & Leong, 2013	Theoretical Work
Cartwright, 2012	Review of the Literature
Center on the Developing Child at Harvard University, 2011	Review of the Literature
Center on the Developing Child at Harvard University, 2011	Guide
Davidson, Amos, Anderson, & Diamond, 2006	Research Study
Diamond, 2012	Guide
Diamond, 2007	Research Study
Diamond, 2012	Review of the Literature
Diamond, 2014	Guide
Eberle, 2014	Review of the Literature
Frost, 1998	Review of the Literature
Fuhs & Day, 2011	Research Study
Garon, Bryson, & Smith, 2008	Review of the Literature
Gordon, 2014	Review of the Literature
Hughes, 2011	Review of the Literature
Ivrendi, 2011	Research Study
Jamison, Forston, & Stanton-Chapman, 2012	Guide
Kelly, 2011	Research Study
Miller, Nevado-Montenegro, & Hinshaw, 2011	Research Study
Myck-Wayne, 2010	Theoretical Work
National Scientific Council on the Developing Child, 2007	Review of the Literature
Razza, Bergen-Cico, & Raymond, 2013	Research Study
Rushton, 2011	Review of the Literature
Rushton, Juola-Rushton, & Larkin, 2009	Review of the Literature
Sasser & Bierman, 2012	Research Study
Schoemaker, Mulder, Dekovic, & Matthys, 2012	Research Study
Watson & Westby, 2003	Guide
Weiland, Barata, & Yoshikawa, 2013	Research Study
Williford, Whittaker, Vitiello, & Downer, 2013	Research Study
Vuontela, Carlson, Troberg, Fontell, Simola, Saarinen, & Aronen, 2012	Research Study

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3.2. Research design, participants, data sources, and findings of the studies

I located 14 research studies that met my selection criteria. The research design, participants, data sources, and findings of each of these studies are identified in Table 2. (Albertson & Shore, 2008; Blair & Razza, 2007; Davidson et al., 2006; Diamond et al., 2007; Fuhs & Day, 2012; Ivrendi, 2011; Kelly & Hammond, 2011; Miller et al., 2011; Razza et al., 2013; Sasser & Bierman, 2012; Schoemaker, Mulder, Dekovic, & Matthys, 2012; Vuontela et al., 2012; Weiland et al, 2013; Williford et al., 2013)

Table 2

Authors	Research Design	Participants	Data Sources	Findings
Albertson & Shore, 2008	Quantitative	32 preschool-age children, 16 3-year-olds and 16 4-year-olds	True/pretend identities task, EF battery from Carlson and Moses study which required participants to replace a proponent tendency with an opposing behavior, Working Memory Tasks, digit forward and digit backward task from WISC III, and expressive vocabulary from Kaufman ABC	There is a relation between memory for pretense and executive functioning and working memory. Findings suggest that executive function is important in processing and remembering pretense, or the false belief.
Blair & Razza, 2007	Quantitative	170 Head Start students, ages range from 3.9 to 5.8. 80 female 90 male	Measurements/assessments to assess EF (item selection measure, and peg tapping measure), effortful control (Children's Behavior Questionnaire filled out by teachers and parents), and false-belief understanding (an unexpected contents task and a changed location task).	Inhibitory control is a prominent correlation of early math and reading ability. Curriculum designed to improve EF skills are most effective in helping children succeed in school.
Davidson, Amso, Anderson, & Diamond, 2006	Quantitative	325 Individuals from 4 to 45 years old. 11 children were excluded that failed to complete the tasks. Remaining 314 participants were	Set of four investigator designed related tests presented on the computer. Tasks were designed to manipulate demands on working memory and inhibitory control	Inhibitory control is especially difficult for the very young. When young inhibitory control caused lower accuracy in tasks. As inhibitory control increased, memory demands caused lower accuracy in tasks.

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		157 female 157 male.		Working memory and inhibition are not independent. Cognitive flexibility showed a long developmental progression.
Diamond, Barnett, Thomas, & Munro, 2007	Mixed Methods	147 preschoolers. 85 in Tools of the Mind and 62 in a version of Balanced Literacy Curriculum. All participants were from the same neighborhood and low-income families.	EF skills were measured using The Dots task and Flanker task,	Preschoolers that participated in the Tools of the Mind curriculum (which uses play as a basis) showed an increase in executive functions (EF). Preschoolers that participated in the Balanced Literacy Curriculum did not show an increase in EF.
Ivrendi, 2011	Quantitative	101 children enrolled in public kindergarten programs. Sub sample of 30 children used for test-retest reliability.	Results from two instruments used the Assessing Number Sense Instrument and Head, toes, knees and shoulders Instrument.	Young children's self-regulatory behaviors are critical for learning mathematical skills. There is a need to increase children's self-regulation behavior.
Kelly & Hammond, 2011	Quantitative	20 children ages 48-89 months. 15 male 5 females	Sun-Moon Stroop task, Semantic Fluency task, Test of Pretend Play, Spontaneous symbolic play, The Object substitutions task. Shortened version of WPPSI-III	Symbolic play and inhibitory control are connected. Greater inhibitory control results in more symbolic play.
Miller, Nevado-Montenegro, & Hinshaw, 2011	Mixed methods	140 Females diagnosed with ADHD ages 6-12. 88 typically developing. At ten year follow	Longitudinal study of behavioral, neuropsychological, social, and family functioning.	Childhood EF skills can predict later outcomes. Strongest predictors were working memory, deficits in working memory predicted

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		up 216 women between the ages of 17-23		difficulties in school, work, and task performance. A measurement of sustained attention better predicted employment status over IQ or diagnostic group status.
Razza, Bergen-Cico, & Raymond, 2013	Quantitative	34 3-5 year olds, (18 intervention and 16 control) from 2 preschool classrooms.	Pretest/posttest, questionnaires, individual assessments	Students that participated in the mindful yoga program showed an increase in EF skills, particularly inhibitory control. They did not see an improvement in focused attention.
Sasser & Bierman, 2012	Mixed methods	2 cohorts of 4 year-old children, 164 total, attending 22 different Head Start classrooms.	Longitudinal research, direct assessments, teacher ratings, and interviewer ratings.	Children with low EF skills were less socially competent. Children with low EF skills were significantly lower in numeracy skills.
Vuontela, Carlson, Troberg, Fontell, Simola, Saarinen, & Aronen	Quantitative	54 children 7.8-11.8 years old, from areas of good socioeconomic status	Computer based n-back, Continuous Performance Task (CPT) to test for attention, working memory task and Go/No-go tasks which looked at response inhibition, the Teacher Report Form and Child Behavior Checklist completed by teachers.	Inhibitory control was the most important EF to predict adaptive functioning, academic performance at school and less psychiatric symptoms. Further studies are needed on associating inhibitory control and internalizing symptoms in nonclinical and clinical child populations
Fuhs & Day, 2011	Quantitative	132 children from 43 to 63 months, 50%	Battery of tests designed for EF assessment. Including response inhibition	Verbal ability has a significant role in development in EF. There is a need to

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		female. English as first language.	assessments (Head/Feet game, and Day/Night Stroop task), attention shifting (The flexible item selection task), Teacher report (Inhibition scale and shifting scale from BRIEF-P), and verbal ability (subscales taken from the Wechsler Preschool and Primary Scale of Intelligence)	conduct studies on self-speech used to regulate actions and plans. Classroom practices that encourage self-talk may help develop self-regulation skills.
Weiland, Barata, & Yoshikawa	Quantitative	400 4.5-5 year old children attending preschool programs in public school	Working memory tests (Forward digit span and backward digit span), Attention shifting tests (Dimensional Change Card Sort), Inhibitory cognitive control (Pencil Tapping task), Receptive vocabulary (PPVT-III) Assessment were conducted in school in one-on-one pull-out sessions	EF skills in the beginning of preschool positively associated with end of kindergarten receptive vocabulary. Receptive language in the beginning of preschool did not predict end of preschool EF skills. EF skills increased during the preschool year.
Williford, Whittaker, Vitiello, & Downer, 2013	Mixed Methods	341 Preschool Children enrolled in 100 preschool classrooms. All typically developing. 67% low-income Hispanic children.	Surveys (teacher-child rating scale, emotion regulation checklist), observations (at least 2 visits a year, 4 participants were observed in 15 minute cycles, teacher reports were also collected), assessments (pencil tap task and toy sort)	Positive interactions with teacher were related to executive control. Children actively engaged in classroom tasks made gains in emotional regulation skills. Quality of interactions between teachers, peers, and learning materials varied greatly in programs. Further studies are required to look at quality of programs

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				and specific experiences needed in programs.
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3.2.1. Research Design

Nine of the studies (69.2%) used a quantitative research design (Albertson & Shore, 2008; Blair & Razza, 2007; Davidson et al., 2006; Ivrendi, 2011; Kelly & Hammond, 2011; Razza et al., 2013; Vuontela et al., 2012; Fuhs & Day, 2012; Weiland et al, 2013). 4 of the studies (30.7%) used a mixed methods research design (Diamond et al., 2007; Miller et al., 2011; Sasser & Bierman, 2012; Williford et al., 2013).

3.2.2. Participants and data sources

A majority of the research studies included in this meta-synthesis collected data from preschool aged students enrolled in preschool programs. Out of the 13 studies 9 of them (69.2%) collected data from preschool children ages 3-5 (Albertson & Shore, 2008; Blair & Razza, 2007; Diamond et al., 2007; Ivrendi, 2011; Razza et al., 2013; Sasser & Bierman, 2012; Fuhs & Day, 2012; Weiland et al, 2013; Williford et al., 2013). 4 of the studies (30.7%) included children past the preschool age (Davidson et al., 2006; Kelly & Hammond, 2011; Miller et al., 2011; Vuontela et al., 2012).

In the research studies included in this paper 12 (92.3%) used tests/assessments given to the participants by trained professionals to collect data (Albertson & Shore, 2008; Blair & Razza, 2007; Davidson et al., 2006; Diamond et al., 2007; Ivrendi, 2011; Kelly & Hammond, 2011; Razza et al., 2013; Sasser & Bierman, 2012; Vuontela et al., 2012; Fuhs & Day, 2012; Weiland et al, 2013; Williford et al., 2013). Out of those 12 studies 2 (16.7%) also used surveys and rating scales (Sasser & Bierman, 2012; Williford et al., 2013). One (7.7%) study used a longitudinal study (Miller et al., 2011).

3.2.3. Finding of the studies

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The findings of the 13 research studies included in this meta-synthesis can be summarized as follows.

1. More studies are needed to definitively show the importance of EF and how play supports EF skills. Many studies included in this meta-synthesis mentioned that data in this area is limited due to the accessibility of programs as well as a small sample sizes as many programs are available to only qualifying populations.

2. Students that participated in programs that included activities to directly target EF showed an increase in EF abilities. Activities that included student movement, play, teacher scaffolding, and student interest increased the development of EF; particularly impulse control. In programs that were more academically based (literacy programs, theme based) EF skills were less developed.

3. Inhibitory control is the most important EF to predict student success in school in the early years in math and reading abilities. Students that participated in programs that improved inhibitory control also increased math and reading abilities.

4. Programs that included “self talk”, positive peer and adult interactions, dramatic play, and adult scaffolding during play showed an increase in EF. These programs had structured play designed by teachers to encourage self-talk, planning, and expansions of ideas within small groups. Self-talk, also known as private speech or egocentric speech, is linked to later school success.

3.3. Emergent theme

5 themes emerged from my analysis of the 34 articles included in this meta-synthesis. These emergent themes, or theme clusters, include: (a) symbolic play increases inhibitory

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control; (b) purposeful and quality programs are needed to increase EF skills in the preschool years, ages 3-5; (c) further studies/assessments are needed in the development of EF in early childhood; (d) Quality among preschool programs varies greatly; (e) the development of EF skills is a predictor of later school success and positive life choices. These 5 theme clusters and formulated meaning are represented in Table 3.

Table 3

Theme Clusters	Formulated Meanings
<p>Symbolic Play Increases Inhibitory Control</p>	<ul style="list-style-type: none"> ● During play children must follow rules to play a role. ● During play students must observe, restrain, and respond. ● Children must remember what their role in the play is as well as others. ● Children build EF skills through meaningful social interactions. ● Children must decide on prompts that may be needed and work together to gather the prompts, without becoming distracted. ● Make believe games (dramatic play) with rules promote EF skills as children determine, negotiate, and follow rules. ● Inhibitory control appears to be the first EF to develop in the preschool years, when symbolic play is at its peak. ● Symbolic play is a natural way for preschool aged children to learn and experience their environment. ● During symbolic play children must ignore outside distractions to stay engaged with the activity. ● During symbolic play teachers can increase the play scheme to support the student in using higher-level thinking. ● Symbolic play allows students to try on different roles and experience different limitations or rules. ● Symbolic play involves turn taking and sharing materials, which supports inhibitory control.
<p>Purposeful and quality programs are needed to increase EF skills in the preschool years, ages 3-5.</p>	<ul style="list-style-type: none"> ● Programs with small adult/student ratios allowed for more intricate play schemes, leading to higher thinking skills. ● EF skills are shown to increase dramatically in the preschool years. ● Programs, which included adult interactions to help students plan, stay on the plan, and encouraged self-talk showed increase in EF skills. ● Adults are needed to scaffold play to ensure students are increasing their abilities as well as modeling the next steps. ● Programs which adults were play partners, instead of directors or observers, showed an increase in EF and higher level play schemes.

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	<ul style="list-style-type: none"> ● Programs that were too structured (with the adult leading most activities, decrease in open choice time) showed a decrease in EF development. ● When self-talk, or private speech, is demonstrated by an adult during play children are more likely to use it. Self-talk is linked to inhibitory control. ● Children’s play must evolve to higher levels to support the development of EF skills. ● Activities must be scaffold to meet individual needs; this requires the ability to work in small groups. ● Appropriate amounts of time must be allowed for children to plan and execute play schemes. Teachers must honor this need. ● Adult involvement to help students maintain engagement in EF developing activities. ● Activities must be designed or set up to address specific EF skills, children left to develop games on their own may not practice the EF skills. ● Successful EF programs emphasize oral language, active hands-on approach, encourage social learning, and use student interests to design activities. ● Individual EF components emerge before age 3; ages 3-5 are an important period in the development of EF. ● Children that attended programs that had specifically designed activities to develop EF skills show an increase in EF skills as well as literacy skills over those in literacy-based programs. ● Studies showed that positive interactions with teachers are related to gaining EF. ● Children must be actively and positively engaged in classroom activities to increase EF. ● Programs, which had negative peer interactions showed limited growth in EF and increase in behavioral outbursts.
<p style="text-align: center;">Further studies/assessments are needed in the development of EF in early childhood.</p>	<ul style="list-style-type: none"> ● Many studies in EF are limited in age ranges. ● Many studies are working with a limited population. ● The development of EF skills in children experiencing delays requires additional research. ● Some research points to links of low EF skills and ADD/ADHD and Dyslexia. ● EF skills increase in children between ages 4 and 5. ● Most research on EF skills is not focused on impact in academic areas.

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	<ul style="list-style-type: none"> ● Interventions aimed at specific EF skills show a short-term effectiveness, further research is needed to show long-term effects. ● With limited research on EF developing activities, it is unknown how many activities do support the development of EF skills. ● Findings suggest that verbal ability in at risk populations can impact EF development; however, this research is limited. ● Longitudinal studies are needed to better understand interventions in EF development. ● Research on specific strategies or practices needs to be done to better educate teachers in ECE. ● Tasks to measure EF abilities in children are limited as many are aimed for older students and adults. ● Studies that include developmental trajectories for EF in different groups of children (typically developing, children with ADHD, Autism, or Sensory Processing Disorder). ● Studies of environmental influences on EF and the interventions needed for those at risk. ● Limited assessments aimed at preschool students has led to limited evidence on the development of EF and symbolic play. ● Studies suggest that early intervention for children in developing EF may reduce the risk of negative outcomes. ● Research shows a connection between low EF and behavioral problems. However more research is needed to understand the connection and how to develop interventions. ● Longitudinal studies are needed to show the role of EF and behavioral problems in later years. ● Studies that are focused on the correlation between positive peer interactions and the development of EF are needed. Early studies show that positive peer interactions are necessary for EF development.
<p>Quality among preschool programs varies greatly</p>	<ul style="list-style-type: none"> ● Preschools in the country vary greatly by funds, staffing, and materials. ● Limited resources for early education prevent preschool programs from providing a quality program. ● Very few preschool teachers receive instruction on EF skills and how to improve EF skills.

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	<ul style="list-style-type: none"> ● Evidence shows that EF skills can be increased in preschool classrooms when they are included in the class curriculum. ● Pressure to devote majority of class time to academic tasks (counting, alphabet, memorizing information) has led to a decrease in “play” time, which is where EF skills are best developed in early childhood. ● The experiences that play the biggest part in shaping a child’s brain involve the child’s caregiver and their ability to support development. ● The pressure of learning pre-academic knowledge prevents educators from meeting students at their developmental level, focusing on activities that will increase student’s abilities to learn. ● Positive interactions in preschool programs vary greatly depending on each preschool’s resources and staffing.
<p>The development of EF skills is a predictor of later school success and positive life choices.</p>	<ul style="list-style-type: none"> ● Curriculum designed to increase EF increases student success in school. ● Inhibitory Control predicted success in math and literacy. ● Students that tested low in EF skills also tested low in literacy skills. Those that tested high in EF skills tested high in literacy skills. ● EF skills are building blocks in cognitive and social capacities. ● Studies following students show that students with stronger, or more developed, EF skills were more likely to stay in school as well as make positive life choices. ● Development of EF skills is critical for success in the twenty-first century. ● Development of EF skills increase abilities needed to be successful in the classroom, such as maintaining attention. ● A direct link between EF skills and number sense/mathematical skills were found. ● EF scores better predict later outcomes of a student than IQ scores. ● Students with higher EF skills displayed less behavioral problems both in the school setting and out. ● Strong EF skills in the beginning of preschool are associated with end-of-kindergarten receptive vocabulary.

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4. Discussions

In this section I have summarized the emergent themes from the 34 articles used in this meta-synthesis. I then connected the emergent themes to my personal experiences as a special education preschool teacher and how I will use the information to better my educational environment.

4.1. Symbolic play increases inhibitory control

In the preschool years the child's brain is developing quickly. In this development the first executive function (EF) to emerge is inhibitory control: the ability to control impulses, think through our actions, and manage the surrounding distractions. Also during this time an increase in symbolic play (dramatic play) occurs; that is play using materials to represent real life objects, play schemes, and assigning roles in play. This type of play is a natural way for preschool aged children to learn and explore their environment. During this play, inhibitory control is practiced as students must learn to follow rules of the roles they are playing, waiting for turns with materials and follow the leads of others. Inhibitory control is also practiced during this play. As students develop plans with another student, they must remember the plan that was made and follow it to stay engaged in the activity, as well as control their impulses to take over roles that others are playing. While symbolic play will naturally occur within a group of peers, a teacher can help structure the activity to introduce skills that students are ready for, as well as increasing development of inhibitory control.

Using a student's interests and abilities to increase their skills is the most effective way to support the development of a child. In the classroom I can use the above knowledge to create an environment that will support symbolic play. By understanding how the skills involved in inhibitory control are developed, I can scaffold symbolic play to meet the needs of my students.

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As a special education teacher, I recognize that for many of my students joining in in symbolic play can be difficult due to delays in communication, physical disabilities, as well as sensory integration issues. Since symbolic play is a significant part of developing inhibitory control, I will make it a priority to structure symbolic play in my classroom that is accessible to all. This may include smaller groups in the symbolic play area, using familiar stories to encourage participation, providing adult support, as well as modified materials, to create plans and stay with the plan. As an early childhood educator, I believe symbolic play is an invaluable part of a young child's education and will make it a purposeful activity in my classroom. Through my research I have found that inhibitory control in early childhood is a strong predictor of later school success, specifically in literacy and math skills. A focus on symbolic play in the classroom will support the development of inhibitory control.

4.2. Purposeful and quality programs are needed to increase EF skills in the preschool year, ages 3-5

Between the ages of 3 and 5 children are developing skills and learning about their environment. Programs that work with this age group should provide quality activities that focus on the development of EF. During this time, EF skills are being developed through positive interactions between peers and adults, scaffold activities, and adults as active play partners rather than directors or observers. Programs that work with preschool aged children need to have purposeful activities that encourage self-talk, peer interaction, and adult involvement. Activities that are designed to support EF development increase student success and literacy skills. These are activities that have students create play plans, encourage self-talk, require students to play by rules, take turns, and remember the play event. Activities based on literacy themes that is

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activities and materials that are linked to a story do not show as big of a growth in literacy skills. Programs that are designed to support EF must reserve enough time in the day to allow children to plan and execute play schemes with peers, allowing for these play schemes to expand and reach higher level skills.

One of the areas an early childhood educator must defend is how much time they allow for “play” during the day. We are often faced with adults that expect to walk in a classroom and see students working on clearly academic tasks such as working on letters, sorting activities, sequencing stories, or math activities. However, programs that target EF skills show an increase in EF development. The development of EF, specifically inhibitory control, is directly linked to greater school success and academic performance. EF skills are developed through play, the natural language of children. As an early childhood educator I will reserve a significant amount of time in my classroom for purposeful symbolic play. This play will include adult play partners to expand play schemes as well as push students to higher levels of thinking. With emphasis in oral language, self-talk, planning, and positive peer interactions my program will support the development of EF skills in preschool aged children.

4.3. Further studies/assessments are needed in the development of EF in early childhood

While research into the development of the brain in early childhood and EF has increased there is still a need for more direct and longitudinal research. Much of the research available is limited in age ranges, populations, and additional data. The research aimed at populations experiencing delays or disabilities is extremely limited. Those that do are primarily focused on ADHD/ADD, and ASD. Most research has a focus on typically developing children. There is a lack of longitudinal studies in this area. While longitudinal studies cannot give definitive results due to the variables within them, they can be used to support the research that shows a

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connection between EF and school success as well as what programs may best address EF development. With limited research in this area, there are also limited assessments aimed at ages 3-5 to test for EF skills, which in turn makes it difficult for educators to know how to scaffold activities in their curriculum. The research collected for this paper suggests that intervention in the early years can increase EF skills, that strong EF skills are linked to school success as well as positive life choices, and that groups with strong EF skills have less behavioral problems.

As educators we create curriculum based on our students' needs and what we know to be best practices. With the research available it is easy to see that EF skills are an essential part of ECE; however, with limited research it is difficult to know exactly how to integrate EF into the curriculum and how to assess where our students currently are. I will continue to educate myself on the research as it develops and use tools that are known to increase EF skills in my classroom. I will be able to defend the use of play and play therapy in my classroom as well as the focus on EF skills in addition to academic skills by using the current research.

4.4. Quality among preschool programs varies greatly

Preschool programs in our state (and country) are limited and vary greatly in their quality as well as their availability. Differences in funding result in preschools being understaffed or staffed with untrained adults. In preschools that are state funded, a pressure to focus on academics can reduce the time needed for play, an essential part of a child's development. Research shows that one of the biggest impacts in a child's development is the positive relationship with a care giver. As teachers we are often the adult, aside from the guardian, that sees the child the most. In order to create these positive relationships preschools need to be properly funded and staffed so students can work in small groups and receive the attention they

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need from adults. This theme is linked to the need for more research in ECE and EF skills so we can create better preschool programs that are accessible to all.

As a preschool teacher, I can take the information available to me and use it to strengthen my program. By working with my fellow ECE professionals I can share ideas and knowledge in hopes to strengthen my program as well as others. I can take what I have learned as an ECE educator and advocate for the need of quality preschool programs, using the available research to show the benefits of quality preschool programs. I believe that creating programs for early childhood education that have a focus on EF development benefits children with disabilities as well as typically developing children.

4.5. The development of EF skills is a predictor of later school success and positive life choices

Research shows that students with strong EF skills in particular inhibitory control have greater school success as well as making positive life long choices. It has been shown that students that tested low in EF skills also tested low in literacy skills; students with high EF skills also tested high in literacy skills. This is also true when looking at mathematical skills. Students with high EF skills also displayed less behavioral problems. This in turn allows for longer time available for academics. Teachers that are able to spend less time on behaviors in their classroom are able to spend more time in small group instruction. Longitudinal studies showed a correlation between low EF skills in the early years and students that did not complete high school and made high-risk choices outside of school.

In education, we strive to help students meet their potential and become successful members of our society. By supporting the development of EF skills in the early childhood we can support students in their future school success. With research showing that EF skills are predictor to the success of a student, we must support EF development through quality programs.

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In my classroom I will implement plans to support EF development based on my students needs: specifically, inhibitory control. I will educate my staff on the importance of EF skills and how they as adults can support the development in the classroom. And perhaps most importantly, I will defend the time used in the classroom to play.

5. Conclusion

The information that was found and added to this meta-synthesis supports the need for play in the early childhood classrooms. Play, which is the natural language of children, is where students will be engaged and most confident in their abilities. In play children learn how to navigate social interactions, how to problem solve, apply rules, and explore their environment. Also through play children begin to develop inhibitory control, a larger indicator in school success than IQ. With inhibitory control children learn how to maintain focus, take turns, use materials with purpose, follow given rules, and how to follow a plan. These are skills that are absolutely necessary for later school success. If a student has poor inhibitory control they will have difficulties in staying with the group, maintaining attention to receive information, working with partners or small groups, and following rules that allow classrooms to function. Neurological research shows that inhibitory control begins to develop in ages 3-5. This is also when symbolic play is at its highest. When we do not use this time to develop these skills, we miss an invaluable opportunity to support later school success.

As we continue to face cuts in education preschool programs lose funding. The research that is available shows a correlation between students that receive preschool services and later school success. If you ask primary teachers what they want students to be able to do when they enter a classroom it is not know the alphabet, be able to count to 100, or other academic skills.

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They want students to be able to come in and join in classroom routines, stay with the group, work with peers, problem solve, and maintain attention. These are executive functions; these are the skills early childhood should focus on. Early childhood educators need to use research to support the need for early education, with properly staffed programs, to improve student success and lead to fewer interventions later.

As mentioned early on in this paper, I had been approached by a fellow special education teacher that felt that all I did was “play” with my students. Since making that comment this teacher has apologized. She shared that since working with kindergarten students she now understands that my program is focused on helping students learn how to function in school, how to use their executive functions to do their work in the classroom. Students that have left my room have entered kindergarten with stronger EF skills than they would have had, and they are more capable of accessing their educational environment. According to the research they will be better equipped to make life decisions and will go farther in their education. As an educator, that is my goal. Yes, we play in preschool, and in this play we learn how to be a student and member of a community. Through play we teach executive functions, a group of invaluable skills that better predict and support student success than IQ or pre-academic skills. Executive functions are directly linked to literacy and mathematical success in school and low executive functions are directly linked to behavioral problems and difficulties in school. As we continue to learn more about EF and ECE we must use this knowledge to create and support quality early childhood programs.

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