Towards Sustainable Access to Early Childhood Development in Zambia: Re-Envisioning the Role of Community Based Early Childhood Programs in Promoting School Readiness

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Abstract

The study examined the influence of community based early childhood education on children's' literacy and cognitive skills. The study sought to investigate whether children who attended the community based early childhood programmes were ahead of their peer who did not attend any programmes. The method used was quantitative in nature. The total sample was approximately two hundred and thirty-one. These were divided into treatment and control groups. The skills measured included early literacy—letter naming, fine motor skills, receptive and expressive language and cognitive skills—Rapid Automatised Naming (RAN), problem solving and attention skills. Other moderating factors included age, gender and socioeconomic status. On early literacy outcomes, SES and ECE attendance strongly predicated letter naming while age, SES and ECE predicted fine motor skills. ECE and socioeconomic status predicated expressive language while none predicted receptive language. Predictors for cognitive skills were SES for Rapid Automatised Naming (RAN); age, SES and ECE attendance predicted problem solving skills. None of the predictors explained variation for the attention skills. Children attending the community based ECE programmes in rural areas are ahead of their counterparts with no ECE exposure and are better prepared for school compared to those that do not. Implications of the findings are discussed.

Keywords

Community Based Early Childhood Programmes, Early Childhood Education,

1. Introduction

Early Childhood Development (ECD) has recently become a critical area of focus owing to the global recognition of the importance of early years. Early years present a window of opportunity to improving learning outcomes and in addressing inequalities later in life. There is convincing evidence suggesting that skills acquired early in life facilitate the acquisition of more sophisticated skills for later application in school (Duncan & Murnane, 2016). Early childhood education provide children with experiences necessary for development of competences in one or more domains including cognitive, language, literacy, math, social-emotional development and physical development (Buysee & Wesely, 2005). At school entry, children will have a set of skills determined by interaction between their own endowment (genetic) and the quality of interactions of the experiences in the home and child-care settings that support school readiness (Deguzman et al., 2010).

In this regard, research on parameters that deal with delays in school readiness signifies a strategic direction for leveraging upward socioeconomic mobility, by reducing exposure to adversity and improving quality of adult life, health, and well-being (Ritsher, Warner, Johnson, & Dohrenwend, 2001; Sammons et al., 2004). This is especially true for Sub-Saharan Africa where poverty is at the centre of many adversities including inequalities in education. Informed by research evidence, investment in the early years is seen as an economic imperative due to long-term benefits including; improved achievement, higher rates of high school graduation, fewer crimes, and better employment outcomes (Campbell et al., 2012; Coghlan et al., 2009; Schweinhart et al., 2005). Neuroscience has further provided unequivocal evidence suggesting that the first three years are characterised by massive brain development and that early childhood experiences are crucial in shaping the architecture of the brain (Shonkoff & Phillips, 2000). Despite this growing recognition however, global evidence has shown that more than 200 million (39%) children younger than 5 years (under-5s) in low-income and middle-income countries (LMICs) are at risk of not reaching their developmental potential, leading to an average deficit of 19.8% in adult annual income (Grantham-McGregor et al., 2007) with the highest percentage from sub Saharan Africa. There is also evidence showing that the gap in educational achievements between advantaged and disadvantaged children is pervasive and likely plays a key role in the inter-generational transmission of poverty (Fitzpatrick, McKinnon, Blair, & Willoughby, 2014). Others have emphasized that educational and cognitive inequalities associated with low socioeconomic status (SES) begin early in life (Bradley and Corwyn, 2002 & Duncan et al., 1998) and by later elementary school, these differences are robust and persist as children transition to high school (Alexander et al., 1993, Brooks-Gunn and Duncan, 1997; Entwisle et al.,

2005). This gap in itself represents a major threat to the achievement of the Sustainable Development Goals where children are expected not only to survive but also to thrive. Particularly, SDG (4.2) requires that "*By* 2030, *ensure that all girls and boys have access to early childhood development, care and pre-primary education so that they are ready for primary education*". This goal rests on the global aspiration to achievement of quality and equality in education. Undoubtedly, SDG 4 is one of the overarching goals upon which achievement of many other goals for sustainable development is anchored. For example, quality and equality in education would translate into better health, less poverty, more innovation, reduced inequality to mention but a few.

While ECE has become increasingly common, Zambia continues to record marginal increase in children attending ECE from 15.3% in 2004 to 27% in 2016 although attendance among children from rural communities and disadvantaged backgrounds remains relatively low (MoGE, 2016). In view of this, expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children has become fundamental. One of the initiatives to enhance access to ECE in sub Saharan Africa has been the breeding of community based early childhood programs across the country. Targeting and empowering communities is the most sustainable approach of improving learning outcomes and reducing the socioeconomic achievement gap for children in low income communities.

Although the body of literature on the role of ECE in improved learning outcomes is large, relatively few studies have explored the impact of community based Early Childhood programs on school readiness in Zambia. One of the measures of success of ECE is its role in increasing readiness to learn and it is for this reason that the present study explores the potential of community based early childhood education services in boosting school readiness. The current study focused on learning outcomes that relate to attention and executive functions, problem solving, language and literacy acquisition for school readiness. Research has shown that skills for attention and problem solving provide the neural foundation that supports school readiness and facilitates both self-regulated behavior and academic learning (Blair, 2002; McClelland et al., 2007). Higher cognitive processes; executive functions and working memory have been found to promote the acceleration of literacy and mathematical skills acquisition in primary schooling (Welsh et al., 2010; Clark, Pritchard, & Woodward, 2010; Willoughby et al., 2012; Röthlisberger et al., 2012) and enhance the resilience of children who experience early adversity (Pears et al., 2010). In addition, it is purported that skills for attention and problem solving among children growing up in poverty are often delayed (Noble, McCanliss, & Farah 2007). The effect of ECE experiences on literacy skills in early years cannot be overemphasized. Numerous studies have reported a correlation between writing letters of the alphabet in ECE and the ability to spell in the first grade as well as strong associations between ECE experience and letter knowledge, phonological awareness and early reading (Adams, 1990; Bryant & Bradley, 1985; Wagner et al.,

1994). Further, early ECE experiences in letter naming and phonological awareness have been found as strong predictors of Grade 1 reading and writing ability (Berninger, et al., 2006a).

Study Aim

The study addresses the overarching question; Does enrolment in ECE matter for school readiness for children in rural communities? If so, are these associations due to ECE, or are they the result of other moderator factors such as social economic status, gender, and age? The answers to this question have implications for policymakers in influencing the extent to which investment in ECE is strengthened through community based initiatives for purposes of reaching every child including rural children. Our hypothesis is that children who are exposed to ECE would be relatively ahead of their counterparts with no exposure to ECE in cognitive skills and learning outcomes.

2. Methods

This was a cross-sectional study involving children enrolled in community based early childhood centres and those not enrolled in early childhood education.

Participants

Participants were randomly selected from six community based ECE centres from Chipta, Eastern Province of Zambia. The sample consisted of a total of 231 participants with approximately 124 (53.7%) boys and 107 (46.3%) girls. A total of 161 children were randomly selected from community based ECE centres representing the treatment group. Whereas 70 children had no exposure to ECE representing the comparison group and were drawn from the communities as those enrolled in ECE.

Measures

Subtests from the Zambia Child Assessment Test (Zam CAT) and other measures were used to assess letter naming, attention skills, problem solving, language and working memory. The details for individual sub tests are presented.

Letter naming

Knowledge of the alphabet was assessed through letter name knowledge. Children were presented with an A4 sheet with 26 letters of the alphabet in random order. The letters were printed in random order to ensure that the task measured children's knowledge of letters and children were not simply repeating the "alphabet song". The range of possible scores for letter naming is 0 - 26.

Fine motor abilities

Fine motor subtest comprised various activities including coping from a given stimuli, threading, buttoning, putting stones in a cup and the Nsolo game (Nsolo is a traditional game involving manipulation of stones or pebbles on a grid. The game is played in many parts of Africa). The total score for the fine motor abilities is 10 yield the Cronbach's value of 0.90 (n = 231) for internal consistency.

Receptive language

Receptive language was assessed using the Peabody Picture Vocabulary Test

(PPVT) Dunn and Dunn (1997). The test presents four visually displayed pictures on each trial of which the child has to choose one a picture that corresponds to the spoken word. Each correct response receives a score of 1. The range of possible scores for this test is 0 - 30. The Cronbach's alpha value was 0.88 (N = 231)

Expressive Language

Expressive language was assessed with an informal test: telling a story. This was a test of language skills that required children to tell a story of their choice in the language of instruction to the teacher. The children were probed by the question: "Tell me an interesting story". The children's responses were rated on a zero to two scale, with a child scoring zero being completely non-responsive and a child scoring a two giving a full, multiple-sentence answer using correct grammar to the questions posed.

Problem solving

Problem solving task required children to manipulate various objects including building blocks, colours and shapes. The total score for this subtest is 6 and the Cronbach's alpha value was 0.71 (N = 231).

Attention skills

Attention skills were assessed using the pencil tapping test. The Pencil Tapping Test is a simple and child-friendly assessment that takes the form of a game played between the child and the assessor. The assessor explains the "rules" of the game (i.e., when the child has to tap), and the child must remember and apply the rules as instructed. The task therefore assesses attention and memory. The total score for the attention skill subtest is 20 with the Cronbach alpha value was 0.86 (N = 231).

Rapid Automatised Naming (*RAN*)

The RAN task asks children to look at a series of picture stimuli and to name them as quickly as possible (Denckla & Rudel, 1976). The test assesses working memory.

The study controlled for background variables; age, gender and socio- economic status and measured by the home possession index. The home possession index had a total of 10 items with the Cronbach's alpha value was 0.63 (N = 231).

Procedure

Graduate students were trained in the administration of the ZamCAT and supervision was provided throughout the data collection process to ensure data quality. The assessment instruments were translated into ciNyanya, a familiar language for Eastern and Lusaka Provinces of Zambia. Parental consent was obtained from the participants through written consent. Children were assessed individually in their homes and the assessment session took an average of an hour per child. Demographic information was generated through the parent survey.

3. Results

Bivariate correlations

Table 1. Zero order correlations and descriptive statistics of variables $N = 231$.

	Variables	1	2	3	4	5	6	7	8	9	10	11
1	Age	1										
2	Gender	−0.01	1									
3	SES	−0.05	−0.06	1								
4	Letter Naming	0.04	0.03	0.19**	1							
5	Receptive Language	0.02	0.06	0.02	0.23***	1						
6	Expressive Language	0.01	−0.02	0.06	0.19***	0.17**	1					
7	Fine motor Skills	0.21***	0.06	0.15*	0.37***	0.42***	0.54***	1				
8	Random Automatised Naming	−0.03	−0.03	0.17**	−0.05	−0.22***	−0.20***	−0.11	1			
9	Problem Solving Skills	0.21***	−0.02	0.28***	0.41***	0.30***	0.45***	0.68***	0.05	1		
10	Attention Skills	0.07	−0.04	0.10	0.25***	0.26***	0.37***	0.39***	−0.16**	0.36***	1	
11	ECE Attendance	−0.05	−0.02	−0.24***	0.22***	−0.09	−0.15**	0.36***	0.03	0.41***	0.12*	1
	Minimum Score	4	1	0	0	0	0	0	0	0	0	1
	Maximum Score	9	2	10	22	30	5	10	785	5	19	2
	Mean	5.58		5.76	1.46	21.34	3.32	6.34	148.35	3.78	6.50	
	SD	0.76		1.87	3.43	6.50	1.39	3.33	129.32	1.66	4.85	

$*p < 0.05.$ $**p < 0.01.$ $***p < 0.001.$

Parametric Pearson correlations were performed to assess the associations of the interest variables. Results from Table 1 show significant associations between child age and fine motor skills and problem solving skills $p < 0.01$ respectively. Gender did not significantly correlate with any of the variables $p > 0.05$. SES was only correlated with ECE attendance among the moderator variables. Significantly associations were noted with the outcome measures like Letter naming, fine motor skills, problem solving and RAN. ECE significantly correlated positively with fine motor skills, problem solving skills and attention skills. Attention skills were not found to correlate significantly with any variable except for the ECE.

Regression Analyses

Hierarchical regression analyses were computed to determine the impact of predictor variables—age, gender, SES and ECE attendance. To deal with the issue of multicollinearity in the data, all variables were examined using the Variance Inflation Factor (VIF) and Tolerance in SPSS. Results from these tests showed that the assumption of multicollinearity was not violated with VIF values less than 1.25 and Tolerance values above 0.93. Multicollinearity I violated when the VIF values are close to 5.0 and Tolerance values close to 0. Moderate correlations were found among variables, showing some shared variance.

Results from Table 2 assessing the impact of predictor variables on literacy outcomes show that SES and ECE attendance strongly predicated letter naming, $p < 0.05$; age, SES and ECE predicted fine motor skills, $p < 0.01$; None of the predictor variables significantly predicted receptive language while ECE and age

Table 2. Hierarchical regression analyses of age, gender, SES and ECD predicting literacy skills.

Predictors	Early Literacy outcomes											
	Letter Knowledge			Fine motors skills			Receptive language			Expressive language		
Step 1	B	T	P	β	T	p	B	t	p	B	t	P
Age	0.03	0.58	0.561	0.21	3.19	0.002**	0.018	0.27	0.78	0.11	3.30	0.001**
Step 2												
Age	0.39	0.58	0.561	0.21	3.18	0.002**	0.019	0.28	0.78	0.11	1.65	0.100
Gender	0.23	0.49	0.653	−0.02	−0.27	0.781	0.06	0.87	0.38	0.02	0.35	0.728
Step 3										0.11	1.70	0.091*
Age	0.05	0.75	0.452	0.22	3.36	0.001**	0.02	0.29	0.77	0.02	0.28	0.776
Gender	0.04	0.68	0.506	−0.01	−0.10	0.922	0.06	0.89	0.38	0.10	1.67	0.118
SES	0.19	20.94	0.004**	0.17	2.56	0.011**	0.02	0.37	0.71	0.06	0.97	0.332
Step 4												
Age	0.04	0.58	0.563	0.20	3.17	0.002	0.015	0.22	0.82	0.10	1.57	0.118
Gender	0.03	0.46	0.652	−0.03	−0.49	0.623	0.053	0.77	0.43	0.03	0.47	0.638
SES	0.15	2.25	0.025*	0.20	1.52	0.132	0.006	0.08	0.94	0.03	0.46	0.645
ECE	0.18	2.71	0.007**	0.29	4.46	0.000***	−0.08	−1.19	0.23	0.14	2.04	0.043*

Table 3. Hierarchical regression analyses of age, gender, SES and ECD predicting cognitive skills.

Predictors	Cognitive Outcomes								
	Rapid Automatized Naming			Problem solving			Attention skills		
Step 1	B	T	P	β	T	P	β	t	P
Age	−0.025	−0.38	0.704	0.21	3.28	0.001**	0.07	1.02	0.308
Step 2									
Age	−0.025	−0.38	0.703	0.21	3.21	0.001**	0.07	1.02	0.308
Gender	−0.04	−0.59	0.555	−0.24	−0.37	0.715	0.01	0.12	0.901
Step 3									
Age	−0.16	−0.23	0.814	0.23	3.69	0.000***	0.07	1.10	0.27
Gender	−0.03	−0.42	0.673	−0.01	−0.14	0.892	0.01	0.22	0.825
SES	0.17	2.60	0.010**	0.26	4.20	0.000***	0.10	1.52	0.129
Step 4									
Age	−0.01	−0.23	0.819	0.21	3.60	0.000***	0.07	1.00	0.316
Gender	−0.03	−0.41	0.679	−0.04	−0.66	0.511	0.01	0.09	0.926
SES	0.17	2.54		0.18	3.00	0.003**	0.08	1.12	0.262
ECE	0.005	0.08		0.36	5.97	0.000***	0.10	1.51	0.133

were the only variables that predicted expressive language.

Results from Table 3 assessing the impact of predictor variables on cognitive skills show that only SES $p < 0.01$. Problem solving skills were predicted by age, SES and ECE attendance $p < 0.01$ and $p < 0.001$ respectively. Results also showed

that none of the predictors explained variation for the attention skills.

4. Discussion

Results of this study have demonstrated a significant association between exposure to Early Childhood Education and preschool learning outcomes. Specifically, hierarchical regression analysis performed showed significant associations between ECE and letter naming, fine motor skills, expressive language, and problem solving. Thus ECE provide learners with experiences that enhance these foundational skills through structured activities in formal ECE settings. Similarly, background variables such as age predicted letter naming, fine motor skills and problem solving. Significant associations were also found between socio-economic status (SES) and learning outcomes confirming previous research where SES was strongly associated with cognitive ability and achievement during childhood and beyond (Adler & Rehkopf, 2008; Black & Devereux, 2010; Merikangas et al., 2010). Surprisingly, the present study found no associations between ECE and receptive language implying that ECE did not facilitate receptive language and attention skills contrary to previous research (Dickinson & McCAbe, 2001) were strong associations between ECE and receptive language have been found. The plausible explanation to this pattern of results could be the tendency in many Zambian preschools to use English as a medium of instruction contrary to the Ministry of General Education curriculum requirements which emphasises the use of a familiar language from pre-primary to grade four. It is our assumption therefore, that the use of English as medium of instruction could diminish the potential effects of ECE on development of oral language skills as children may lack proficiency in English and at the same time the opportunities to practice in a familiar Zambian language may not be maximised for children to benefit from ECE. The study also found that performance in working memory and Attention and Executive functions was not distinguishable between children enrolled in ECE and those with no ECE exposure. Working memory and Executive functions are crucial skills for school readiness and are closely linked with performance in pre-math and pre-reading tasks (Welsh et al., 2010; Clark, Pritchard, & Woodward, 2010; Willoughby et al., 2012; Röthlisberger et al., 2012). The results from the present study could be indicative of the fact that the quality of early childhood education particularly low cost ECE does not provide children adequate opportunities to be exposed to activities that stimulate these key foundational skills.

In light of these findings, the present study strongly supports our earlier hypothesis that exposure to ECE matter for school readiness as it plays a crucial role in stimulating cognitive abilities and academic achievement. These associations hold true even when potential confounders such as; age, gender and socio-economic status are included in the model. Regrettably, our findings have revealed that performance was not distinguishable in executive functions, working memory and receptive language between children attending ECE and those not exposed to ECE, a helpful reminder that poor quality ECE will not yield the

results we seek and that greater benefits could be gained by investing in improving the quality of community based ECE programmes. Thirdly, our findings expand current theoretical and empirical discussions on the potent of community based ECE programmes in boosting school readiness for children in scarce resource countries like sub Saharan Africa.

5. Conclusion

To conclude, the present study has extended the previous empirical findings regarding the importance of early childhood education in stimulating cognitive skills and improving learning outcomes. The study has also amplified the potential of community based ECE programmes in boosting school readiness and therefore offers promise in narrowing achievement gaps for children from disadvantaged backgrounds. Findings of this study call for commitment towards investment in community based ECE programmes as a pathway to scale up access to ECE in sub Saharan Africa. Provision of ECE to children in scarcely resourced communities remains crucial to the attainment of Sustainable Development Goals, particularly Goal No. 4 (2). Although the results from the present study may not be conclusive on whether children who participate in ECE have better learning outcomes due to lack of robust longitudinal support, it is undeniable that stimulation of child characteristics that are targeted to reduce educational inequalities at school entry between advantaged and disadvantaged children represents a critical foundation in reducing the economic, health, and social burdens associated with poverty.

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