

THE DIFFERENCES BETWEEN BOYS' AND GIRLS' ACTIVITY LEVELS DURING  
PLAY, AND THE RELATIONSHIP BETWEEN THESE DIFFERENCES AND THEIR  
SENSORY PROCESSING PATTERNS

BY

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## Table of Contents

Acceptance Page .....	2
Acknowledgments .....	4
Abstract .....	5
Introduction .....	6
Literature Review .....	7
Purpose and Research Hypotheses .....	13
Methods .....	13
Participants/Setting .....	13
Materials/Instrumentation .....	14
Procedures.....	15
Data Analysis .....	16
Results .....	17
Discussion .....	20
Implication for Practice .....	21
References .....	23
Appendix A: Comprehensive Literature Review.....	27

## Abstract

Play is the primary occupation for young children. There is no evidence that explains if boys and girls prefer different body positions while playing or if body position might be used to measure their activity levels. The purpose of this study was to examine the differences in activity levels and sensory processing preferences between 53 typically developing preschool-aged boys and girls using observations of play and the Sensory Profile. Results revealed no significant differences between boys and girls in body position mean ( $p = .33$ ) body position standard deviation ( $p = .19$ ), total number of change position times ( $p = .28$ ), and their sensory preferences for activity level, body position and movement ( $p = .89$ ). However, we found a significant difference between children who have younger siblings in relation to these sensory preferences ( $p = .05$ ). Future research should investigate children's play in outdoor playgrounds, and implement more rigorous methods in rating children's activity levels.

## Introduction

Occupational therapy is founded on an understanding that engaging in occupations structures everyday life and contributes to health and well-being (Roley, et al., 2008).

Occupation is referred to as productive activities that people engage in throughout their daily lives to fulfill their time and give life meaning, and occupational therapists are unique in their emphasis on productive activities (Missiuna & Pollock, 1991; Roley, et al., 2008). These activities reflect cultural values, provide structure to living, and meaning to individuals (Roley, et al., 2008). Furthermore, they meet human needs for self care, enjoyment, and participation in society. Play is considered one area of occupation. It is valued as a major occupation in which people engage throughout their lives (Bazyk, Stalnaker, Llerena, Ekelman, & Bazyk, 2003). In the occupational therapy practice framework, play is defined as any spontaneous or organized activity that provides enjoyment, entertainment, amusement, or diversion (Roley, et al., 2008).

Historically, play has been regarded by occupational therapists as both an indicator of development and a means for intervention (Miller & Kuhaneck, 2008). Play is a universal activity that promotes development (Bazyk, et al., 2003). It is a necessary occupation for children, and contributes to their physical, cognitive, and social development (Bundy, et al., 2008; Sturgess, 2003). To better understand play, occupational therapists should consider factors that influences how and why children play. The following sections briefly discuss literature related to how gender, activity level and sensory processing factors are related to play.

## Literature Review

### *Play in Literature*

Play is the primary occupation for young children, and has long been known to contribute to their physical, cognitive, and social development. (Bundy, et al., 2008; Sturges, 2003). Play facilitates the development and learning processes; as children move around and explore their worlds, they receive information through their senses and gain knowledge about the nature and properties of objects (Hamm, 2006; Missiuna & Pollock, 1991). During play, children have the opportunity to develop and test social and occupational roles, as well as, to discover what effect they can have on objects and people in their environment (Missiuna & Pollock, 1991).

Motivation to play includes both an exploratory component, in that children play for the sake of playing, and also a competency component that results from an inner drive to master the environment. Understanding factors that influence both the exploratory and competency components of play is important in facilitating free play for children to explore their own capacities, to feel they are internally motivated and controlled, to understand cause-and-effect relationships, to learn, to persist, and to understand consequences (Bundy, 1993; Missiuna & Pollock, 1991). For the purpose of this study, we limited the review to gender, physical activity and sensory processing factors –knowing there are many factors that influence children’s play-.

### *Gender*

Gender is one of the most studied variables that affect play choices and play preferences, and toys are highly gendered (Lewis, 1991). Researchers have found that children asked for gender stereotyped toys, and that boys and girls prefer and play with different toys (Blakemore & Centers, 2005; Green, Bigler, & Catherwood, 2004; Lewis, 1991). For example, boys prefer

vehicles, trucks, and outer- space toys, while girls prefer dolls, doll houses, and domestic toys (Blakemore & Centers, 2005). One reason behind these differences is that children, especially boys, who engage in cross-gender play are more likely to be criticized by parents, teachers, and peers (Freeman, 2007). Another reason may be that boys and girls predict their parents are more likely to approve if they play with same sex toys than if they were to play with cross-gendered or neutral toys. Psychologists thought that gender differentiation in play might be due to biological differences between boys and girls, and their cognitive conceptualization of gender (Green, et al., 2004). Also, psychologists emphasized the role of parents and peers in modeling and reinforcing gender appropriate play. In general, children's play behavior is guided by gender schemas that contain information about whether objects and activities are appropriate for boys or girls. In addition, children attend to and internalize environmental information about gender appropriateness of toys which in turn guides their own toy play behavior.

Same sex toys and play behavior may benefit children in many ways. For example, play with feminine stereotyped toys encourages girls to learn roles, to imitate behavior, and to use adults as a source of help, whereas boys' toys provide feedback for correct answers, and encourage boys to explore their environments independently (Cherney & London, 2006). However, selection of same sex play toys and play behaviors may have some disadvantages. It may limit children's experience and inhibit their ability to develop certain skills or characteristics that could be enhanced by engagement in cross-gender-typed toys and behaviors. For example, feminine stereotyped toys can elicit higher complexity of play (longer play sequences) than boys stereotyped toys, thus limiting boys' levels of play complexity.

### *Physical Activity Play*

Play in preschoolers can take several forms, and physical activity play is one of these forms (Pellegrini & Smith, 1998). It is the physically vigorous component of play, and often is also called locomotor play or exercise play. Examples of physical activity play include running, climbing, chasing, and play fighting. Physical activity levels are very important for children, not only for their physical development, but also for their cognitive performance after participating in physical activity. Forms of physical activity play may differ by age, but in general they begin in infancy and decline in early adolescence.

Home environment is very important in targeting physical activity behaviors, and the parent-child relationship contributes to aspects of skill and behavior development in children (Chiarello, Huntington, & Bundy, 2006). Fathers appear to socialize with their children through physical play, especially rough and tumble play (Flanders, Leo, Paquette, Pihl, & Séguin, 2009). Rough and tumble play RTP is a specific form of physical play characterized by aggressive behaviors, such as wrestling, in a play context. This form of play is very common in father-child play, and fathers tend to stimulate their children physically and push them to take risks (Flanders, et al., 2009). Physical activity play is very important for children to blow off excess energy, and for their physical development (Pellegrini & Perlmutter, 1988; Pellegrini & Smith, 1998). It is also important for children's cognitive performance subsequent to physical activity, and to their social organizations and social skills (Pellegrini & Smith, 1998).

Evidence suggests that boys exceed girls in the frequency of physical activity play, especially RTP (Pellegrini & Smith, 1998). Boys have higher rates of initiation of RTP while girls have higher withdrawal. This is because girls react differently from boys to tactile stimulation of the sort that characterizes RTP. In addition, the physical vigor and roughness typical of boys' play groups seem to be important factors for girls' segregating themselves from

boys' play groups. Besides RTP, boys tend to engage in exercise play at higher rates than girls. In studies examining children's exercise play, RTP was included with exercise play. Therefore, some of the gender differences in exercise play may be attributable to the well-documented gender differences in RTP. Researchers recommended further investigation in this area, and suggest this investigation will help people who are working with children in considering each child's needs and interests.

### *Play and Sensory processing*

Occupational therapy is unique in attaching meaning to sensory experiences (Dunn, 2001). Sensory processing refers to the registration and modulation of sensory information, and the internal organization of sensory input in order to execute successful adaptive responses to situational demands, therefore enabling meaningful engagement and participation in daily occupations (Engel-Yeger, 2008). In 1997, Dunn proposed a model for sensory processing that accounted for the nervous system's thresholds for acting and the person's propensity for responding to those thresholds (Dunn, 2001). Her model has proven useful in providing structure in gaining insights into the nature of sensory processing across the life span.

Dunn's model of sensory processing represents a continuum of possible conditions of thresholds and responding strategies (Dunn, 2001; Engel-Yeger, 2008). Dunn (2001) explained that a person's ways of responding to sensory events in daily life can be characterized as reflecting both a particular threshold and a responding strategy. Her model suggests four quadrants in which a person's responses to sensory events could fall on a continuum: *low registration* refers to high thresholds with passive responding strategies; *sensory seeking* refers to high thresholds with active responding strategies; *sensory sensitivity* refers to low thresholds

with passive responding strategies, and sensory avoiding refers to low thresholds with active responding strategies.

The Sensory Profile (Dunn, 1999) is one of the most prevalent tools for evaluating sensory processing patterns, and is based on the conceptual model proposed by Dunn in 1997 (Engel-Yeger, 2008). The Sensory Profile can be used to characterize children's behavior and performance in relation to their sensory processing patterns. In addition, it can measure the way in which those patterns support or interfere with the children's functional performance. A number of researchers attempting to investigate sensory processing patterns implemented the Sensory Profile as one measurement tool in their studies (Cheung & Siu, 2009; Dunn, 1994; Dunn & Westman, 1997; Engel-Yeger, 2008; Ermer & Dunn, 1998; Kientz & Dunn, 1997; Lawson & Dunn, 2008; Tomchek & Dunn, 2007). For example, Mische Lawson and Dunn (2008) studied the relationship between sensory processing patterns and play preferences. They suggested that children with different sensory processing patterns would prefer different toys. The study revealed the importance of considering children's sensory processing patterns when offering play materials. Similarly, Engel-Yeger (2008) attempted to study sensory processing patterns and play preferences of Israeli children. The study results suggest that typical children's sensory processing patterns may be associated with their preferences for different activities, and that sensory processing deficits affect children's activity preferences and their occupational needs. In summary, researchers in this field shed light on the importance of sensory processing abilities and how they affect all aspects of children's daily life, especially play and leisure (Bundy, Shia, Qi, & Miller, 2007).

### *Summary*

Occupational therapy aims to provide maximum engagement and participation in daily life occupations, and play is considered the primary occupation for young children. Occupational therapists should take into consideration that play is one method that facilitates development and socialization in early childhood. Recognizing the differences between boys' and girls' play and toy preferences provides insight into their choices in playing and participating in activities that are meaningful and purposeful to them. Although literature revealed that boys and girls differ in their activity levels, especially in the frequency of engaging in physical activity play, we still do not know if they prefer different body positions while playing or if body position can be used to measure differences in activity levels between them. This is important in facilitating play and play environment for all children, and in designing therapy for children with various challenges and needs. Because occupational therapists should consider each child individually, we should keep in mind that each child is different in assigning meaning to various play experiences and that children are different in their sensory processing patterns. To maximize the individualistic view, it is helpful for occupational therapists to relate children's sensory meaning to their play experiences.

Occupational therapists know that children are different in their sensory processing patterns, and these patterns affect their play preferences (Lawson & Dunn, 2008). Literature suggests that boys and girls have different play and toy preferences (Blakemore & Centers, 2005; Cherney & London, 2006; Miller & Kuhaneck, 2008), and boys tend to engage in physical play at higher rates than girls (Pellegrini & Smith, 1998). In depth study of various types of play and how these types vary with gender will help occupational therapists be more effective in using play as an occupation and a therapeutic tool.

## Purpose and Research Hypotheses

The purpose of this study is to examine the differences between typically developing preschool-aged boys' and girls' activity levels and sensory processing preferences. To address this purpose, we used data from Mische-Lawson and Dunn (2008) and examined the interaction between gender, observed body position during play, and children's sensory preferences. We hypothesized that analyses of play observations and children's Sensory Profiles will indicate that 1.) Using observations of play, boys will have greater activity levels during play than girls 2.) Using the Sensory Profile, boys will have lower scores (indicating greater sensory preference) for activity level, body position and movement than girls and 3.) Boys will have greater sensory preference for activity level, body position and movement and also will have greater activity levels during play. For the third hypothesis, we assumed that boys' and girls' sensory preferences are related to their play behaviors.

## Methods

This study retrospectively analyzed data from Mische Lawson and Dunn's (2008) study that examined the relationship between sensory processing and play preferences of preschool-aged children. Mische-Lawson and Dunn (2008) used the Sensory Profile (Dunn, 1999) and observations of each child's play behavior as tools for collecting data. Results indicated that children's sensory processing patterns influence their play preferences (Mische-Lawson & Dunn, 2008). We used Mische-Lawson and Dunn's (2008) original data set for more in-depth analysis; therefore we provided a thorough description of methods used in Mische-Lawson and Dunn (2008) in the following sections.

### *Participants/ Setting*

Mische-Lawson and Dunn (2008) conducted their study in a suburban preschool, which served approximately 99 children between ages 3-5 years in Kansas. The sample consisted of 53 typically developing children of which 29 were males and 24 were females. Researchers recruited children via an invitation to participate during a parent information meeting at the preschool with follow-up materials that teachers sent home with children, and via monthly newsletters. Researchers obtained approval to conduct the study from the University of Kansas Medical Center's Human Subjects Committee, and informed consents from parents. Secondary data analysis for this study took place in the occupational therapy department in the University of Kansas Medical Center.

#### *Materials/Instrumentation*

The Sensory Profile (Dunn, 1999) is a caregiver questionnaire documenting children's responses to sensory events in daily life. When using this instrument, caregivers report the frequency their children engage in behaviors described by each of the 125 items using a 5-point Likert-type scale (always, your child responds in this manner 100% of the time; frequently, 75% on the time; occasionally, 50% of the time; seldom, 25% of the time; or never, 0% of the time) (Dunn & Daniels, 2002; Mische-Lawson & Dunn, 2008). Dunn (1999) divided the questionnaire into sections by sensory systems (general processing, auditory processing, visual processing, touch, movement processing, and oral sensory processing (Mische-Lawson & Dunn, 2008). Dunn have normed this instrument on more than 1000 children without disabilities and 150 children with disabilities. Dunn (1999) reported the internal consistency of the Sensory Profile, and the values of Cronbach's Alpha ranged from .47 to .91. In addition, she reported the Standard Error of measurement from 1.00 to 2.80. Dunn (1999) established the content,

construct, convergent, and discriminant validity of the Sensory Profile during the development of this instrument.

Mische-Lawson and Dunn (2008) rated activity level by body position (1=prone; 2=supine; 3=sit; 4=kneel and 5= stand), and by movement (1= completely still; 2= small motor manipulation; 3= rocking or fidgeting in the absence of other body movements; 4= large-motor arm and/or leg movements in the absence of other body movements; 5= walking, climbing, rolling, crawling, throwing, active fighting over a toy, pulling on a toy; and 6= running, dancing, chasing another child, jumping). For each interval, Mische-Lawson and Dunn (2008) recorded the highest level of activity observed, and listed the name of toy(s) the child played with. Two independent raters established inter-rater reliability estimates for the rating of body position, body movement, and toy preference from simultaneous observation of 15.5% of the total observations, and Kappa values (body position 94.5%, body movement 82.6%, and toy 87.6%) indicate near perfect agreement.

### *Procedures*

In Mische-Lawson and Dunn (2008), researchers sent the Sensory Profile and a demographic form home with each participant for completion, and included study updates in the preschool monthly newsletter. When researchers received participant's Sensory Profiles and their demographic forms, they scheduled with each child's preschool teacher times to observe the child's free-play behavior. Play observations consisted of observing the child's play activity level and play material choices five minutes per day on five separate days using a discontinuous 15 second partial interval recording system. Evidence suggests a 5-minute session assessment process (most time efficient) produces results similar to results obtained during 10-minute and

15-minute sessions (least time efficient) processes (Reid, DiCarlo, Schepis, Hawkins & Stricklin, 2003). Therefore, a 5-minute observation session is generally efficient in capturing true behavior. Mische-Lawson and Dunn (2008) conducted observations within three and a half months, and discontinued after observing each child on five separate days.

### *Data Analysis*

To determine if boys and girls have different activity levels during play, we performed t-tests using gender as the independent variable and body position mean summary scores (from observation) as the dependent variable. We expected boys to have higher body position mean scores indicating greater energy expenditure. As with the original study, we also used the standard deviation of body position as a summary score and conducted the same t-test. In addition, we used the total number of times (out of 100 data points) children change position as a summary score and conducted the same t-test. We expected boys to have greater standard deviation of body position, and greater number of position change times. This would indicate greater variability of body position, which could be interpreted as greater activity level during play. We chose to conduct one-tailed t-tests because we were comparing two independent groups that contained independent set of subjects with no inherent relationship derived from repeated measures or matching (Portney & Watkins, 2000). To analyze this hypothesis and the followings, we set the  $p$  value at the standard level of .05 and used SPSS 17.

To determine if boys and girls have different sensory processing preferences, we created a summary score combining activity level, body position and movement items in the Sensory Profile, and interpreted lower scores on these items as greater preference for movement. These subsections of the Sensory Profile combine items that indicate seeking, avoiding, sensitivity and

low registration preferences; therefore, we separated summary scores to reflect these preferences. Because we examined typical children who would not exhibit extreme patterns of sensory processing, we divided the participants into quartiles to represent the range of sensory processing patterns of our sample. We conducted Analysis of Variance ANOVA using the quartiles (1=bottom quartile and scored under 90, 2=middle 50% and scored 91-101, 3= top quartile and scored 102 and greater) as the factor variable, and demographic information (number of older siblings, number of younger siblings, twin sibling, age, medical diagnosis, educational diagnosis, label, special services received, income, and gender) as the dependent variables. ANOVA is a powerful analytic tool to compare three or more conditions or groups, and to determine if the observed differences among a set of means are greater than would be expected by chance alone (Portney & Watkins, 2000). Our results did not support the first and second hypotheses, so we did not run the analysis for the third hypothesis to investigate the relationship between activity levels during play and sensory preferences. We will provide in-depth explanation in further sections.

## Results

To evaluate the first hypothesis that boys have greater activity levels during play than girls, we compared the observed activity levels of boys and girls. The independent-samples *t* test that compared body position mean summary scores revealed no significant difference,  $t(51) = .456, p = .33$ , between boys and girls (see table 1). For the first hypothesis, we also conducted independent-samples *t* tests to compare body position Standard Deviation (SD) and total number of change position times. We found no significant differences in body position (SD)  $t(51) = -.87, p = .19$ , and total number of change position times,  $t(46) = -.60, p = .28$ , between boys and girls.

Table 1

*The independent-samples t tests comparing observed play position between boys and girls.*

Statistics (Boys n= 29, Girls n=24)				
	Mean	Standard Error	<i>t</i>	<i>p</i>
Variables	Difference	Difference		
Body Position Mean	.05	.12	.46	.33
Body Position SD	-.04	.04	-.87	.19
Body Position Change	-1.12	1.88	-.60	.28

Regarding the second hypothesis that boys have lower scores (indicating greater sensory preference) than girls in items that reflect activity level, body position, and movement in the Sensory Profile, the one-way ANOVA revealed no significant difference,  $F(2) = .12, p = .89$  between children's ranked seeking quartiles and their gender (see table 2). This indicates there is no difference in boys' and girls' sensory preferences for activity level, body position and movement. The test also compared children's ranked seeking quartiles with other demographic information, and revealed a significant difference,  $F(2) = 3.23, P = .05$ , only between children who have younger siblings and their sensory preferences for activity level, body position and movement. More specifically, Least Significant Differences (LSD) post hoc analysis showed a significant difference ( $p = .02$ ) between children who are most seeking (bottom quartile of seeking scores) and children in the middle group (middle quartile of the seeking scores). This difference indicates that children who have younger siblings have greater sensory preference for activity level, body position and movement than children who do not have younger siblings.

Table 2

*The one-way ANOVA for children's ranked seeking quartiles and their demographic information.*

Statistics (Boys n= 29, Girls n=24)		
Variables	F	P
Gender	.12	.89
Age	.94	.40
Medical Diagnosis	.62	.54
Educational Diagnosis	1.00	.38
Label	.29	.75
Number of Older Siblings	.23	.80
Special Services Received	.67	.52
Number of Younger Siblings	3.23	.05*
Twin Sibling	.36	.70
Income	1.15	.33

Because we did not find significant differences between boys' and girls' sensory preferences for activity level, body position and movement, or their observed activity levels during play, we did not run the third analysis to determine if boys' higher activity levels during play are related to their sensory preferences for activity level, body position and movement. Our results did not support our anticipated hypotheses, but revealed some possible explanations discussed further in the next section.

## Discussion

Results from analyzing observations of children's play did not support our first hypothesis that boys have greater activity levels during play than girls. Although literature suggested boys exceed girls in the frequency of physical activity play, especially RTP (Pellegrini & Smith, 1998), our results did not support this notion. One reason might be the ratings of body position did not represent children's actual activity levels. For example, children who were playing with toy cars in a prone position might push them the same way as children who were sitting, thus exhibiting the same activity level. Also, children who were walking around while kneeling might have more energy expenditure than children who were playing in a standing position. Therefore, the sitting and the standing positions in these two cases might not indicate higher activity levels. A second reason might be children were engaging in play in the classrooms, which might restrict their tendency to engage in physical activity play. Evidence suggests that a supportive environment is important to trigger physical activity in children, and that barriers in the physical environment discourage children from engaging in physical activity play (Franzini et al., 2009). The indoor classrooms where observations took place for this study may not have been supportive of physically active play, because free play and outdoor recess allow children to move and engage in daily physical activity more than indoor play. A third reason might be that parents and teachers expect children to be less active when they enter school; therefore, children start to less engage in physically active play. Mische-Lawson and Dunn (2008) explained that during the data collection of the original study when children were engaging in highest activity level of play, teachers were directing them to a quieter activity.

Although literature reports that boys' prefer physical activity play more than girls, results from this study did not support our second hypothesis that boys have greater sensory preference

for activity level, body position and movement than girls. One reason might be our sample was not representative of boys in general. Children in this study were all from the middle class; therefore, they might have more exposure to television and video games causing them to prefer sedentary activities. Singh, Kogan, Siahpush, and van Dyck (2008) found that television viewing was associated with inactivity levels among children less than 12 years. They also found that parental inactivity levels significantly influence physical activity among all children. This could be another reason that the boys in this study did not show greater sensory preference for activity level, body position and movement than girls. Finally, the Sensory Profile might not be the best tool for measuring preferences for physical activity as it is not designed to have items taken out and used in isolation (or sub-groups). We grouped items according to clinical experience and professional opinion, so they may not be the best ones to capture children's true preferences.

In summary, our study did not indicate that boys and girls have different activity levels during play nor did they prefer different activity levels. Future research should develop a more rigorous method to rate activity levels of children during play. Also, future research should investigate children's play in various environments that support their preferences and needs, and bring meaning to their play experience. More specifically, researchers should study children's activity levels in playgrounds because they encourage children's engagement and participation in physical activity play.

#### Implication for Practice

Studying children's play is important for occupational therapists to facilitate meaningful play experiences for all children. Knowing that children are different in assigning meaning to various play experiences is important in designing environments that match their play choices and play preferences. Results from this study underscored that occupational therapists view

people as individuals when they work with children and their families. Occupational therapists consider children's and families' needs a priority, and help them engage in what they find meaningful in their life.

Knowledge about various sensory processing patterns provides insights for occupational therapists regarding the impact of children's sensory processing on their daily life. Play is children's daily occupation through which they learn and develop. Knowing that some children exhibit a particular sensory processing pattern does not mean that occupational therapists should change it. When children find challenges in engagement and participation, occupational therapists work with children and their families to find ways to adapt to various life situations, or design environments that support their participation.

The school playground is a good place to support children's play choices and activity levels. Supplying school playgrounds with various equipment and materials may help children meet their sensory and play preferences. Occupational therapists working in the school environment should be aware of children's differences in how they assign meaning to their play experiences. Also, occupational therapists should provide encouragement to play choices that reflect children's needs and sensory preferences, and help children who face challenges adapt the environment in a way that enhances their participation in meaningful play experiences.

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## Appendix A

The Differences between Boys' and Girls' Activity Levels during Play, and the Relationship  
between these Differences and their Sensory Processing Patterns

Comprehensive Literature Review

By

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## Play in Literature

Occupational therapy is founded on an understanding that engaging in occupations structures everyday life and contributes to health and well-being (Roley, et al., 2008).

Occupation is referred to productive activities that people engage in throughout their daily lives to fulfill their time and give life meaning, and occupational therapists are unique in their emphasis on productive activities (Missiuna & Pollock, 1991; Roley, et al., 2008). These activities reflect cultural values, provide structure to living, and meaning to individuals (Roley, et al., 2008). Furthermore, they meet human needs for self care, enjoyment, and participation in society. Play is considered one area of occupation. It is valued as a major occupation in which people engage throughout their lives (Bazyk, Stalnaker, Llerena, Ekelman, & Bazyk, 2003). In the occupational therapy practice framework, play is defined as any spontaneous or organized activity that provides enjoyment, entertainment, amusement, or diversion (Roley, et al., 2008). Play has historically been regarded by occupational therapists as both an indicator of development and a means for intervention (Miller & Kuhaneck, 2008).

From the emergence of the discipline of occupational science, researchers explored the concept of play as an occupation and studied patterns of play participation (Miller & Kuhaneck, 2008). During the early part of the twentieth century, play was viewed as the means of recruiting the mind-body connection in an effort to reach wellness (Case-Smith, 1996). Early literature described play as synonymous with recreation, and as a therapeutic modality equal in importance to crafts and habits training. Then play began to take on the role of a therapeutic modality; it was described as activities which serve as a stimulus for normal growth and development. Recent occupational science literature suggests that therapists must understand play as providing value and quality to children's lives as they freely engage in it (Miller & Kuhaneck, 2008). While work

is considered as voluntary engagement in disciplined physical or mental effort to obtain material benefit, play is an eager engagement in pleasurable physical or mental effort to obtain emotional satisfaction (Missiuna & Pollock, 1991). Play is a necessary occupation for children, and has long been known to contribute to the physical, cognitive, and social development of all children (Bundy, et al., 2008; Sturges, 2003). It is the primary productive activity for young children (Miller & Kuhaneck, 2008; Missiuna & Pollock, 1991; Skaines, Rodger, & Bundy, 2006), but we don't know which play activities contribute most to children's development, or what characteristics of activities make them more valuable. An occupation is something children do with commitment, energy, and a sense of purpose (Sturges, 2003). These characteristics of occupation can also describe play.

The benefits of play for children are well established (Missiuna & Pollock, 1991). Motivation to play includes both an exploratory component, in that children play for the sake of playing, and also a competency component that results from an inner drive to master the environment. During play, children have the opportunity to develop and test social and occupational roles, as well as, to discover what effect they can have on objects and people in their environment (Missiuna & Pollock, 1991). Play facilitates the development and learning processes; as children move around and explore their worlds, they receive information through their senses and gain knowledge about the nature and properties of objects (Hamm, 2006; Missiuna & Pollock, 1991). These skills permit children to interact with and respond to the demands of the environment, which in turns leads to perceptual, conceptual, intellectual, and eventual integration of cognitive abilities (Missiuna & Pollock, 1991).

Florey (1981) referred to six principles of play that are common to most theorists and are used to set parameters for the studies of play. The first principle referred to play as a complex set

of behaviors characterized by fun and spontaneity. That means play activities do differ from the obligatory nature of self-care and work, because play is self-chosen and intrinsically motivated (Bazyk, et al., 2003). The second principle emphasized that play is sensory, neuromuscular, mental, or a combination of all three (Florey, 1981). The third and fourth principles suggested that play proceeds within its own time and place boundaries, and that it involves repetition of experience, exploration, experimentation, and imitation of one's surroundings. As a result for that, play involves risk taking and mastery, and interpretation of reality-fantasy as contrasted to reality. The fifth principle implies that play functions as an agent for integrating the internal and the external worlds. This is a means of how a child takes information from the environment and makes sense of it. The final principle emphasized that play follows a sequential, developmental progression. Using this set of principles, Florey (1981) described the boundaries of studies of play conducted by occupational therapy students.

Researchers study play from different perspectives; however, they all shed the light on its importance for children. In occupational therapy, play is considered an important occupation in which children engage and participate. Bazyk, et al. (2003) considered play as a universal activity that promotes development. However, they suggested that in order to understand play as an occupation, it is important to observe play as it occurs in natural environments. They stated that play is a very different phenomenon depending on the context in which it takes place. For this reason, it is important for occupational therapists to study play and how it varies with age, personal values, gender, culture, and context. The study emphasized the importance of occupational therapists developing a culturally informed understanding of a child's daily occupations by considering the physical context and parents' values and beliefs about child rearing. Similarly, Miller and Kuhaneck (2008) emphasized that play should be viewed, studied,

and considered in its naturalistic form and that it need not to be broken down into its components. They suggested that how children make play choices and assign meaning to the experience of this occupation is an important area of study for occupational therapists. They also suggested that an expanded understanding of the complexities of play and play behaviors will lead to a better understanding of this occupation and its practice. Bundy (1993) viewed play and leisure as different occupations with which occupational therapists are concerned. She explained that play is a transaction or activity in which people engage because they want to, not because they feel they must. She suggested that play and leisure activities may be some of the purest expressions of who people are because they freely choose them.

While some researchers attempted to study the nature of play of typically developing children, others were interested in studying play of children who have special challenges. Restall & Magill-Evans (1994a) attempted to look at how the play of children who have autism differ from that of normally developing children, in addition to looking at the relationships between play performance and adaptive abilities (Restall & Magill-Evans, 1994b). Working with nine children with autism and nine children without autism, results of their study indicated that preschool children with autism play differently than their typically developing peers. Similarly, Missiuna and Pollock (1991) studied the play deprivation in children who have physical disabilities (Missiuna & Pollock, 1991). In their study, they considered the purpose and benefit of free play experiences, and the barriers that children who have physical disabilities may encounter. Also, they emphasized the importance of considering a less evident function of play, which is the value of free play for its own sake. This is because in therapy, occupational therapists frequently use play activities to achieve treatment objectives such as fine motor, skill development, postural control, and concept development. Missiuna and Pollock (1991) refer to

free play as being spontaneous, intrinsically motivated, self regulated, and requiring personal involvement of the child. The study concluded that children who have physical limitations and are not given adequate opportunities to engage in free play may be acquiring secondary disabilities, including diminished motivation, imagination, and creativity. They might also experience poorly developed social skills and increased dependence.

In the studies examining the play of children who have Attention Deficit Hyperactivity Disorder ADHD, researchers found that children who have ADHD engage in less overall play than typically developing children (Leipold & Bundy, 2000). Perhaps this is because children who have ADHD are reported to be more demanding and domineering to take other's toys, and initiate interaction in disruptive ways. Adding to that, Skaines, et al. (2006) reported that children with ADHD have difficulties with use of objects and interacting with people during play. Because of the difficulties that children with ADHD have when they play, a number of clinicians and researchers have tried to develop interventions to help them play better (Skaines, et al., 2006). Their focus was on teaching play skills and incorporating toys that elicit different types of play. For occupational therapists, enabling play in children is important because play is one of the central occupations in childhood. An occupational therapist can assess the strengths and weaknesses of a child with ADHD by observing him play (Leipold & Bundy, 2000). If assessment reveals ineffective play, then intervention should aim at improving play skills.

To support the notions above, a number of researchers have attempted to study children's playfulness (Bundy, et al., 2008; Hamm, 2006; Leipold & Bundy, 2000; Okimoto, Bundy, & Hanzlik, 2000; Reed, Dunbar, & Bundy, 2000; Skaines, et al., 2006). Playfulness is the internal disposition of play and is understood as a quality of a child's play rather than simply the child's skills in performing specific activities (Skaines, et al., 2006). Researchers suggested that all

children have a unique play style that is likened to other personality descriptors and individual attributes, such as age, gender, family and environmental situation. They believed that each child's playfulness is a stable aspect of the child's personality, and a construct that holds consistently across raters, situations, contexts, tasks, materials and time.

Skaines, et al. (2006) concluded that the play behaviors of children who have ADHD are qualitatively and quantitatively different from those of typically developing children in terms of constituent skills of play, social interaction and communication, cognitive ability, and use of imagination and pretence. Leipold and Bundy (2000) compared the playfulness of children with and without ADHD. The study revealed that children who have ADHD are significantly less playful than peers without ADHD. Similar to the work of Leipold & Bundy, Skaines, et al. (2006) hypothesized that children who have ADHD would be less playful than their typically developing peers on the Test of Playfulness (Bundy 2003). The findings supported Leipold and Bundy's (2000) findings that children with ADHD were less playful than their typically developing peers. While researchers conclude that children with ADHD play differently than typically developing peers and that intervention can improve their ability to play, Bundy et al. (2008) also suggests typically developing children may also benefit from play intervention. They used materials with no defined purpose and placed them on the playground for 11 weeks. Their work revealed the potential role of occupational therapists on typically developing children in school, and suggested that there are clear implications for the adoption of such a project in schools that include children who have disabilities.

Playfulness may be related to environmental support of play in children with and without disabilities (Hamm, 2006). Hamm (2006) found that when children feel safe and comfortable in their environment, they will be able to play. For this reason, it is important for occupational

therapists to look beyond skill development and examine the role of the environment as it supports or inhibits playful interaction. Based on the interpretation of her study results, Hamm (2006) concluded that interventions to increase playfulness should include direct involvement of the child and with the child's human and non-human environment. This can be obtained by training parents or caregivers and service providers in effective ways to promote play in children with disabilities and encourage playfulness. Similarly, Missiuna and Ploolik (1991) revealed the impact of environmental barriers on play and stated that barriers imposed by the physical environment may severely limit a disabled child's opportunities for free play. People working with the child can make changes to the environment around the child to make it more accessible and functional for play. However, it can be difficult to extend these changes to communities. Physical barriers are not the only environmental barriers for free play. Several researchers suggest that children who have certain disabilities may have problems interacting with peers which then limit their interaction with other players (Hamm, 2006; Leipold & Bundy, 2000; Okimoto, et al., 2000; Restall & Magill-Evans, 1994a; Skaines, et al., 2006). With decreased interaction in early years, the child who has a disability may not know how to initiate play with another child or how to join a group of children already engaged in play (Hamm, 2006). In essence, occupational therapists are responsible for developing and maximizing free play opportunities for children who have certain disabilities. Awareness of the barriers that the child frequently encounters may facilitate the consultative process.

### *Gender Differences and Play*

Children's behavior preferences are based on what they perceive is appropriate for their own sex (Lewis, 1991). Gender is one of the most studied variables that affect play choice and play preferences, and toys are highly gendered. In general, boys and girls have different toys, and

it is important to know how those toys impact their development (Blakemore & Centers, 2005; Green, Bigler, & Catherwood, 2004; Lewis, 1991). A group of researchers observed the toys and other objects in one to six years old boy's and girl's bedrooms (Blakemore & Centers, 2005). They found that boys had a greater variety of toys, and tended to have more toys. They also found that they had more vehicles, trucks, clocks, magnetic, outer- space toys and larger items. On the other hand, girls' rooms contained more dolls, doll houses, and domestic items. There were some gender-neutral items found in both boys' and girls' rooms, for example, sports equipment, toy animals, and educational and art materials. In addition, some dolls were found in boys' rooms but in categories such as cowboys and soldiers. By looking at what researchers have found, it is noticeable that children asked for gender stereotyped toys, and that boys and girls prefer and play with different toys.

Literature reveals some of the reasons behind these differences in play and play preferences between boys and girls. Researchers suggested that children ,especially boys, who engage in cross-gender play are more likely to be criticized by parents, teachers, and peers (Freeman, 2007). This may be due to adult concerns that boys who exhibit cross-gender behaviors will become increasingly feminine, but at the same time believe that girls will become as feminine as their peers whether or not they exhibit cross-gender behaviors. In addition, fathers are more likely to impose sex-role expectations on their son than on their daughters, and are less flexible in their gender appropriate behaviors than mothers. Another reason for gender preferences may be that boys and girls predict their parents are more likely to approve if they play with same sex toys, than if they were to play with cross-gendered or neutral toys. Psychologists suggest that early behaviors may be precursors for later behaviors, including adults social and occupational roles (Green, et al., 2004). For this reason, gender differences in toy play

and other behaviors are of interest to psychologists, especially in understanding the interplay of biology and environment in development.

Psychology researchers hypothesized three major families of theoretical approaches to understand gender differentiation in play and other domains: gender essentialist, gender environmentalist, and gender constructivist. Gender essentialist emphasizes the role of innate biological differences in shaping children's play, like differential selection pressures. On the other hand, gender environmentalist emphasizes the role of parents and peers in modeling and reinforcing gender appropriate play. Gender constructivist emphasizes the active role that children play in gender differentiation via their cognitive conceptualization of gender. In general, children's play behavior is guided by gender schemas that contain information about whether objects and activities are appropriate for boys or girls. In addition, children attend to and internalize environmental information about gender appropriateness of toys which in turn guide their own toy play behavior. Same sex toys and play behavior may benefit children in many ways. For example, play with feminine stereotyped toys encourages girls to learn roles, to imitate behavior, and to use adults as a source of help, whereas boys' toys provide feedback for correct answers, and encourage boys to explore their environments independently (Cherney & London, 2006). However, selection of same sex play toys and play behaviors may have some disadvantages. It may limit children's experience and inhibit their ability to develop certain skills or characteristics that could be enhanced by engagement in cross-gender-typed toys and behaviors, For example, feminine stereotyped toys can elicit higher complexity of play (longer play sequences) than boys stereotyped toys, thus limiting boys' levels of play complexity.

Occupational therapists should take into their considerations that one of the methods that facilitates development and socialization in early childhood is through play with various types of

toys. Recognizing the differences between boys and girls in their play and toy preferences will emphasize their choice in playing and participating in activities that are meaningful and purposeful to them. Occupational therapists should not forget the important role of the child's family and the significance of their involved decision throughout the therapeutic process.

### *Physical Activity Play and the Environment*

Childhood is a crucial time for children to develop, engage, and participate in health promoting behaviors and activities (Fitzgerald, Bunde-Birouste, & Webster, 2009). Play is a naturally occurring occupational behavior during which children learn and develop new skills (Chiarello, Huntington, & Bundy, 2006). Children's play often has a vigorous physical component, and may variously be called physical activity play, locomotor play, or exercise play (Pellegrini & Smith, 1998). Examples of physical activity play include running, climbing, chasing, and play fighting. Physical activity levels are very important for children, not only for their physical development, but also for their cognitive performance subsequent to physical activity. Physical activity levels are also important for children's social organization and social skills, and their psychology. Forms of physical activity play may differ by age, but in general they begin in infancy and decline in early adolescence.

Environmental factors have an important influence on children's physical activity and it can either inhibit or support physical activity (Fitzgerald, et al., 2009; Hume, Salmon, & Ball, 2005). Children's immediate surroundings, such as homes, schools, and neighborhoods, play a role in influencing their physical activity behaviors (Hume, et al., 2005). For example, children's social environment (e.g. support and encouragement to be active from family and friends) has been found to influence their participation in physical activity. In addition, school environments

that promoted physical activity were positively associated with children's activity levels. School playgrounds provide children with an important source of physical activity and recreational opportunities, and the presence of appropriate play equipment is very important to their enjoyment of the school environment. Beside schools, open areas and green spaces are important features in a child's environment, and it is important to consider children's safety in these places. Unfortunately, some children have limited opportunities for physical activity, due to shortage of play spaces, dangerous neighborhoods, and the increased demands of formal schooling (Pellegrini & Smith, 1998).

A child's home environment is also very important in promoting or inhibiting physical activity behaviors. Because of this, it is important to emphasize the parent-child relationship as it contributes to many aspects of skills and behaviors development in children (Chiarello, et al., 2006). Research suggests that fathers and mothers play differently with their children. For example, fathers hold their children on their lap for a greater proportion of play intervals compared with mothers. While play with fathers involves more intense physical stimulation, mother-child play tends to be toy mediated, verbal, and non-physical. Fathers appear to socialize with their children through physical play, especially rough and tumble play (Flanders, Leo, Paquette, Pihl, & Séguin, 2009). Rough and tumble play RTP is a specific form of physical play characterized by aggressive behaviors, such as wrestling, in a play context. This form of play is very important for children to blow off excess energy, especially during school recess (Pellegrini & Perlmutter, 1988). Also, this form of play is very common in father-child play, because fathers tend to stimulate their children physically and push them to take risks (Flanders, et al., 2009). In general, children's playfulness and activity levels are related to their parents' responsiveness and

home environment, and it is important to provide parents with suggestions for facilitating motor learning and skills through play (Chiarello, et al., 2006).

Evidence suggests that boys exceed girls in frequency of physical activity play, especially RTP (Flanders, Leo, Paquette, Pihl, & Séguin, 2009; Pellegrini & Smith, 1998). Boys have higher rates of initiation of RTP while girls have higher withdrawal (Pellegrini & Smith, 1998). This is because girls react differently from boys to tactile stimulation of the sort that characterizes RTP. In addition, the physical vigor and roughness typical of boys' play groups seem to be an important factor for girls distancing themselves from boys' play groups. Young boys use RTP as a way to affiliate with other boys, and to condition cardiovascular and muscular systems (Pellegrini, 2006). Later, RTP relates to boys' dominance and aggression, and is used to initiate heterosexual contact. Besides RTP, boys tend to engage in exercise play at higher rates than girls (Pellegrini & Smith, 1998). In studies examining children's exercise play, RTP was included with exercise play. Therefore, some of the gender differences in exercise play may be attributable to the well-documented gender differences in RTP. Engaging in RTP is part of the normal developmental process, and contributes to physical development and social bonding (Pellegrini, 2006). Researchers suggest that if children are deprived of physical activity play for long periods of time, their health, in terms of cardiovascular and physical fitness, may suffer. In addition, there may be social consequences on the normal development of boys' peer groups (Pellegrini & Smith, 1998).

Besides emphasizing children's activity levels and their surrounding environment, it is important to consider children's developmental skills and abilities as an important contributor to their play skills and playfulness. Occupational therapists have suggested that a child's play may be affected by many kinds of dysfunction; however, few of them have examined play while

simultaneously examining the skills and abilities thought to underlie play (Morrison, Bundy, & Fisher, 1991). Morrison, Bundy, & Fisher (1991) suggested that combining playfulness with motor proficiency to describe play warrants further research. They believed that motor proficiency is an important contributor to play and should be included as a variable in further exploration of play. Each child has specific skills and competencies, and it is important for occupational therapists to consider each child individually when adapting environments or consult with parents to promote healthy play.

### *Sensory Processing and Play*

Occupational therapy is unique in attaching meaning to sensory experiences (Dunn, 2001). Sensory processing refers to the registration and modulation of sensory information and the internal organization of sensory input in order to execute successful adaptive responses to situational demands, therefore enabling meaningful engagement and participation in daily occupations (Engel-Yeger, 2008). Researchers have investigated the unique features of sensory processing that occur for persons with various conditions, and found that sensory processing is related to every aspect of daily life (Dunn, 2001). They suggested that sensory processing dysfunction affects the ability to regulate and organize the degree, intensity, and nature of the response to sensory input in a graded and adaptive manner (Engel-Yeger, 2008). In other words, sensory processing dysfunction affects participation in everyday occupations of life, which is a vital part of human development and life experience through which a person acquires skills and competencies, connect with others and his community, and find purpose and meaning in life. One of the major areas in which participation is essential is play and leisure, in which a child chooses, engages, and participates in activities or toys of his/her interest.

Jean Ayres - the founder of sensory integration theory – believed that sensory integration dysfunction is the result of insufficient central nervous system processing or organizing the flow of sensory impulses in a manner that gives the individual good and precise information about him/herself in his/her environment (Mulligan, 1998). She explained that there are many types of sensory integration disorders, and each is associated with a dysfunction in a particular neural substrate within the central nervous system. A critical issue in the application of the sensory integrative frame of reference to children's needs is the proper identification of the behaviors that indicate sensory integrative deficit. Researchers investigated a number of ways that help identify critical behaviors in their natural contexts including standardized tests, interviews, and checklists (Dunn, 1994). There are numbers of studies that investigated the application of these assessment tools; however, few of them reported analysis of the tactile system. In 1997, Dunn proposed a model for sensory processing that accounted for the nervous system's thresholds for acting and the person's propensity for responding to those thresholds (Dunn, 2001). Her model has proven useful in providing structure in gaining insights into the nature of sensory processing across the life span.

Dunn's model of sensory processing represents a continuum of possible conditions of thresholds and responding strategies (Dunn, 2001; Engel-Yeger, 2008). Dunn (2001) explained that a person's ways of responding to sensory events in daily life can be characterized as reflecting both a particular threshold and a responding strategy. She investigated four interaction points where a person's responses to sensory events could fall on any of them: *low registration* refers to high thresholds with passive responding strategies; sensory seeking refers to high thresholds with active responding strategies; sensory sensitivity refers to low thresholds with passive responding strategies, and sensory avoiding refers to low thresholds with active

responding strategies. According to this model, people who have high neurological thresholds require a lot of sensory input to respond, whereas those who have low neurological thresholds notice sensory stimuli much faster and experience more sensory events than others. In addition, some people respond in counteracting behaviors that are contrary to the neurological thresholds (Engel-Yeger, 2008). Counteracting a low threshold leads to avoidance of sensory stimuli, while counteracting a high threshold entails immersion in sensory stimuli. Dunn's model of sensory processing provided a framework for studying, interpreting, and gaining insights into the nature of sensory processing with all its complexities and impact on daily life (Dunn, 2001). While this model refers to individuals on both extreme ends as having atypical sensory processing patterns, other models refer to these individuals as having sensory processing disorders (Engel-Yeger, 2008).

The sensory profile is one of the most prevalent tools for evaluating sensory processing patterns, and is based on the conceptual model proposed by Dunn in 1997. The sensory profile and the short sensory profile (Dunn, 1999) –which is the short version of the sensory profile - can be used to characterize children's behavior and performance in relation to their sensory processing patterns. In addition, it can measure the way in which those patterns support or interfere with the children's functional performance. A number of researchers attempting to investigate sensory processing patterns implement the sensory profile as one measurement tool in their studies (Cheung & Siu, 2009; Dunn, 1994; Dunn & Westman, 1997; Engel-Yeger, 2008; Ermer & Dunn, 1998; Kientz & Dunn, 1997; Tomchek & Dunn, 2007). Another group of researchers was interested in the relationship between sensory processing patterns and age, gender, and activity preferences of children (Benson, Nicka, & Stern, 2006; Bundy, Shia, Qi, & Miller, 2007; Clifford & Bundy, 1989; Dunn, 1997, 2007, 2008; Engel-Yeger, 2008; Lawson &

Dunn, 2008; Mische Lawson, 2006). Researcher's studies in this area help occupational therapists in providing background knowledge for constructing daily life routines and contexts that are suitable for each individual's needs and interests. Occupational therapists believe in play as the everyday life of a child, and that it requires efficient processing and integration of sensory information and the subsequent use of this information (Lawson & Dunn, 2008).

When investigating the relationship between sensory processing patterns and play preferences, Lawson and Dunn (2008) suggested that children with different sensory processing patterns would prefer different toys. In their study, they found that children who are less sensation seeking preferred toys that are miniature version of real things and usually sit down to play with them. On the other hand, sensation seeking children preferred creative art toys, building materials, or had no toy preference. The study revealed the importance of considering children's sensory processing patterns when offering play materials. Similarly, Engel-Yeger (2008) attempted to study sensory processing patterns and play preferences of Israeli children. The study resulted in that typical children's sensory processing patterns may be associated with their preference for different activities, and that sensory processing deficits affect children's activity preferences, and their occupational needs and interests. On the other hand, Clifford and Bundy (1989) in their study on normal boys and boys who have sensory integrative dysfunction found that both groups preferred toys representing sensorimotor play over construction and symbolic toys. However, they found that both groups differed as to how they used the toys and how well they used them. In summary, researchers in this field shed the light on the importance of sensory processing abilities and how they affect all aspects of children's daily life, especially play and leisure (Bundy, et al., 2007).

## Conclusion

In 1998, Fisher stated that “occupation is a wonderful word,” because it conveys the powerful essence of persons’ engagement and participation in activities that are meaningful and purposeful to them. Occupational therapists consider play as the primary occupation of children, and that it contributes to the normal development of all children. Occupational therapists value children’s free play as an important assessment and therapeutic tool instead of using play activities to achieve treatment objectives. This is because each child is different in attaching meaning to various play activities and toys. In addition, evidence suggests that boys and girls are different in choosing activities and toys that are of interest to them, and that they have different physical activity levels. Besides emphasizing children’s play as a self-chosen activity, occupational therapists should also consider that each child has an individualized pattern of sensory processing. It is important for occupational therapists to link children’s patterns of sensory processing to their everyday life behaviors and activities, and use these patterns as part of the assessment and intervention processes. Knowing more about how sensory processing patterns affect children’s play will help occupational therapists in facilitating children’s participation in daily life occupations.

Play has been well studied. This literature review shows that among other things, children’s play preferences are influenced by gender and sensory processing preferences. Because of the increased prevalence of obesity in young children (Hessler, 2009) it is important that occupational therapists understand what motivates children to engage in play, particularly physical activity play. While the body of evidence regarding physical activity play is extensive, it is mainly focused on increasing children’s activity levels to decrease obesity. It is also important to understand what drives children to want to move. Future research should focus on ways to measure movement during activities that might not be considered physical activity play,

as well as explore the factors, such as gender or sensory processing, that are associated with greater movement during play. This information will help occupational therapists design more individualized therapy based on each child's needs and interests.

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