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The Impact of Father-Child Relationship on Preschoolers' Task of Executive Function

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Abstract

The aim of the study was to examine the correlation between parent-child relationship and preschoolers' executive function, together with exploring the impact of father-child relationship on preschoolers' task of executive function. There were 19 parent-child dyads (4 of which were fathers) who volunteered to be in this current study from Bangkok and Nakhon Pathom. All parents filled in the general information questionnaires and the Parent-Child Relationship Inventory, which measured the relationship between parents and their children. In addition, task of executive function of all preschoolers was evaluated by the Task of Executive Control. The parent-child relationship and the task of executive function scores, were matched to find the correlation among the subscales and the participants. Data from fathers was gathered through an in-depth interview. The finding indicated that there was a correlation between autonomy subscale of parent-child relationship and the inhibition of preschoolers' executive function. Moreover, from the in-depth interview of fathers, whose children had high scores in working memory and inhibition skills, revealed the relations between father-child relationship through autonomy support, story-telling and socioeconomic status of fathers with preschoolers' executive function.

Keywords: Father-child relationship, Executive function, Preschoolers

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Introduction

Early Childhood is the most crucial period in one's lifetime. It is indeed the sensitive time when one's physical, emotional and cognitive develop the most. World Health Organization (WHO) stated that "Early Childhood determines the quality of health, well-being, learning and behavior across the life span" (WHO, 2015). Development during the early age of life depends on the experiences a child receives through his or her surrounding environments which family is the most influential constituent. Parent can provide stimulation for fundamental physical needs and emotional support to the child that brings about a great opportunity for him or her to have a great quality of health, well-being, learning and behavior in the long run. Increasing interest in early childhood experiences with parents indicates the link between these experiences and a child neurocognitive development (Meuwissen and Carlson, 2015). A proper cognitive development in early years leads to various necessary life skills in order for children to functional live their lives in social context.

One cognitive aspect that several researchers recently go further into is executive function (EF) as it aids children with working memory, planning, school competency, self-regulation, mental flexibility, reasoning, decision-making, communication and social skills (Bernier, Carlson and Whipple, 2010). Executive function is not something that all human has since birth; rather, we have potential to rapidly developed EF in the first six-year of life and it will keep maturing through adolescence.

If an individual's executive function does not have opportunities to develop during their preschool years, they would face a great amount of problems entering their teenage period as they handle changes poorly, which lead to the ongoing problems of the society. That is because weak EF skills make teens even more impulsive and once they are impulsive; their decision-making ability would be poor which set them up for risk-taking behaviors (Kessler and Dawson, 2015). Parent-child relationships in children's early years are the key component to prevent children from making such mistakes because relationship with parents provide security, confidence and appropriate life skills for children to protect themselves from harm once encountering new unfamiliar environments. Various studies have been done on parent-child relationship and suggest that the interaction between a parent and a child has an influence on a child executive function during their early childhood until their later years (Blair and Razza, 2007). Although, there are plenty of studies on parent-child relationship, most of them were be conducted by only on mothers. According to Wurzel (1995), several researches undergoing studies on single parents tend to omit father's presence due to the absence of fathers once they

got divorce because in most divorce cases, the court decides to let the children to stay with mothers as they believe in mother's instinct of child rearing rather than child-rearing instinct of fathers. Recently, in the US, a few new studies focus on the importance of father as the rate of single-dad has increased. Some studies started to look more into father-child interaction and an influence of the role of father on a child's cognitive development, which the existing research proposes that fathers (Meuwissen and Carlson, 2015) affected the cognitive development of children. Father interactions with children provide excitement through physical contacts that do not occur in mother-child dyad, which such excitement gives children,'s cognitive with high arousal stimulation (Lamb, 2004).

However, there are limited number of studies on the role of father on child's cognitive development particularly on their task of executive control or EF, therefore, this research examines an impact of parent-child relationship especially father-child relationship on preschoolers' task of executive control in order to fulfill these gaps of previous research.

Objectives of the study

1. To examine the correlation between parent-child relationship and preschoolers' executive function

2. To explore the impact of father-child relationship on preschoolers' task of executive function

Methodology

This research is a combination of quanitative and qualitative research methods via questionnaires and in-depth interview. The target population of current study was parents and their children at 5 – 6 years of age. Children at age 5-6 have to be kindergarteners in local kindergarten schools in Bangkok and Nakhon Pathom Province, Thailand. According to Schumacher and Lomax (2010), the best practices in factor analysis is 20 sample size with the minimum of 10 subjects per variables (10:1 ratio for the number of parameters) which this research is a pilot study that consists of one dependent variable, that is, children's executive function. As a result, the goal of this study is to have the sample size of 20, however, including drop-out cases. As a result, there were 19 parent-child dyads (4 father-child dyads and 15 mother-child dyads) who voluntarily participated. Participant recruitment material included posters which were posted at National Institute for Child and Family Development, Mahidol University in Nakhon Pathom Province and other kindergarten schools in Bangkok.

This study used questionnaires and two standardized tests as instruments that were general questionnaires, parent-child relationship inventory (PCRI) and task of executive control (TEC).

1. General questionnaire surveys created by the researcher were send to all the parents asking about their general background including age, education level, occupation and socioeconomic status.

2. Parent-child relationship inventory (PCRI) by Anthony Gerard is a self-report for parents for measuring their parenting skill and attitudes toward parenting and their children age 3 – 15 years old with 0.8 reliability. The format of PCRI is a Likert-type, 4-point response format range from strongly agree, agree, disagree and strongly disagree. The higher scores indicating better parenting skills and the lower scores indicating a poorer parenting skill. In this research, all PCRI 78 items will be used which divided into 7 content subscales including;

2.1 Parental support (SUP) is a term that use for parents on how they receive the practical help and emotional support as a parent.

2.2 Satisfaction with parenting (SAT) means the enjoyment one receives from being a parent.

2.3 Involvement (INV) refers to the involvement of parents with his/her children that can show through their activities and time they spend together.

2.4 Communication (COM) measures parent's awareness of how well they communicate with their children through different situations in daily life.

2.5 Limit setting (LIM) represents the effectiveness and the role of parent's discipline techniques.

2.6 Autonomy (AUT) refers to a willingness of parents for promoting their children's independence.

2.7 Role orientation (ROL) represents two distinct approaches, which are how parents approve the view that both parents share equally in most parenting roles and how they view the difference roles of father and mother.

3. Tasks of Executive Control or TEC, invented by Peter K. Isquith and colleage, is a standardized computer-administered measure of 2 basic aspects of executive function which are working memory and inhibitory control yielding four sequential tasks for children who are at the age of 5-7 and 6 tasks for children and adolescents at the age of 8-18. In this research, four sequential tasks were applied to 5- to 6-year-old children were the participants. These tasks consist of two types of commonly used tasks in functional neuroimaging: the N-Back for working memory and the Go/No-Go for inhibitory control. For TEC test, N-Back task will present in an

individual with a series of stimuli. In the form of pictures on the computer screen, one stimuli at a time, and is requested to press a certain button (blue button) each time one sees a frequent or standard stimulus but a different button (red button) when one sees an infrequent or target stimulus. Another task that used for elevating inhibitory control is Go/No-Go task which in TEC, the no-go cue is a grey box surrounding any pictured object and one is instruct not to respond when the box is present. Incompatibly, any stimulus not surrounded by a box is a go stimulus. All four sequential tasks of N-Back and Go/No-Go take 30 minutes to complete. With assessing executive function through stimulus that are pictures, Task of Executive Control is considered a culture-free tool that children from any background can be tested without any bias with reliability coefficients ranged from .75 to .98 for factor scores and from .68 to .99 for summary scores. Moreover, validity also was investigated within several clinical samples, including children and adolescents with ADHD, mild traumatic brain injury, learning disabilities, and fragile X syndrome.

Procedure of this research began with the researcher setting up an appointment with participants whom interested in participating via telephone. Once all the appointment were set, all participants whom were parents fill in the inform consent if they agreed to participate and agreed to have their children participate. All parents completed general questionnaire survey (10 items) and parent-child relationship inventory (PCRI) form (78 items) while all children took a 30-minute Task of Executive Function (TEC) test on a computer. Parents handed all the forms back to the researcher when they finished. For all preschoolers, after they were done taking the TEC test, the researcher came to save the results of each child on the computer. Once all the results have been collected, the researcher analyzed the data with statistic computer program which descriptive statistic was used for general questionnaire survey and Spearman correlation was used for correlationg parents' PCRI scores and preschoolers' TEC scores. Afterwards, the researcher conducted an in-depth interview with fathers only whose children's executive function skills in the range of "very good" in order to investigate more on father-child relationship and other factors related to high executive function skills in preschoolers.

Results

1. Parent background

According to descriptive statistic of parents' background, results showed that 21.1% of sample were fathers and the rest were mothers. For parents' age, 52.6% of parents was in the range of 30 – 39 years of age and 26.3% was in the range of 40 – 49 years of age. For level of

education, most parents' education or 36.8% were in a middle school level, 26.3% were in elementary level and 15.8% obtained an undergraduate degree. For parents' occupation, most parents owned a private business, were a stay-at-home parent (31.6% for each occupation), and followed by 26.3% of a general contractor. For family income, the results showed that 42.1% of parents received income in the range of 10,000 – 20,000 baht per month, 21.1% received more than 20,000 – 30,000 baht a moth and 15.8% earned less than 10,000 baht per month. For adequacy of family income, more than half of parents or 73.7% reported that their family income was adequate with their expenses per month.

Results of descriptive statistic analysis particularly in the group of fathers in order to observe in distinct backgrounds and compared to the whole group of parents. According to the descriptive statistic, the results revealed that the majority of fathers, which is 50%, were in the range of 30 – 39 years of age, 25% were in the range of 40 – 49 years old and another 25% was in the range of 50 – 59 years of age. For level of education, almost all of the fathers which is 75% obtained an undergraduate degree and 25% graduated from middle school.

For occupation, 50% owned a private business, 25% were a government employee and another 25% were a private sector employee. For family income, 50% earned more than 50,000 baht per month, 25% received more than 30,000 – 40,000 a month and 25% earned around 10,000 – 20,000 baht a month. For adequacy of family income, 50% reported that they had income more than they needed per month, 25% had enough income for their expense and another 25% was in debt.

2. Preschoolers' background

Results showed that, for gender, 52.6% of preschoolers were female and 47.4 % were male. For age, 84.2% were 5 year olds and the rest were 6 years old. For illness or health condition, 94.7% were reported that they were not diagnosed with any disease or health condition and 5.3% reported with a health condition unrelated to brain functioning or communication. Furthermore, all of preschoolers were reported that they had no disabilities.

3. The correlation between parent-child relationship and preschoolers' executive function

Table 1 represented results of the correlation between parent-child relationship and preschoolers' executive function in each subscale. The Spearman correlation was used for correlating parents' PCRI scores and preschoolers' TEC scores. The results showed that autonomy subscale of parent-child relationship in parents was significantly correlated to inhibition subscale of executive function in preschoolers ($r = 0.56$, $p < 0.05$). Such result indicated that higher scores

in autonomy subscale of parent-child relationship tended to have higher scores in inhibition subscale of executive function in preschoolers.

Table 1 shows the correlation between parent-child relationship an d preschoolers' executive function

Parent-child Relationship Inventory Subscales	Exeucutive Function Subscales	
	P Value of Working Memory	P Value of Inhibition
1. Parental support	.629	.924
2. Satisfaction with parenting	.154	.078
3. Invovlement	.308	.283
4. Communication	.891	.581
5. Autonomy	.727	.014*
6. Limit setting	.144	.075
7. Role Orientationb	.901	.388

*P < 0.05

4. In-depth interview of fathers

The main point of interest for this research is to explore the impact of father-child relationship on preschoolers' executive function. This section, then, focuses on the distingue group of preschoolers whose executive function skills in the range of "very good" among all preschoolers. There were 6 children who were categorized in this level and half of them had fathers as participants in this research. In order to investigate more on father-child relationship and other factors related to high executive function skills in preschoolers, therefore, the researcher conducted an in-depth interview with fathers which is present in Table 2.

Table 2 shows the in-depth interview of fathers

Factors related to executive function skills	Case Study		
	Case Study A	Case Study B	Case Study C
1. General background of father and child	**Father** - 52 years old - middle school diploma - businessman - income = 10,000 – 20,000 Baht/month, adequate amount for all family expenses **Child** - 5-year-old daughter. - youngest with 2 older sisters - no health condition nor disability.	**Father** - 48 years old - bachelor degree - businessman - income = 50,000 Baht/month, in debt **Child** - 5-year-old daughter with one younger brother - no health conditions or disabilities	**Father** - 38 years old - bachelor degree. - private company employee - income > 50,000 Baht/month, more than enough money each month **Child** - 5-year-old son with younger brother - no heal conditions nor disability
2. Child's daily activities	- waking up, getting ready for school and going to school which father was the one who sent her to school every morning - spend all day at school until 3 pm, picked up by father - play at home with her toys (mostly dolls) and rarely went down to	- waking up, getting ready for school and going to school and father would come and pick her up. - After school, she would play with her friends, have an extra writing class with her teacher from school and swim before heading home. - During the car ride	- waking up at 7 am. He would get ready for school by himself, he would brush his own teeth, picked out his own student uniform, eat breakfast by himself and going to school which father was the one who sent her to school every morning - After school he played

Factors related to executive function skills	Case Study		
	Case Study A	Case Study B	Case Study C
	play with neighbors' kids whom live in the same apartment complex.	home, parents set a rule for their kids to share about everything that happened that day with everyone in the family. - At home they are usaully eat dinner and the child would have time to play and parents would read her stories before she went to bed every night.	with his friends at the school's playground until 4.30 pm - At home, he would have some free time to practice his piano lessons, pick his outfit for school the next day and play with his Lego or ride a bicycle. - Taking a shower and be in bed by 8.30. However, he would not sleep until 10 pm so his parents would read him some stories and play with him before bed. - On weekends and during the time that school was off, he would mostly stay and play at home. He was taken out to the park to play and eat out with family occasionally.
3. School environment	- kindergarten 1 - public school in Rama 2 district, Bangkok. - 32 children in her class with a teacher	- kindergarten 2 - a private kindergarten school located in Salaya, Nakhon Pathom Province.	-kindergarten 2 -a private kindergarten school located in Salaya, Nakhon Pathom Province.

Factors related to executive function skills	Case Study		
	Case Study A	Case Study B	Case Study C
	and a nanny. - The school emphasized on both academic-teaching and integration-teaching style	- 15 kids in her class with 1 teacher and 2 nannies. - This school was integration-teaching style	- This school was integration-teaching style
4.Father-child interactions	- spent quality 10 hours each day together for weekdays and 16 hours each day on weekends. - One of the times that interactions between the two happened the most was her pick-up time from school till they got home. Father would ask her how her day was and she would tell him about what happened at school.	- spent 5 hours a day together each day during the week and spent 12 hours total on Saturdays and Sundays - Most conversations happened during the car ride home and before bed when fathers would mainly tell the stories for her. - Compliments were use frequently with her. - Father was learning to acknowledge feelings of his child more and listen to her more on what she wanted to communicate and now the child learned how to express her feelings to her parents more. - He tended to give her a choice to do certain	- spent 5 hours together every day during the weekday and 6 hours each day during the weekend. - Father would get to spend time with his child on the way to school and back and also when they play together at home. - The child liked to do role play with his parents and little brother, sing and coloring. Father was very attentive every time his son spoke to him and he would make conversation with him. - Most of the time, the child had a very good self-control and a good patience.

Factors related to executive function skills	Case Study		
	Case Study A	Case Study B	Case Study C
		things but if those things concerned with her safety, he would take her away from those things immediately without giving a reason. - When she was mad, he would distract her to calm her down and then tell her what to do after. - When she and her brother fought, parents would let them negotiate and let them come to a solution by themselves.	- When father talked to his child, he would use a lot of compliment and encouraging words. - Father gave his child a freedom to choose from what he wanted to wear to school to what he would like to eat as long as it did not harm him or under the rules they both created. - The child would tell his father everything that happen at school on their ride back home every evening.

Conclusion

From the current study, the result showed that there was a correlation between parent-child relationship on the subscale of autonomy with the inhibition skill of executive function in preschoolers. Since there were limited resources on father-child relationship and executive function, this study also investigated this point of interest and found that father-child relationship through autonomy support, story-telling and socioeconomic status of fathers may relate to their preschoolers' working memory and inhibition skills of executive function. With these findings, it revealed that both fathers and mothers parenting are very important for children's cognitive development during preschool age. Fathers are not only the "helpers" to mothers in raising a child but the trend of co-parenting (both having fathers and mothers as the main caregivers)

should be embraced more in parenting and cognitive research. High-quality parent-child relationship could be a key component for preschoolers' executive function development.

Discussion

1. **The significant correlation between autonomy and inhibition**

Results analysis found that there was a subscale of Parent-Child Relationship Inventory or PCRI of parents, which is autonomy, was significantly positive correlated to the inhibition or inhibition control skill of preschoolers' executive function. This result interpreted that higher scores in autonomy subscale of parent-child relationship tended to have higher scores in inhibition subscale of executive function in preschoolers. Autonomy evaluated a willingness of parents for promoting their children's independence, which from such result indicated that parents who promoted their children's independence, the higher inhibition of preschoolers. This finding of current study was consistent with a previous research conducted by Bernier et al. (2010) with 80 children whom were assessed their maternal sensitivity, mind-mindedness and autonomy support at 12 to 15 months and later at 18 to 26 months, their executive function were measured. This research focused on the prospective links between quality of parent-infant interactions and subsequent child executive functioning in all three subscales and found that the strongest predictor of executive function at each child's age was autonomy support from parents regardless of general cognitive ability and maternal education (Bernier, Carlson and Whipple, 2010). Therefore, the finding confirmed the hypothesis of this current research that there was a correlation between parent-child relationship and preschoolers' executive function.

There were considerable research and theory that explain the significant correlation between autonomy and inhibition. According to Grolnick and Pomerantz, autonomy allows children's desires and needs to be acknownledged by their parents, which bring about children's initiative and opportunity for them to solve problems by themselves (Grolnick and Pomerantz, 2009). With such reason, there are more possibilities for children to face challenging activities which executive functions would be required, for example, a complicated puzzle, board games, social play and etc. Once children engaged in such activities that already helped with executive function skills, they would be motivated autonomously to maintain their attention in those activities for extended periods of time and ignored other appealing activities that might not be helpful with their executive function (Bindman, Pomerantz and Roisman, 2015). Therefore, being able to do so over time required opportunities to use executive function skills especially inhibition.

The results showed that no other subscale of Parent-Child Relationship Inventory (PRCI) including parental support, satisfaction with parenting, involvement, communication, limit setting and role orientation correlated with executive function skills. For parental support, which was a subscale that measured the practical help and emotional support that one received as a parent, there was no correlation between parental support and working memory nor inhibition. The previous research on the correlations between parent-child relationship and executive function in children using PCRI and BRIEF-P with 141 parents and their 4-to-5 years old preschoolers found that working memory and inhibition had a significantly negative correlation with parental support (Isquith, Roth and Gioia, 2010). The result from current research conflicted with this previous finding, possibility could be because of the small sample size of the current research and the different method that used for executive function evaluation. With the same study (Isquith, Roth and Gioia, 2010), Ruangkhruawong discovered that satisfaction with parenting, involvement and communication did not have a relationship with working memory and inhibition, which consistent with the result from present research. As for limit setting and role orientation, there was a significant result for the correlation between limit setting and role orientation from previous study by Ruangkhruawong (2013) which inconsistent with the current study. The reason being could possibly becuase the sample size that were too small for this present research.

2. The impact of father-child relationship and preschoolers' executive function

The point of interest of the current study was the impact of father-child relationship and their preschoolers' executive function. In the group of children who had high score in working memory and inhibition, half of them had fathers as participants in the present research. After investigating in details with these fathers through in-depth interview, there were a few common interactions or parenting techniques that fathers used with this particular group of preschoolers that might be the predictors of children's executive function. First, these fathers promoted their children's autonomy. As discussed in previous section, this current research found that there was a correlation between autonomy and preschoolers' executive function, an obseravtion from three case studies that all father encouraged their children to make their own decisions in their daily activities. The previous research studied by Meuwissen et al. (2010) which tested the correlations between father autonomy supportive and controlling parenting and preschool children's executive function with 110 children and their fathers in the Midwestern United States of America found a very interesting result. This research found that father autonomy support was a marginally significant predictor with their 3-year-old children's executive function beyond family income and children's age-standardized verbal ability, which indicated that father parenting, and

autonomy supportive skill of fathers was an essential variable to consider concerning executive function development in preschool children. Second, all fathers use story telling as a part of father-child interactions. There was a suggestion from one previous research on the union of narrative and executive function: different but complementary that executive function and narrative ability support each other over developmental time (Friend and Bates, 2014). Even though their finding showed that executive function and narrative ability appeared independent, however, the ability to maintain focus or inhibitory control at 4 years supports subsequent narrative ability. Last is father's socioeconomic status. 2 out of 3 case studies of fathers reported that they earned income more than 50,000 baht per month which can be considered well-off. From observation, it can possibly indicate that socioeconomic status of parents somehow related to children's executive function. This observation is consistent with a previous research by a group of researchers from the US on the correlation between neurocognitive and socioeconomic status in kindergarten children.

This study found the relations between language, executive function and socioeconomic status and the predominant role of individual differences in language ability involved in socioeconomic status associations with executive function.

Suggestion

For the suggestion, this study interested in father-child relationship and preschoolers' executive function and with the result of current study that showed autonomy of parents correlates positively with inhibition skill of executive function of preschoolers, there should be a specific research that enhance an intervention of father autonomy support towards their children in order to help with children's executive function. Furthermore, studies on father parenting should conducte more for filling the gap of limited resources of parenting research.

Expected Benefits

1. To promote the importance of executive function skills in preschoolers
2. To enhance the idea of co-parenting to fathers and their importance to their children

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