The Association between Cognitive Stimulation and Core Children's Cognitive Competence (Parent-based Assessment)

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Abstract

The purpose of this research was to assess the relationship between parental stimulation and pre-school children's cognitive competence, at Debre Berhan Town, Ethiopia. A total of 192 (M=87, F=105) children's parents selected via random sampling technique were participated in this study. A quantitative approach was employed for this study. Data were collected using questionnaire consisted of demographic variables, parent report of children's abilities scale and the home observation for measurement of the environment scale. Data were analyzed using percentage, mean, independent sample t-test, Pearson correlation coefficient and one way ANOVA. The Pearson correlation result indicates that parental stimulation has a significant moderate positive relationship with children's cognitive competence r (192)=.411, *P*<.05. *The independent sample t-test result revealed that children's cognitive stimulation does not statistically significantly different by parental gender t*(190)= -.616, P>.05). *There was no a statistically significant difference between employed and unemployed parents with regard to level of children's cognitive stimulation t(190)= .001, P >.05),nevertheless, there was a statistically significant difference in level of children's cognitive stimulation score between parents who send their children at the government and private pre-schools* t(161.163)= 3.073, *P*<.05). *In addition, the one way ANOVA result revealed that a statistically significant difference was found among parents education level on children's cognitive stimulation, $F_{(3,188)} = 4.301$, P< .05, and among parents' monthly income and level of children's cognitive stimulation, $F_{(2.189)} = 10.027$, P<.05. As there is a relationship between parental children's cognitive stimulation and children's cognitive competence, parents need to give more attention on children's cognitive stimulation to boost their cognitive competence.*

Key words*: **Parent, Children, Cognitive Stimulation, Cognitive Competence***

Introduction

The household environment shapes, facilitates or constrains immediate and long-term cognitive and intellectual competencies in young children (Tarumi & Ota, 2010). Hence, the role of family on pre-school and school age, cognitive development has occupied the discourse of cognitive development (Biedinger, 2011), as parenting practices contribute significantly to the early child development and child environmental interactions affecting child adaptation (Chang et al., 2009). Therefore, it is important to ensure that children are having the kinds of experiences that support their growth and development, parents should show empathy, affection, support their children's learning, in and out of school as well as providing academic guidance and supportive learning environment at home and communicate with their children and the school (Stanikzai, 2013).

It is obvious that children's early capabilities shape who they are and affect their life-long health and their learning (Richard, 2015). For example, a child living-in a disadvantaged environment likely exposed to biological and environmental dangers that affect brain development, hence contributing to permanent changes in the developing brain's structure and functions as well as experiencing particular difficulties at school (Baker & Lopez, 2010; Biedinger, 2011).On the other hand, exciting environment and practices are important for a child's brain development because they encourage reading through the exploration of surroundings and interactions with parents, health care providers and others (Aleksandra, 2012). A continuation of positive thoughts further helps to send positive messages to the brain that eventually defines the healthy behavioral and cognitive development of a child at the latter stages (Stanikzai, 2013).

Furthermore, Amin (2017) unveiled that when a mother sings or talks to her baby, even before he can talk, the baby learns to communicate back and when a father encourages a child's interest and curiosity in the world, the child reaches out to learn more and all of these activities are what is called stimulation. Although stimulation occurs through responses and increasingly complex, developmentally appropriate interactions should exist between caregivers and children (Boss, 2014).

Additionally, the characteristics of the environment responsible for stimulating positive brain changes include a variety of toys, especially home-made toys created by adults and older siblings are also good

indicators of parental concern and sensitivity towards play that encourages exploration and problem solving changed on a regular basis, which provide stimulation, novelty and opportunity for perceptual, cognitive and motor activity that help to create a stimulating environment with-in the home as well as social interaction (Chang et al., 2009). Parents can foster children's development by providing them with a safe and stimulating home environment and engaging and supporting them in learning opportunities inside and outside of the home (Sandstrom & Huerta, 2013), as a lack of nurturing and interaction can limit a child's potential (Berns, 2010). Therefore, children need safe and stable secure relationships with adult caregivers, responsive parenting, and high-quality learning opportunities at home, in child care settings and schools (Save the children, 2014).

In fact, how parents help their children learn better depends on their level of education, gender, socioeconomic class and many other factors (Stanikzai, 2013). In a study by Amin (2017), from common strategies; conversation with a baby through talking, reading stories, singing rhymes and poems are the preferable stimulation that will help a baby to develop a better child cognitive development. Also, Duursma et al. (2008) found out in their study that better home literacy environments have a positive effect on children's vocabulary scores in first grade and on their general reading comprehension both in first and second. Furthermore, according to Carroll (2013), the highly educated mothers used the highest teaching talk level, e.g. parent conversations with children that go beyond the immediate information or children's immediate knowledge significantly more often than they used the other two lower levels of teaching talk, yet the less educated mothers used middle and lower levels of teaching talk more frequently (Aleksandra, 2012).

Similarly, income has a greater impact on the well-being of children as families living in poverty than those living out of poverty; furthermore, this relationship diminishes as income moves further away from the poverty line (Carroll, 2013). Families spending money on their children, such as the purchasing of toys, books, and learning materials for the home or enroll in high quality child care and extracurricular activities, are investments that contribute to positive child outcomes (Sandstrom & Huerta, 2013). On the other hand, young children with limited exposure to educationally stimulating materials often experiencing deficiencies in basic literacy

and arithmetic skills upon entering school and consequently to be at a disadvantage compared to children who have mastered such skills (Carroll, 2013). Most importantly, children from lower socio-economic status families enter kindergarten with substantially lower reading and math skills than children from high socio economic status families (Aleksandra, 2012).

By and large, objects such as old phones, cell phones, puppets, dolls, wordless books, familiar books, pictures, play dough, and felt board cutouts are essential instruments that stimulate conversations (Boss, 2014). Further, Tarumi and Ota (2010) stipulated that language stimulation and learning materials in the home are the parenting practices most strongly linked to school readiness, vocabulary and early school achievement. Thus, there is a support for a causal role of responsive parenting, with a responsive style for the effect of several parenting interventions on greater gains in young children's learning (Sandstrom & Huerta, 2013).

As discussed above, stimulating environment and practices are important for children's cognitive development thus, parents should stimulate their children by providing learning materials, employ various stimulation mechanisms like; modeling, responsiveness, acceptance and others. In the regards, Baker and Lopez (2010) stipulated about the importance of undertaking further research to determine if stimulation in the home predicts children's cognitive development. In addition, as far as the researchers' knowledge is concerned, there have not been researches available on the area exploring the role of parental stimulation on children's cognitive competence, in the Ethiopian context. Thus, the research can provide new insights to parents about the importance of stimulating their child at an early age for their attainment at later stages, which initiate the researchers to undertake a research in the area under consideration. Grounded on those justifications, the current research addressed the following research questions;

- Is there a statistically significant relationship between parental stimulation and cognitive competence of children?
- Are there statistically significant differences in parental stimulation of the child as a function of parents' education level, gender, employment, income and parents who send their children in the government and private pre-schools?

Methods

Research Design

The primary aim of this research was to explore children's cognitive stimulation by their parents on their cognitive competence. To this end, this study employed a correlational design that examines the relationship among the study variables.

Sampling Method

Parents who send their children in the government and private pre-schools in Debre Berhan Town during the study period were considered as population for this study. The researchers primarily categorized the pre-schools into two clusters such as the private and government groups and the inclusion of parents were made based on the clusters done on pre-school types. Finally, children's parents were randomly selected from those clusters to form sample. Hence, the required sample size regarding the proportion of pre-schools and children's parents were determined based on the 20% suggestion of a survey research. Thus, out of the thirty five pre-schools available in Debre Berhan Town during the data collection period, a total of 7 pre-schools (3 government & 4 private) were included in the study and the inclusion of children's parents were done from seven pre-schools using 20% sample size determination. In sum, the sample pre-schools and children's parents were determined as follows:

Sample n= N (20) /100, Number of Government Pre-schools (NGPs) = 15

NGPs =15(20) /100= 3 government pre-schools were selected randomly using a lottery method.

On the other hand, Number of Private Pre-schools (NPPs) = 20

NPPs= 20(20)/100 = thus, 4 private pre-schools were selected randomly using a lottery method.

In sum, using the above procedures, Biruh Tesfa, Ase Zar Yacob and Model No-2 pre-schools were selected randomly using a lottery method from the governmental pre-schools while Millenium, Seven Day Adventist, Birana Youth and Abogida were selected from the private pre-schools using a lottery method. In addition, the researchers included the children's parents via their children using a lottery method; hence parents' of the children were taken as samples for this study.

Table-1: Sample Pre-schools, Number of Children and their Inclusion as Samples

Pre-schools	Name of preschools	Number of children in each pre-school	20% of total number of children in each pre-school	Sample
Government	Model No-2	265	265*20/100	53

	AseZarYacob	35	35*20/100	7
	Biruh Tesfa	375	375*20/100	75
Private	Millenuium	150	150*20/100	30
	Seven day Adventist	145	145*20/100	29
	Birana	220	220*20/100	44
	Abogida	30	30*20/100	6
Total		1220		244

As Table-1discloses, 244 children's parents were selected as participants in this study through their children. From the 244 children's parents, 192 of them filled the questionnaire properly (87 males & 105 females) while 52 children's parents were excluded from this study as they returned the incomplete questionnaire.

Measures

The independent variables for this study were parental stimulation, gender of parents, parental income, parental educational level, parental employment level, and parents who send their children in the private and government pre-schools while children's cognitive competency (quantitative skills, spatial abilities, symbolic play, planning and organizing, adaptive behaviors and memory) was considered as the dependent variable.

Demographics: in this study pertinent background variables of children's parents such as gender, education, employment, income, and the type of pre-schools where parents' send their children were included.

Cognitive measure-the researchers adapted the questionnaire from the Parent Report of Children's Abilities (PARCA), is a standardized measurement and designed by Saudino et al., (1998) extended to encompass the Bayley Scale of Infant Development II (BSID-II) items developed to assess a parental assessment measure of non-verbal cognitive abilities of a child. The measure consists of a parent-report component and this component consists of 32 questions assessing the area of quantitative skills, spatial abilities, symbolic play, planning and organizing, adaptive behaviors and memory. From the 32 items 23 of them were modified and contextualized based on the ecological and cultural aspects of children's parents taken into account. Therefore, the questions were modified and phrased in terms of specific activities and parents were being asked to indicate whether or not they had seen their child perform the activity (e.g., Can your child put a simple piece, such as a square or an animal, into the correct piece on a puzzle board? or Does your child recognize him/herself when looking in the mirror?). Parents were encouraged to try a task if they

were not certain whether their child could perform the task. Asking participants to indicate their level of agreement with the items, from 1(Most of the time) to 4 (Never). Samantha (2004) also measured the psychometric property of the scale and her study indicates that a high degree of internal consistency was indicated by Cronbach's alpha coefficients of .84 and .87 for the scales respectively.

Home environment measure-the researchers adapted the questioner from the home observation for Measurement of the Environment Scale, is a standardized measurement and developed by Caldwell & Bradley (1984) was used for assessing the quality of family environment in the first five years of life. The Home Inventory version applied in the study for the age group 3 to 6 years olds. The Early Childhood Home is made up of 39 items that are grouped in seven different subscales include Language stimulation (6 items), Learning materials (4 items), Acceptance (4 items), Physical environment (4 items), Academic stimulation (6 items), Responsively (9 items), Modeling (6 items), and asking participants to indicate their level of agreement with the items, from 1 (Most of the time) to 4 (Never). Out of the 39 items major and minor modifications were made on the 35 items considering the ecological and contextual validities were taken into account. Totsika and Sylva (2004), also measured the psychometric property of the scale. Their study revealed that the internal consistency of the items were again estimated as split-half reliability and it ranged from .53 to .83 for the subscales while for the total scale it was .93.

Generally, the data collection instruments were translated from the English version to the Amharic version for ease of administration as the participants were Amharic native speakers. However, the translation and backward translation were done using content and language experts.

Piloting

The two adapted instruments namely the Parent Report of Children's Abilities and Home Observation for Measurement of the Environment Scale were required to check their appropriateness and reliabilities. In this study, content validity was checked for ensuring what the instruments really measure and to address content validity, the researchers' obtained feedbacks from experts of Psychology and Education fields. Then, piloting was conducted at Melikit Academy on thirty-nine children's parents after they were informed by the director to come to that pre-school for the purpose.

Finally the Amharic versions of the instruments were administered to 39 (12 male & 27 females) respondents. The participants were gathered in one room and explanation was given about the instruction and the way they would react to some items of the questionnaire. After the responses of the participants were compiled, the responses were computed using the SPSS version 21 and Cronbach's alpha as well as inter-item total correlations were computed to see the internal consistency of the items of each instrument.

Table 1: Summary of the Reliability Index of the Instruments

No	Questionnaire/ Scale	Number of items	Cronbach's alpha
1	Non-verbal cognitive ability	32	.875
2	Home environment	39	.797
	a. Learning material	4	.791
	b. Language stimulation	6	.695
	c. Academic stimulation	6	.765
	d. Physical environment	4	.732
	e. Responsiveness	9	.702
	f. Modeling	6	.696
	g. Acceptance	4	.703

As it is disclosed in the Table-2 above, the Cronbach's alpha value for the two instruments were .797(Home environment) and .875 (non-verbal cognitive ability).The Cronbach's alpha coefficients for the Home environment sub-scales were.791 (learning material), .695 (language stimulation), .765 (academic stimulation), .732 (physical environment), .702(responsiveness), .696 (modeling), and .703 (acceptance).

Procedures

To undertake the data collection, first the researchers deliver the letter to the principals of the respective selected pre-schools. Once the initial letter directed to the respective principals of the pre-schools in person and the consent was obtained from them to pursue the research, detailed briefing was provided to them about issues such as the aim of the study, including the focus of the study and benefits of the research to society. Once approval was obtained from the respective pre-school principals to undertake the research in the children's parents, they were requested to call the children's parents to come to the respective pre-schools via the letters just to administer the questionnaire. The next days, the children's parents were in the respective pre-schools and they were fully informed about the intent of the study as well as the oral and written consents were obtained from them. Once the researchers

ensured consent, participants' were told that participation was voluntary and they could exercise the right to withdraw without any consequences or any loss of benefits and that their responses would be kept strictly confidential. Then after, the distribution and collection of the questionnaire were done with the help of pre-school principals.

Analysis

Once data were checked for completeness, out of the 244 participants, 52 participants' responses were discarded as they had submitted the incomplete information; then data were entered in SPSS version 21 and analyzed using the descriptive and inferential statistics.

- Pearson product moment correlation (Pearson-r) was employed to see the relationship between parental stimulation and children's cognitive competence.
- Independent sample t-test was computed to see if there was a statistically significant difference in children's cognitive stimulation by parental gender, level of employment, and the type of schools children attended their education (government and the private pre-schools).
- One-way ANOVA was computed to assess if there were statistically significant differences in cognitive stimulation by parents' education level and income. Moreover, following the ANOVA analyses Tukey/Kramer (TK) post hoc pair wise comparisons were computed to see if there are cell mean differences. This method was selected among others because of its appropriateness for unequal sample size mean comparisons.

Results

Table-3: Correlation between Parental Stimulation and Children's Cognitive Competence

		Parental stimulation	Cognitive competence
Parental stimulation		1	.411**
Child cognitive competence		.411**	1
**Correlation is significant at the .05 level (2 tailed).			

As displayed in Table-3, there was a statistically significant moderate positive relationship between parental stimulation and children's cognitive competence r (192) =.411, *P*<.05.

Table-4: One Way ANOVA on Parental Stimulation Score by their Education Level and Monthly Income

***Ind*ependent variables**	**Source of variation**	**Sum of Squares**	**Df**	**Mean square**	**F**	**Sig.**
Level of education	Between group	1875.464	3	625.155	4.301*	.006
	Within group	27323.515	188	145.338		
	Total	29198.979	191			
Monthly income	Between group	2800.949	2	1400.474	10.027*	0.00
	Within group	26398.030	189	139.672		
	Total	29198.979	191			

Table-4 revealed that there was a statistically significant difference among parents' education level and their stimulation score, $F_{(3,188)} = 4.301$, $P<.05$. Also there was a statistically significant difference among children parents' monthly income and their stimulation score, $F_{(2.189)} = 10.027$, $P<.05$. As the one way ANOVA result displayed, level of stimulation were statistically significant across the four groups of parental education level and the three groups of parental income. Hence, it was important to check which pair of the groups had a statistically significant mean difference with the respect to stimulation scores. Therefore, Tukey/Kramer (TK) post hoc test was computed and the results are shown in Table-5 & 6 below.

Table-5: Tukey Post Hoc Test for Parental Stimulation Score across Parental Income

Dependent variable	Income I	Income J	Mean difference (I-J)	Std. Error
Parents level of stimulation	< 4000	4000- 6000	-4.500	2.108
		> 6000	4.712	2.108
	4000- 6000	< 4000	4.500	2.108
		> 6000	9.212*	2.057
	>6000	< 4000	-4. 712	2.108
		4000- 6000	-9. 212*	2.057

*P < .05

The above Tukey test revealed that a statistically significant mean difference was found between parent's monthly income range of 4000-6000 and above 6000 Birr (-9.212), P<. 05. However, no statistically significant mean difference in the parent's level of stimulation was found for the other groups.

Table-6: Tukey Post Hoc Test for Parental Stimulation Score across Education Level

Dependent variable	Education status I	Education status J	Mean difference (I-J)	Std. Error
Parents level of stimulation	Secondary school & below	Diploma	-1.976	2.569
		Degree	4.240	2.296
		Masters & PhD	6.324	2.569
	Diploma	Secondary school & below	1.976	2.569
		Degree	6.216	2.437
		Masters and PhD	8.300*	2.696
	Degree	Secondary school & below	-4. 240	2.296
		Diploma	-6.216	2.437
		Masters & PhD	2.084	2.437
	Masters and PhD	Secondary school & below	-6.324	.069
		Diploma	-8.300*	.013
		Degree	-2.084	.828

*P < .05

As the outcome of the pair wise mean comparison in Table-6 displayed, a statistically significant mean difference on stimulation score was found between those parents having diploma and parents' having the masters and PhD (8.300), P<.05. However, no statistically significant mean difference in the parents' stimulation score was found to the remaining group

Table-7: Independent Sample T-Test for Parental Stimulation Score by Parental Gender, Employment Level, and Types of Pre-schools

Independent sample test		T test equality of mean		
Variable	Assumption	T	Df	Sig.
stimulation score by gender	Equal variances assumed	-.616	190	.538
	Equal variances not assumed	-.612	177.909	.541
Stimulation score by employment level	Equal variances assumed	.001	190	1.000
	Equal variances not assumed	.001	154.884	1.000
stimulation score by types of pre-schools	Equal variances assumed	3.107	190	.002
	Equal variances not assumed	3.073	161.163	.002

*P < .05

The result showed that there was no a statistically significant mean difference on stimulation score between gender of parents t(190)=-.616, P>.05). Regarding the parent's level of stimulation score across employment status, there was no a statistically significant mean difference in scores for those who were employed and unemployed t(190)= .001, P >.05). Regarding, parental stimulation scores by

pre-schools, there was a statistically significant mean difference in stimulation score between parents who send their child at the government pre-schools and parents who send their child at the private pre-schools t(161.163)= 3.073, *P*<.05.

Conclusions

From the study it is to conclude that a significant moderate positive relationship between parental stimulation and children's cognitive competence was found. There was a statistically significance difference in the level of stimulating children's cognitive competence by parental level of education and income. There was no a statistically significant difference in parental level of stimulation score by gender of the parents and by their employment status, however, a statistically significant difference was found in stimulation score between those parents who send their child at the government and private pre-schools.

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