

**NEUROCOGNITIVE DEFICITS IN CHILDREN AGED BETWEEN 7-12YEARS: A
COMPARATIVE STUDY BETWEEN INSTITUTIONALIZED AND FAMILY RAISED
CHILDREN.**

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University

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LIST OF ACRONYMS

KABC-II:	Kaufman's Battery Assessment for Children- Second Edition
HIV:	Human Immunodeficiency Virus
AIDS:	Acquired Immune Deficiency Syndrome
SES:	Socio- Economic Status
SDQ:	Socio- Demographic Questionnaire
MPI:	Mental Processes Index
FCI:	Fluid-Crystallized Index
NVI:	Nonverbal Index

OPERATIONAL DEFINITIONS

Neuro-cognition: This refers to the KABC-II domains of learning ability, visual processing, sequential processing, short term and long term memory storage and retrieval, planning, conceptual thinking and reasoning pattern.

Neurocognitive deficits: This is the impairment of the domains of learning ability, visual processing, sequential processing, short term and long term memory storage and retrieval, planning, conceptual thinking and reasoning pattern.

KABC-II: This is the tool that is used to measure the processing and cognitive abilities in children and adolescents.

Psychosocial: Refers to one's psychological development and how it relates to the social environment

Cognitive deficit: This is an inclusive term most often used to describe the deficits in intellectual functioning associated with global disorders (e.g. mental retardation, intellectual deficit). Less often, it is used to describe specific deficits in cognitive abilities (e.g. certain learning disabilities, autism, ADHD).

Intellectual disability: This term is now increasingly being used instead of mental retardation. It is characterized by significant limitation, both in intellectual functioning and adaptive behavior, as expressed in every day conceptual, social and practical adaptive skills.

Intellectual Functioning: Intellectual functioning, also called intelligence, refers to general mental capacity, such as learning, reasoning and problem solving. Intellectual functioning can be measured by an IQ test. Generally, an IQ score <70 indicates a limitation in intellectual functioning

ABSTRACT

Introduction

It is estimated that over 200 million children fail to meet their developmental potential because of poverty, poor health and non-stimulating environments. Many abandoned and orphaned children spend their early life in orphanages which tend to be significantly depriving. There are high child-caregiver proportions, frequent change of caregivers, inadequate resources and little or no cognitive stimulation). Walker reported that lack of cognitive stimulation, stunting, iron deficiency, iodine deficiency Anemia were the main risks of neurocognitive deficits. Early researchers found that children raised in children homes showed a variety of neurocognitive deficits compared to their counterparts raised in natural families or foster care.

Aim: This study was designed to assess the neurocognitive deficits among children aged 7-12years raised in a children home and how they compare with their counterparts raised in natural families.

Method: A total of 56 children from the children's home and 56 from biological families were recruited. The neurocognitive scaled scores for children raised in biological families were significantly higher than institutionalized children in three subdomains, Sequential Processing (Mean= 62 vs 59, P. value 0.013); Simultaneous processing (Mean= 72 vs 64, P. value 0.013); and Learning (Mean= 127 vs 118, P. value 0.01). Overall the Global MPI (Mental Processing Index) for children raised in biological families (Mean= 75; -2SD (Below Average) while the institutionalized children (Mean= 70 which is -2SD Below Average). This was significant with a P. value of 0.01.

Conclusion: There was higher neurocognitive deficits among 7-12 years old children raised in institutional care than their counterparts raised in natural biological homes. Therefore by all means where possible children are better raised in Biological families

CHAPTER 1: INTRODUCTION

1.1 : Introduction

Neurocognitive deficits, is a general term used to portray impairment in a person's mental processes leading to the acquisition of information. The mental processes drive how a person understands and behaves in the world. The major areas of cognitive functions are Attention, Decision making, General reserve of learning, Judgment and understanding, Language, Memory, Perception, Planning, Reasoning. Any hindrance in either of them can cause huge social issues; (Diana W Schofield, 2016). Moreover, failure to meet the formative developments during the critical time of infancy has been found to have enduring impacts for the duration of the life course. These include school accomplishment, adult lifestyle, and generational transmission of poverty. (Nicole D. Ford¹ and Aryeh D. Stein 2016).

Globally, about 200 million children in the world fail meet their developmental potential because of poverty, poor health, and non-stimulating environments. In one study, approximately 153 million children globally have lost a mother or a father. Among them, 11.63% had lost both parents (Lee, Y., & Kim, S. 2011) and this includes more than 12 million orphans in sub-Saharan Africa (Morantz & Heymann, 2010). Approximately 8 million children were living in institutions worldwide as was estimated by UNICEF (Browne, 2009a). These Institutions/ orphanages have a tendency to be significantly deprived in-terms of care with high child-to-parental figure proportions, little or no social and cognitive stimulation, frequent changes in guardians and more often than not, lacking adequate physical resources. (Emily & Katia et al 2017).

1.2 Background

Kenya was estimated to have over 2.4 million orphans and vulnerable children by 2009. This number has been increasing steadily over the years. While extended families in Kenya had traditionally fostered orphaned and vulnerable children, high incidence of HIV infection and AIDS

and the growing numbers of children left in its wake have continued to become overwhelming to the traditional care structures. In instances where this structure is unable to cope, some Kenyan households end up being child-led. In worst instances children end up homeless and in the streets. This makes them more vulnerable to all forms of abuse and disease. It is their overwhelming and needful state that has made genuine well-wishers start orphanages to offer them shelter. Most of these orphanages are impoverished and lack basic facilities and services for the children. These children continue to lack basic needs and survival needs i.e. food, shelter, clothing, medical attention, school fees among other needs.

Regionally, institutionalization is also common. In some countries the number of children in institutional care may outnumber the number of children in family care. In Rwanda about 3,323 children and young adults were reported in 33 officially registered institutions (Ministry of Gender and Family Promotion & Hope and Homes for Children, 2012).

Brain Development depends on two ways of plasticity; the experience-expectant process which is the incorporation of information from the environment that is present everywhere and common to all members of the same species and has been that way through the evolutionary process. This process seems to evolve to prepare the brain to incorporate specific information for survival preparation.

In childhood, humans have numerous neuro-systems and networks and through experience some of those networks are pruned away following non-use while others are strengthened due to continuous use. The other kind of plasticity is known as experience-dependent where it allows for the incorporation of new environmental info that is unique to each person. This info may include learning about a specific language a vocabulary of culture or even physical environment. This process involves continuous formation of new synaptic connections to respond to situations and

allows for storage of information. (Cicchetti, D. 2015). This therefore means that one's early experiences determine which neuro-pathways werecome permanent and which ones were eliminated. For this process therefore to result to normal development of the brain, the infant must interact with a living and responsive environment Balbernie, R. (2010).

Many studies have documented the negative effects of institutionalization on children in different domains of functioning. This includes their physical, socio-emotional, and cognitive development. Comparing children raised in families, children raised in institutions demonstrated higher rates of emotional and behavioral problems, insecure attachment, (van IJzendoorn & Juffer, F et al 2011). In addition, existing research suggests that children raised in institutional care are consistently more vulnerable to developing psychopathological symptoms, i.e. internalizing and externalizing behavior problems (Cheung & Goodman et al, 2011) as well as low self-esteem (Nilofer & Farooqi et al, 2009; Pinheiro Mota & Matos, 2012).

1.3 Problem Statement

Save the Children report, (2012) estimated the number of registered children homes in Kenya to be 701 holding a total of 43,286 children. In addition, The Department of Children Services estimated that the number of children in these institutions had risen from 10,568 children in 2004 to 40,506 children in 2010. These numbers continued to increase over the years. The African Charter on the Rights and Welfare of the Child (ACRWC) and the United Nations Convention on the Rights of the Child (UNCRC) both in Kenya have ratified the Children Act of 2001, emphasizing that the ideal setting for a child to grow in is a family or at least a community setting. Studies done over 60 years clearly indicate that neurocognitive development of institutionalized children is negatively affected (Marinus H. et al 2014) .The first wave of the studies showed that children raised in institutions had low IQ together with severe delayed

language development (MacLean, 2003). A further study in this area by Van IJzendoorn, et al in 2008 affirmed that children raised in institutions had a notable low IQ compared to children raised in their foster or biological families

In Kenya, Otsetswe and Kumar 2017 showed the prevalence of neurocognitive deficits among HIV positive children attending CCC at KNH was 60% with neurocognitive performance of 54 children being at least 2SD below the mean based on KABC-II scores. An earlier study that focused on the neurocognitive deficits in children with severe falciparum malaria concluded that impairment of the executive function in children suffering from severe malaria was linked to specific neurological phenotypes especially complex seizures. (Kariuki, Abubakar & Newton et al 2014).

These being among the few available studies focusing on neurocognitive development in children in Kenya, there is definitely lack of data to inform other causes of neurocognitive deficits in children. This study intends to therefore fill this existing gap in literature on the neurocognitive deficits as well as highlighting the importance of neurocognitive development in institutionalized children. This study therefore assess the neurocognitive deficits of children between 7-12 years old raised in a children home and how they compare to their counterparts raised in their natural/biological families.

1.4 Research Question

Are children aged 7-12 years, who have been brought up in a children's home more likely to suffer cognitive impairment compared to children aged between 7-12 years raised in their families?

1.5 Overall Objective

The purpose of this study is to assess and compare the neurocognitive deficits among children aged between 7-12 years raised in institutional children's homes and those brought up within natural/ biological families in Ngong sub county Kenya

1.6 Specific Objectives

- i. To determine the neurocognitive deficits of institutionalized children
- ii. To determine the neurocognitive deficits of children raised in their biological homes.
- iii. To compare the neurocognitive deficits of institutionalized children and with those living in their biological homes
- iv. To determine the association between neurocognitive deficits and sociodemographic factors of institutionalized children and children brought up in biological homes/families

1.7 Significance and Justification of Study

Save the Children report, (2012) estimated the number of registered children homes in Kenya to be 701 holding a total of 43,286 children. These numbers continued to increase over the years.

There are just few available studies focusing on neurocognitive development in children in Kenya and non about institutionalized children. This means therefore that there is definitely lack of such data to inform other causes of neurocognitive deficits in children. This study intends to therefore fill this existing gap in literature on the neurocognitive deficits as well as highlighting the importance of neurocognitive development in institutionalized children. In addition, because of the importance of neurocognitive development to children's successful functioning; the study hopes to quickly identify children who werenefit from any cognitive intervention that the

researcher will recommend. Moreover the study will also recommend whether or not KABC (II) tool is suitable for similar studies in Kenya.

CHAPTER 2: LITERATURE REVIEW

2.1 Specific Deficits in orphanage reared children

Children raised in children homes unfortunately provide a natural experiment to study the on the effects of environmental deprivation in children. Relative to children raised in natural family environments, children raised in institutions (orphanages) demonstrate significant neurocognitive deficits/ impairments. (Rutter, M. et al 2012). There are two propositions of how children raised in orphanages decline in neurocognitive development. One is that the institutions generally do not provide stimulating environments for neurocognitive developments that the biological or adoptive parents are thought to provide. As such, these deprivations lead to neurocognitive delays, (Nelson, et al 2010).

The second proposition is that being reared in an orphanage is an on-going stressor that affects their neurocognitive development. These children may also endure chronic unmitigated stress without the benefit of attachment from a consistent caregiver. Child neglect, separation from primary caregiver and exposure to traumatic situation e.g Domestic violence, rape and natural disasters have been shown to have negative biological, social, emotional and cognitive implications (Palaszynski & Nemeroff 2009). Beers and De Bellis (2009) compared cognitive functioning of the children with PTSD in an outpatient setting and children without any history any maltreatment or PTSD and found that, those with PTSD performed poorly in executive functioning (sustained attention, vigilance) abstract reasoning and learning compared to those without.

In addition, Adoption studies with children raised in orphanages demonstrate a clear picture of the effects of depriving environments and stress on young children. These children upon adoption show significant cognitive and developmental delays. Tan & Jackson et al (2015)

compared children raised in Guatemalan children's home to children adopted in foster families and found that children raised in orphanages had poor growth measurements which correlated with the span of time spent in the children's home. Moreover, these children showed high rates of diseases; Anemia, Tuberculosis. Grobbelaar, H. H. (2011) also found similar results in children reared in orphanages in Durban. Similar health problems were noted among children raised in orphanages in Russia. (Welsh, J. A., & Viana, A. G 2012).

In Bucharest Early Project BEIP (Nelson, C. A. (2010), report on children raised in orphanages indicated significantly diminished intellectual performance (Borderline Mental Retardation) comparative to children raised in natural families. An addition, children placed in foster homes showed significant improvement in cognitive outcome. Van IJzendon et al (2008) also reported that children growing up in orphanages showed a delay in IQ in comparison to those growing in families whether foster or Biological. In another joint effect size of about 75 studies with more than 3880 children from 19 different countries showed an average IQ score of 84 in children raised in institutions compared to 104 score of their counterparts raised in families.

2.2 Early Experience and Brain Development

The development of the brain relies on two different means of plasticity. The first one being the experience-expectant process that is the integration of information from the surroundings that is present everywhere, common to all members of the equivalent species and has continued to be that way through evolutionary process. This process appears to advance in preparation of the brain to integrate specific information for survival preparedness. Humans during childhood have abundant neuro-systems and networks. Through experience, some of those networks get pruned away following non-use while others are reinforced due to unceasing use. Experience-dependent is the second kind of plasticity where it allows for the assimilation of new environmental

knowledge that is unique to each person. This knowledge may include learning about a specific language, a vocabulary of culture or even physical environment. This process involves continuous formation of new synaptic connections to respond to situations and allows for storage of information (Greenough, et al 2013). This therefore means that one's early experiences determine which neuro-pathways werecome permanent and which ones were eliminated. The infant must interact with a living and responsive environment for this process to result to normal development of the brain. (Nadeem& Yameen et al 2014).

Abnormal neurodevelopment may result in children who have early prolonged exposure to inadequate experience-expectant stimulation environments (Greenough, et al 2013). Nelson et al (2010) also stipulates that abnormal structural development may occur from exposure to inadequate domain-specific and experience-expectant stimuli during sensitive periods of development. For example, studies on institutionally raised children observed that these children had impairments in language functioning. From experience dependent learning perspective, there was reduced language stimulation in the orphanage setting especially during the critical period of language development and thus altering the neural pathways and structures that mediate language development.

2.3 Stress and Brain Development.

The human nervous system undergoes numerous important development in infancy and early childhood. Prolonged exposure to stress especially during those critical periods of development has negative results on the neurocognitive functioning of the children. Some of the Children reared in orphanages have been rescued from extremely stressful situations. Domestic violence, rape, physical and emotional abuse, sex slavery, natural disasters among others are some of the situations in which these children have been rescued from. Eagle et al 2013, noted that some

specific areas of the brain together with their neural-pathways could be damaged due to exposure to prolonged stress. There was a long-term consequence on the HPA axis (mediates body's stress response) as well as the hippocampus (memory). These regions are associated with cognitive, language and socioemotional functioning.

Lopez, et al (2015) found the limbic-hypothalamic-pituitary adrenal (LPHA) axis to be functionally and structurally abnormal after prolonged exposure to stress. Sapolsky, R. M. (2009) also noted that chronic elevations of glucocorticoids after prolonged exposure to stress could damage the limbic and the hippocampal regions of the brain. Further, stress and glucocorticoids have been associated with dendrite remodeling and repeated or chronic stress could result to cognitive impairments.

Hypothalamus-Pituitary-Adrenal (HPA) axis changes are commonly associated with separation of caregivers. HPA axis regulates production of glucocorticoids, which are released in response to stress. In early childhood and infancy, the caregivers/ parent serve as buffer for stress by providing a nurturing and comforting environment for the infant. Lack of a supportive caregiver in the infant's life poses a challenge in regulation of stress response.

2.4 Attachment and Neurocognitive impairment

Attachment being an affectional enduring relationship that binds two people has been described as a substantial evolutionary function. Bowlby (1960) explained that attachment between infants and mothers is related to responses to fear and anxiety in children. Harlow, Goldberg, D. (2009) in an experiment with infant monkeys found that when stressed, infant monkeys preferred the contact comfort of a cloth-covered mother surrogate to a wire surrogate that offered food. There is a significant relationship between attachment and cognitive functioning. West and Mathews et al (2013) indicated in their study that whereas mothers of securely attached

children being more responsive to provide more cognitive stimulating tasks to their children, children with insecure and ambivalent attachment styles showed negative correlation with cognitive ability.

In another study Johnson, D. E., & Gunnar, M. R. (2011) indicated that the ratio of children to caregivers in Romanian orphanages made minimal contact. The ratios were often 60 children to one caregiver. The institution only provided food shelter and clothing and less care and love for children. Six studies showed high rates of disorganized and insecure attachment as some of the effects of institutional care on (Gunnar, M. R. (2011). Minimally stimulating and stressful environments make children more susceptible to low cognitive functioning. Van IJzendoorn et al (2011) indicated that there was substantial evidence that showed that exposure to disadvantaged environments during the first years of life was associated with negative outcomes in adolescents and adulthood including lower IQ and academic attainment.

In their experiment with rat pups, Afonso, & Fleming, A. S. (2011), observed significant structural changes of the brain regions which are responsible for, social behaviors impulsivity and activity in rat pups that were separated from their mothers and raised in minimally stimulating environments. This in conclusion could therefore mean that lack of expected care with absence of a consistent caregiver in early development could affect some functional and structural brain regions of the brain (Escott, E. J. 2014)

2.5 Other Factors Associated with Neurocognitive impairment

Low socio-economic status (SES) has been associated with neurocognitive delays. From early infancy, preschool persisting through to childhood and beyond, people of low SES perform way below their middleclass counterparts in IQ tests and school achievement (Bradely and Corwy 2002). A study by Lounghan & Perna (2012) on 65 children in public school system

from a low SES household indicated that these children scores way below average across all measures of intellect (memory, executive functions and academic ability). In addition, Lounghman and Perna, (2012) postulated that children from low SES were twice more likely to repeat a grade or be expelled from school than their middle-class counterparts. They were 1.4 times probable to be diagnosed with a learning disability in elementary or high school than their middle-class counterparts.

HIV has also been associated with neurocognitive deficits among children. A study by Boyede et al. (2013) found how WHO clinical stages of HIV infection and use of AAR affected cognitive functioning among HIV infected children (6-15 years) in Nigeria. Deteriorating clinical stages in younger children living with HIV were also associated with lower cognitive performance whether or not they were on HAART treatment. Musindo, Kumar (2017) found a high prevalence of neurocognitive deficits among HIV positive children attending CC-KNH

2.6 Theoretical Framework

Tara A. et al. (2009) suggested that cognitive vulnerability models showed comprehensive ways of understanding the origins and causal factors contributing to psychological problems. The cognitive perspectives including information processing have been related to, anxiety, substance abuse, eating disorders, marital problems, depression and many other psychological problems over the past 30 years. (e.g., Alloy & Riskind et al, 2006). This model assumes that the relationship between the event that a person may experience and the following emotional responses is an important part of information processing and cognitive appraisal. (Lazarus. et al 1991). Alloy & Riskind et al (2006) suggested that, cognitive vulnerabilities develop from a series of causal chains ranging from genetic liabilities to life stressors.

Jean Piaget (1896-1980) suggested the different stages Cognitive Development. These stages are influenced by different things including stimulating environment, genetic predisposition, health, attachment styles, and nutrition. Children with brain vulnerabilities may include those infected with HIV/ AIDS, those on ART, those Malnourished, those whose parents/ caregivers have chronic illnesses, orphaned or institutionalized. Institutionalized children lack stimulation starting from sensory-motor through to pre-operational stages. Reaching concrete stages, these children lack a proper foundation on which to build on their neurocognitive development. For this reason therefore rapid brain development lags behind causing delays in neuro-cognitive development and as a result, abnormal pruning of neurons occurs leading to the disconnectivity in brain functions.

CHAPTER 3: METHODOLOGY

3.1 Study Design

This was a comparative study among Kenyan children aged between 7-12 years utilizing both quantitative data collecting methods

3.2 Study Setting

The study was conducted in Help Kenya Children Rescue Centre and Enoomasiani Primary School Ngong. HelpKe is a children rescue Centre hosting about 182 children aged between 3-17 years. The children are rescued from different situations and backgrounds. The children come from different parts and tribes of Kenya. Enoomatasiani Primary school is a public day primary school hosting about 700 children coming from Ngong and its environs. The children are from Baby class-Standard 8. The children are from different tribes because Ngong is a multi-ethnic town.

The children from their families were selected from Enoomasiani Primary School Ngong. It should be noted that the children from Enoomasiani Primary School Ngong were presumed to live in their own families but no study were done to trace their homes. The researcher will recruit a sample of children raised in the children home from Help Keya Children Rescue Centre. Both the school and the children Home are located in the same location, Matasia, Ngong.

3.3 Study population

The study population were children of school going age in Ngong with the sample population being children in the children's home aged between 7-12 years and children from Enoomasiani Primary School Ngong raised in their biological homes. Other participants in this study were the children home director and the Parents /guardians of the children raised in biological families.

The study will enroll participants who will meet the following criteria

i. Inclusion Criteria and Exclusion Criteria

Children from Help Kenya children rescue Centre

- Children aged between 7-12 years(which were confirmed from the Children's Home records)
- The children have to have lived in the home for more than 3 months (Confirmed through the children's Records from the Home)
- The children who assent to participate in the study.

Exclusion Criteria

- Children who have any obvious mental retardation including any significant Psychiatric and mental illness (confirmed from the house parents)
- Children who do not assent to participate

Comparative Group: Inclusion Criteria

Children from Enoomatasiani Primary School

- Children aged between 7-12 years
- Children living with parents/ guardian or other close relative.
- Children whose parents will consent to participation and they assent to participate

Exclusion Criteria

- Children whose parents will not agree to give consent or if the child does not consent were excluded
- Children who have any obvious mental retardation including any significant Psychiatric and mental illness (confirmed from the teachers)

3.4 Sample size Determination

Children in institutional care and those staying with families were considered as comparative groups – and potentially matched on the background characteristics (age and gender). The two groups were of equal sample sizes which were calculated using a formula in Wittes (2002)

$$n = \frac{2 \delta^2 (z_\alpha + z_\beta)^2}{(\mu_1 - \mu_2)^2}$$

Where;

n – the sample size in each study arm

$\mu_1 - \mu_2$ – Clinically meaningful effect size (detectable difference) of KABC – 2 measurements between the groups.

δ – is the standard deviation of the anticipated effect size.

$\frac{z_\alpha}{2}$ - corresponds to two tailed significance level (1.96 for $\alpha = 5\%$)

z_β – corresponds to a power of 80%.

According to Meta-analysis by Marinus H; Van IJzendoorn et al (2005), children in institutional care had lower KABC – 2 score (mean = 84, SD = 16.79) than those staying with families (mean = 104, SD = 12.88). Statistically, smaller effect sizes require larger sample sizes to detect, Gail M, Richard Feinn (2012). Even though this study by Marinus (2005) found a mean score difference of 20 between the two groups, various detectable differences lower than 20 (2, 4, 6, 8, and 10) are examined to determine which of them would result in a practical sample size. As a conservative approach, we assume children under institutional care would have a mean KABC – 2 score of 84. Also assuming a fixed standard deviation of 15 (pooled from the two arms in Marinus (2015), together with a significance level of 5% and a power of 80%, the resulting sample sizes by varying detectable differences are presented in **Table 1**.

Table 1: Detectable differences versus total sample sizes

Detectable difference	2	4	6	8	10
Total sample size	1764	440	196	110	94
Sample size per arm	882	220	98	55	47

Based on these calculations, detecting an effect size of 8 would require a practical sample size of 55 per arm (total = 110 + 3.6% attrition thus 114 participants), which is more than sample sizes required to detect effect sizes of 10. This figures were increased to 116 to ensure equal gender distribution in each group: 29 boys and 29 girls in both groups.

3.5 Sampling Procedures

A stratified random sampling based on gender was used. All children from Help Kenya Children Rescue Centre and Enoomatasiani Primary school who meet the inclusion criteria, and have no obvious mental retardation were put in a sampling frame. This was then divided for gender into girls and boys list. 29 children were randomly selected from each group using digital assisted randomization. There were 29 girls and 29 boys from the children home. A similar process was used to select children from the comparative group Enoomasiani Primary School Ngong. There were 29 boys and 29 girls randomly selected from those meeting the criteria.

3.6 Recruiting Process and Consenting Procedures

After getting approval from the KNH/UON ERC and permission letters from NACOSTI who gave directions on how to go about go about the school permissions. The researcher will approach the person in charge of the home and the head teacher of the school.

Children's Home: The researcher approached the person in charge of the home and introduced the study, answered any questions raised and ensured that everything was clear. She also showed the consent form signed on behalf of the children by the children's officer. After the person in charge

understood everything, the researcher sought their permission to conduct the study in their orphanage. When permission was granted, the researcher requested for a list of all the children including information on age, gender, duration of stay and whether any of the children had mental retardation. The researcher then compiled a list of all the children who met the inclusion criteria. She then requested to know the best time to meet and assess the children of different age groups for assent. The researcher explained the research and the tool to the child and waited for them to voluntarily assent. Those who assented the researcher went ahead with the study. Those that who did not assent were thanked and excluded from the study. They were assured that they there were no consequences of choosing not to participate. Further recruitment of participants were done on a one to one basis before the assessment. All assessments were done by the researcher KABC-II was administered to the child at approximately 75 minutes.

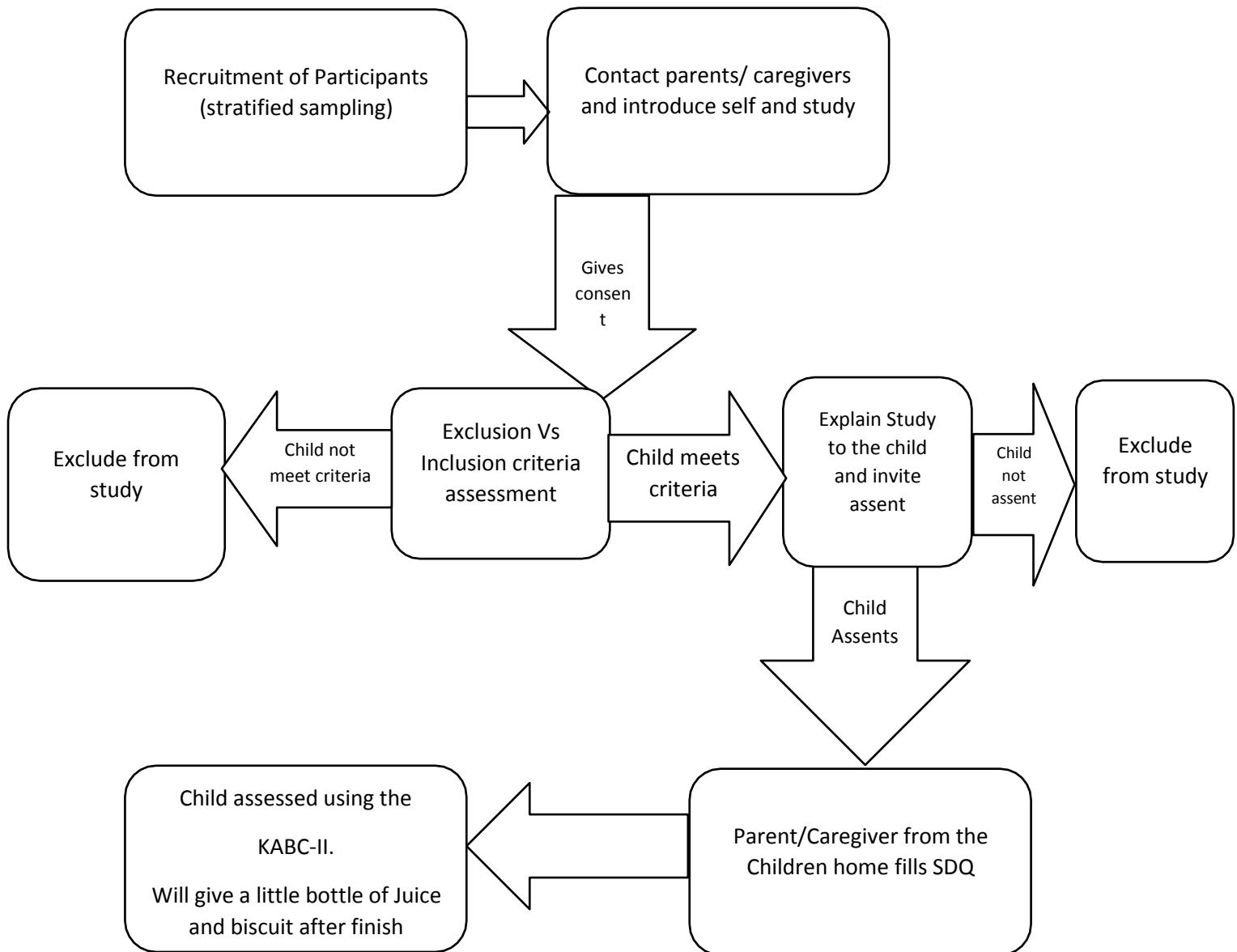
For the School: The researcher after introducing the study to the head-teacher, requested for a list of all the children within the study age group, and whether any of the children had mental retardation. The researcher compiled a list of all the children who met the inclusion criteria. After randomizing as described above, the contact number of the parent/ guardian of all sampled children was requested from the head teacher. The researcher then contacted the parent/ guardian, introduce herself and provide the parent/ guardian with the description of the research, the inclusion and the exclusion criteria of the child was captured as well. The parents who accepted that their children participate in the study were notified that their children would bring the consent form home for them to read and sign. For those who do not understand English or had other questions, had their children offered letters to take home requesting them to come to school to meet the researcher. This case applied too to the parents who do not have phones to be contacted with. Once they come

to school they were told about the research and their questions answered. After that they were offered the consent forms to sign.

The head-teacher advised on an appropriate time to do assessments without disrupting the school teaching program. He also be requested to avail a quiet private room for the assessments which will all be done by the researcher. The researcher arranged to code the questionnaires against the list so that if the parent and child cannot be interviewed at the same time the researcher will did the child later. This helped the researcher because a parent came when the child was in class. The researcher also planned that the parents who cannot be accessed in school be interviewed later at home.

After the consent forms were signed, the researcher will administer a social demographic questionnaire to the parent, which took approximately 15 minutes to complete followed by the KABC-II tool to the child which took approximately 75 minutes. The child was given 15 minutes break between so as to minimize fatigue. Upon completion of the KABC-II the participant were given sweets

Fig 1: Recruitment Process and consenting procedure

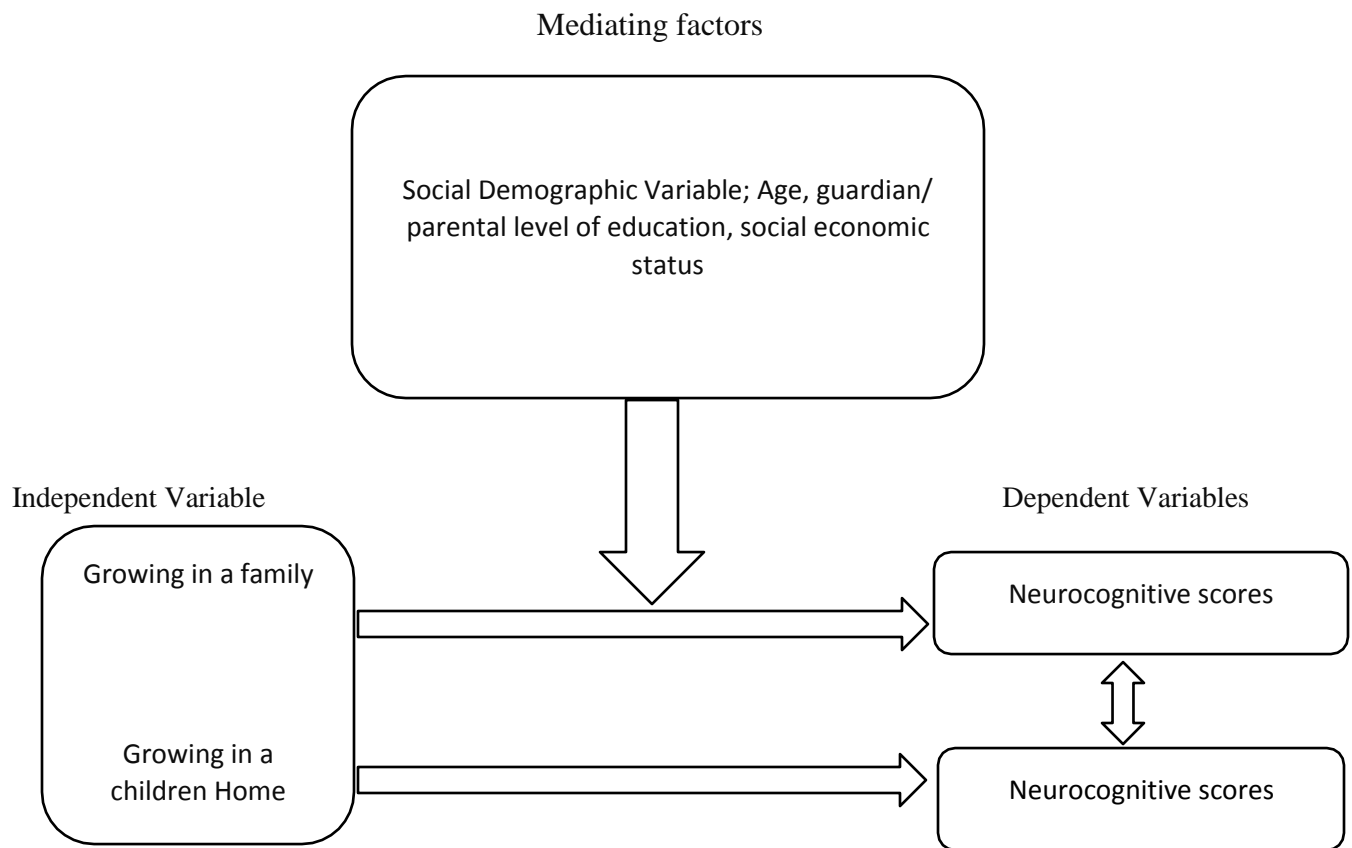


3.7 Variables: Dependent, Independent and Mediators

The independent variable in this study was being raised in the children home and being raised in the family. The dependent variables were the neurocognitive scores measured by the KABC-II. The social demographic data were the mediators in this variables interaction.

The Neurocognitive domains to be measured in children included Learning ability, short term and long term memory, storage and retrieval as well as planning (fluid reasoning) using the KABC-II battery. The mediators of the social demographic variables included age, gender, family background, institutional environment, school environment, guardian or parent education

Fig 2: The interaction of the study Variables



3.8 Data collection procedures

3.8.1 Piloting/ Pretesting

A pretest of the KABC-II was done to identify the elements that may not be well understood by the respondents and the problems that may be encountered during the main study. The pretesting was carried out among children selected from the school in Ngong. The pilot helped the researcher

skills in assessing children in school setting .The pilot process aided in identifying the misunderstood content in the KABC-II tool.

3.9 Data collection instruments

A social demographic questionnaire for the caregivers of children in family settings and a corresponding check list for children in the children's home and the KABC-II. (See appendices f &g)

3.9.1 Socio-demographic Questionnaire for the Caregivers

A socio-demographic questionnaire was created and included the demographic information age, gender, school environment, home environment, socioeconomic status. (See appendix f). The check list for the children in the children's home included age, gender, year of enrolment in the home, parents (alive or dead, single parent) and reason for institutionalization

3.9.2 Kaufman Assessment Battery for Children- second Edition (KABC-II)

In assessing the neurocognitive deficits among institutionalized children in this study, The Kaufman Assessment Battery for Children-Second Edition (KABC-II) was used. The KABC-II is a clinical instrument (psychological diagnostic test) for assessing cognitive development. Its construction incorporates several recent developments in both psychological theory and statistical methodology. (Alan S. Kaufman and Nadeen L. Kaufman 2004). It is a standardized test that assesses the intelligence and achievement in children aged between 3-18 years. This tool was chosen for this study because it has been adopted and validated in a wide range of setting; Kenya, Congo, Uganda and Malawi (Bangirana et al., 2009)

The test battery has been used in low income countries such as South Africa and Malawi and it has proven to be culturally fair (Mitchell, 2015). The KABC-II contains a total of 18 subtests grouped into Core or Supplemental tests. The Core subtests are those used to compute either the

Fluid-Crystallized Index (FCI) or Mental Processes Index (MPI) and separate scale scores, while the Supplemental subtests provide expanded coverage of the abilities measured by the Core KABC-II subtests and allow for the computation of a Nonverbal Index (NVI). In this study only the core subtypes which include; Atlantis, story completion, number recall, rover, Atlantis Delayed, rebus, word order and rebus delayed were assessed. Depending on the model of interpretation choice and age of the child, the subsets are grouped into 4 scales. This study will follow the Luria's model which is made of 4 scales which the sequential processing scale, simultaneous processing scale, learning and planning ability (Mckown, 2010).

Table 2: KABC-II core Battery Index scales- Ages 7-18

	Ages 7-12
Learning/ Glr	<p>Atlantis</p> <p>The assessor teaches the child nonsense names for pictures of fish, shells and plants. The child then has to point to the correct picture when read out the nonsense name.</p> <p>Rebus</p>
Simultaneous/ Gv	<p>Rover</p> <p>The child moves a toy dog to a bone on a grid that contains several obstacles trying to find the quickest path to the bone.</p> <p>Triangles</p>
Sequential/Gsm	Word Order

	<p>The assessor reads the names of common objects, the child then touches a series of silhouettes of these objects in the same order they were read out in.</p> <p>Number Recall</p> <p>The assessor reads a string of numbers to the child. The child repeats the string of numbers in the same order as they have been read out in.</p>
Planning/ Gf	<p>Pattern Reasoning</p> <p>The child is shown a series of stimulus that form a logical linear pattern with one stimulus missing. The child selects the missing stimulus from several options.</p> <p>Story Completion</p> <p>The child is shown a row of pieces that tell a story. Some pictures are missing. The child selects several pictures needed to complete the story from a selection. The child places the pictures in the correct location to complete the story.</p>

Table 3: KABC II Supplementary Subtest –Ages 7-18

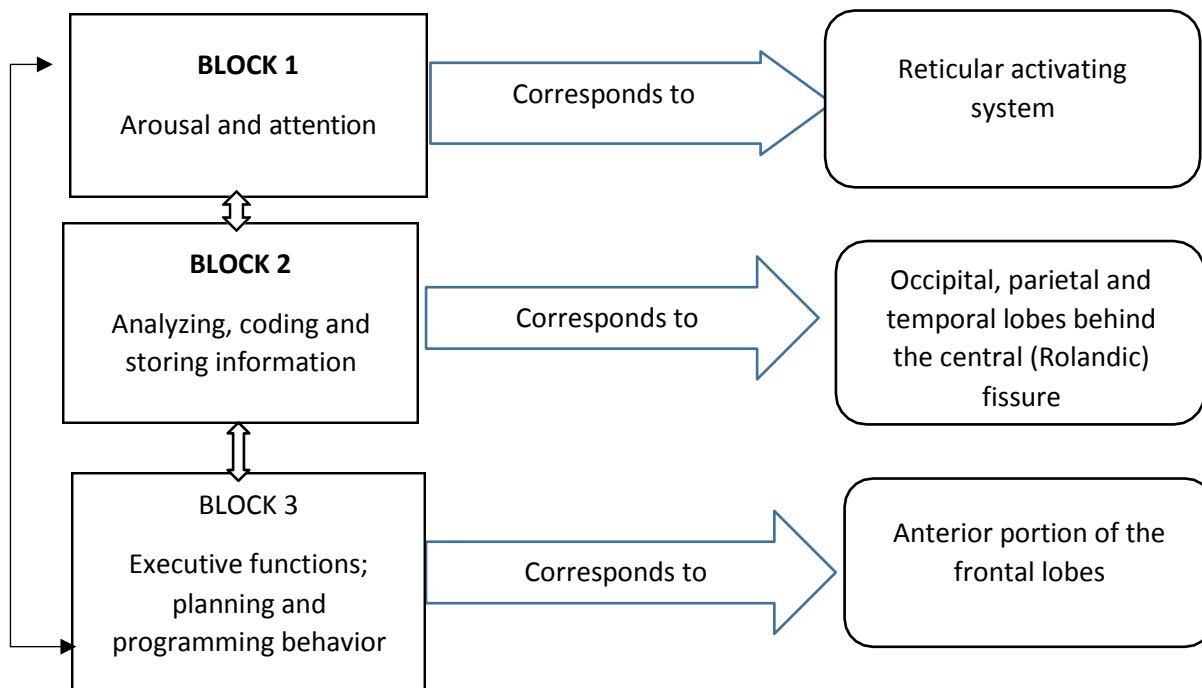
	Ages 7-12
Learning / Glr	Delayed Recall scale Hand Movements
Sequential/ Gsm	Block Counting Gestalt Closure
Planning/Gf	N/A

The KABC-II administration was done by the researcher. The administration period for KABC-II is predicted to last between 30-75 minutes, with a total of up to 15 minute's breaks to stretch a little bit and use the bathroom to minimize fatigue.

The Luria Model

Luria outlined a 3 principal block or functional system of the brain, which when working together unite to regulate all behavior; sleeping and waking, hearing and seeing, thinking and problem solving.

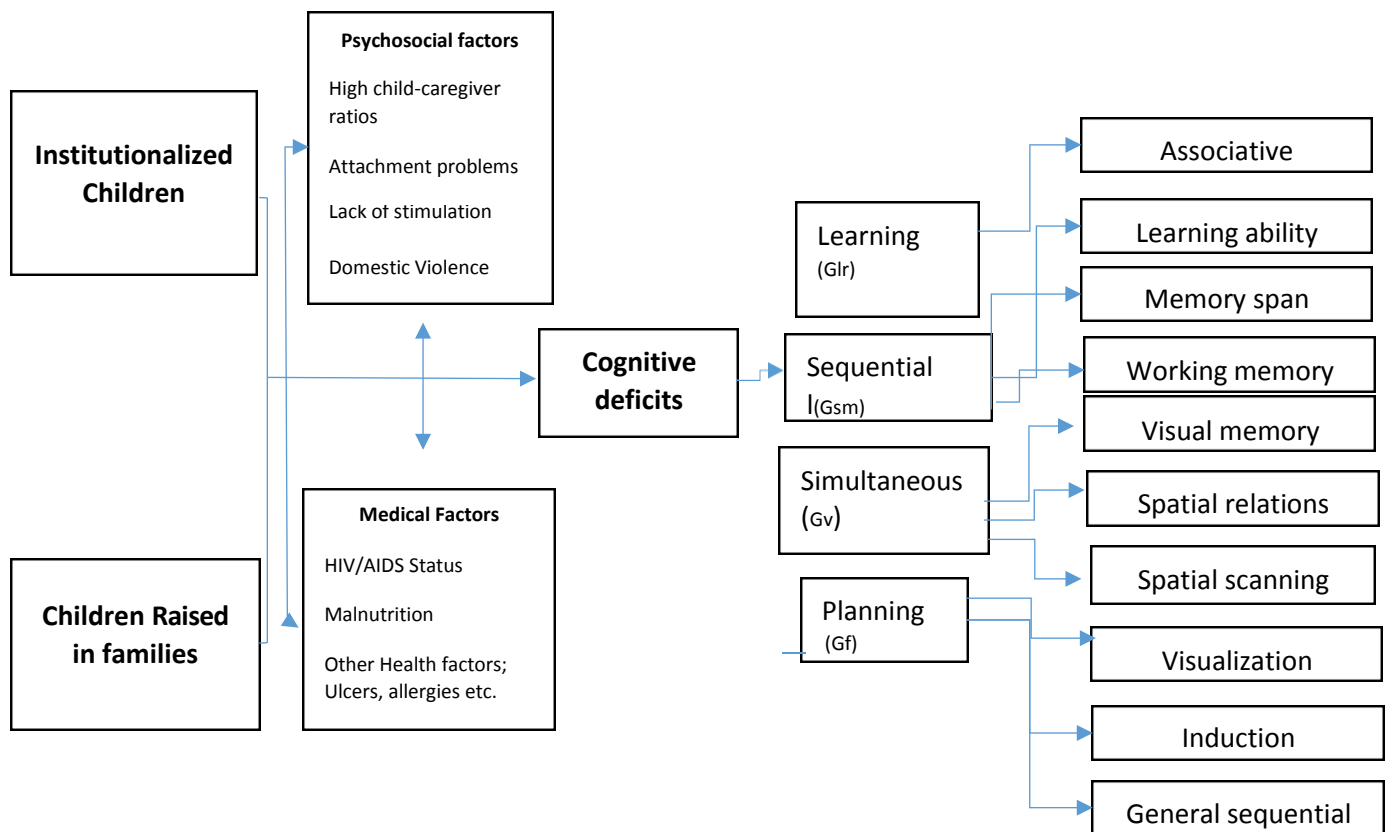
Fig 3: The Luria model



These are the three main blocks representing the brain's basic functions. (Kaufman, Lichtenberger, 2005). These three functional systems are; the arousal attention (Block 1), the sensory input (Block 2) and the output/planning (Block 3) (Flanagan & Harrison, 2005). Luria stipulates that each of these processes maintain a distinctive and vital role in human cognitive

functioning. Block 1; *Arousal and Attention* to incoming stimuli comprises of the reticular formation, some limbic structure (hippocampus) and media aspects of the forebrain. Block 2 is responsible for *receiving, analyzing, coding and storing information* and comprises of occipital lobe, parietal and temporal lobes. This block establishes the connection with Block 3 where *decision and planning* can be made. It's comprised of the frontal lobe which is responsible for regulation, programming and verification of mental activity. (Kaufman & Kaufman, 2004). The figure below shows the interaction of the blocks.

Fig 4: Conceptual Framework for interpretation KABC-II



As demonstrated in the above figure, institutionalization may have a direct impact on neurocognitive functioning of children living in institutional care (orphanage). The factors such as

psychosocial factors (Lack of stimulation, high caregiver-child ratios, attachment issues etc as assessed by SDQ) and medical factors (HIV, malnutrition,) can lead to neurocognitive deficits

3.10 Ethical Consideration

The researcher will submit the research proposal to the KNH-UON institutional Review Board before commencement of the study. From the ministry of Education, the researcher took the IRB approval to NACOSTI, who after approval directed the researcher to take to the County commission and county Education. In addition, permission to conduct the study were obtained from children's home in-charge who offered a letter in support. This was after getting a consent form signed by the children officer on behalf of the children in the orphanage. The assessment was carried out in private, specified room within the research site with only the child and the researcher present.

The participation of the study was voluntary and an informed written consent was obtained from the study participants' representatives before they are enrolled in the study. Any individual's parent or child who declined to participate in the study was not be forced or coerced. Children who decided to discontinue the assessment for whatever reason were respected and all their previously collected data discarded. A code designed by the researcher was used to ensure anonymity. To ensure confidentiality, all study related information was kept under Lock and Key and was not be accessible to the teachers or caregivers in the children's home. However parents who were interested in discussing their child's performance was given a chance to meet the researcher.

Although the tool doesn't assess for psychological distress if any children was noted to be distressed beyond what can be considered performance anxiety, receive psychological support.

Those with significant mental health issues were referred to the children's home counselor or the school counselor who will then take the necessary steps to help

3.10.1 Compensation for Participants

Due to the length of time that were taken to complete the KABC-II tool, participants were allowed to take short breaks during the assessments so as to minimize fatigue. A snack was provided between or after the neurocognitive test. No other compensation shall be given for having participated in the study.

3.0.2 Risks and benefits must be addressed.

This study did not pose any risk to neither the researcher nor the participant.

3.11 Data Management

All research materials including the informed consent and assent forms, researcher designed socio-demographic questionnaires and KABC-II answer sheet and results were checked for completeness and were kept safe by locking them in a safe box at the department resource Centre.

3.11.1 Data entry

Data was entered into the SPSS 22.0.

3.11.2 Data Storage Protection

All research materials including the informed consent and assent forms, researcher designed socio-demographic questionnaires and KABC-II answer sheet and results were kept safe by locking them in a safe box. Soft copies in the computer drives were password protected

3.11.3 Data Analysis

The statistical analysis regarding the cognitive functioning shall be gotten using the SPSS 22.0. Descriptive statistics including means (SD) and percentages were calculated for sociodemographic characteristics of participating children and caregivers. KABC-II standardized

scores were calculated for the global index and each subdomain (sequential, planning, learning and simultaneous processing) and prevalence of major neurocognitive disorder were determined by calculating the percentage of children with KABC-II scores below 2SD below mean. Independent sample T-test were used to establish the differences in mean KABC standardized score between children in the children homes and those raised in the biological families on the children's standardized mental processing index. A multivariable linear regression analysis were done to determine the effects of child factors and care giver characteristics with respect to school performance and their relationship with the child on the neurocognitive performance of the children in children homes. A *p* value of less than 0.05 were used as statistically significant. Since it is expected that the effect of age to make a difference in analysis between the groups, the age were tested as a covariate.

3.11.4 Data Presentation

The analyzed data were presented in tables, graphs and bar charts

3.12 Study Dissemination of Results

The result of the study were shared with the University of Nairobi, KNH-mental Health Department of Psychiatry. Other influential departments, schools, health care, organizations and interested parties were presented with the results upon necessity, interest or request

3.13 Study Limitations

The length of the test battery could affect the participant's performance due to fatigue. To address this, the researcher encouraged the participant to ask for breaks in between in order to minimize the fatigue. Language may be a limitation and the researcher being able to speak Swahili will translate to the child any instruction that may not be understood by the child.

3.14 Study Timeline

The table below shows the research time frame

Activity	Time Frame
Development & Defense of the proposal	November 2018
Proposal submission for ethical approval	December 2018
Data collection	February 2019
Data Analysis	March 2019
Report Writing	April 2019
Results Presentation	April 2019
Submission of the Report	May 2018

CHAPTER 4: RESULTS

4.0 Introduction

This chapter shows the results of the study. These results are interpreted and discussed in relation to the research questions in chapter one. The purpose of the study was to assess and compare the neurocognitive deficits among children aged between 7-12 years raised in institutional care and those brought up within natural/ biological families in Ngong sub county Kenya. This was done using the Kaufman Assessment Battery for children (KABC-II) and a Social Demographic Questionnaire.

At Help Kenya Children Rescue Centre, a total of 70 children were eligible for study as they met the inclusion criteria. From this a total 10 were not recruited because they were unreachable since they were having their exams during the data collection period. The other younger 5 children who did not meet the criteria and wanted to participate were assessed but their data not analyzed. At Enoomatasiani Primary school, more than 75 children met the inclusion criteria. However 15 parents did not return the consent form and therefore their children were excluded. 4 could not be assessed due to different circumstances. 3 were sick while 1 lost a loved one during the data collection process. Those students who met the criteria but parents did not consent and wanted to really participate were assessed but their data was destroyed.

4.1.0 Demographic characteristics of the Respondents

A total of 112 children were recruited for this study. Among the participants, 56 were children recruited from the institution (Help Kenya Children Rescue Centre) while the other 56 were from a school (Enoomatasiani Primary school). The mean age of the institutionalized children was 10.5 years (+_1.7) while 11.0 years (+_0.9) was the mean for children raised in biological families. Among the institutionalized participants 48.86% (n=24), were male and 51.14% (n=36)

were female. Among the children raised in biological homes participants, male and female were 50.00% (n=28) each. Table 4.1 shows the social-demographic characteristics of the participants.

Table 4.1 Social-demographic data of the respondents

Variable		Institutionalized Children(n=56)	Percentage	Raised in a Biological home- (n= 56)	Percentage
Mean Age		10.5 years		11.0 years	
Gender	Male	24	48.86%	28	50%
	Female	32	51.14%	28	50%
Class level of placement			42.9%	27	48.2%
	Grade 4	24			
	Grade 5	23	41.1%	23	41.1%
	Grade 6	9	16.1%	6	10.7%

4.1.1 Other incomparable Demographics affecting the institutionalized children

There were other demographics affecting institutionalized children which affected their neurocognitive scores. Children from the centre were referred to the institution for different reasons. The main reason stated for referral was being orphaned at 27% (n=15), followed by financial problems at 23% (n=13). The least was due to illness at 7% (n=4) and from different forms of abuse at 9% (n=5) as illustrated in Figure 4.1

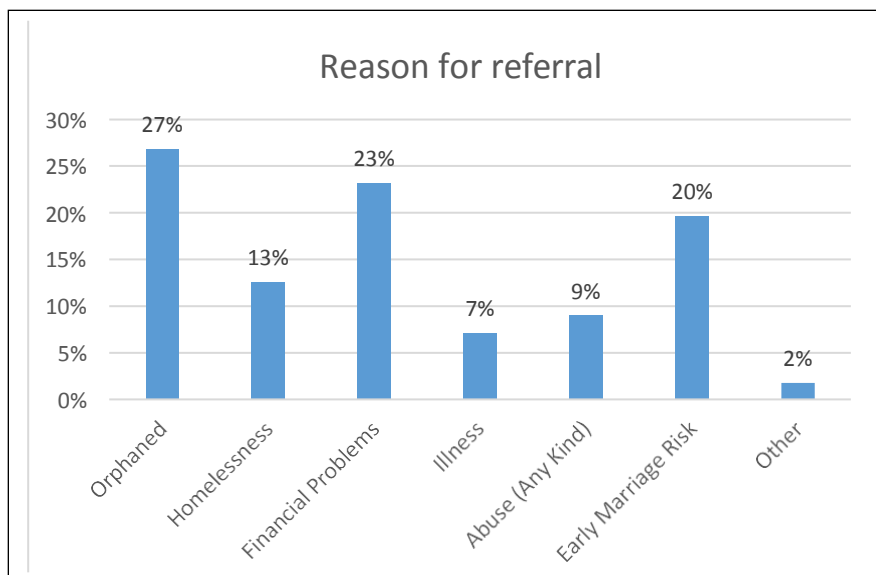


Figure 4.1: Reason for Referral

Table 4.2 and figure 4.2 present forms of illness the children had at time of admission as reported by social workers, these conditions were reported on children's file. All the children presented some kind of medical problem at the time of rescue. More children presented a problem of malnutrition at 30.36% at the time of rescue, about a third 28.57% had untreated wounds while 17.86% had chest and cold problems at the time of rescue

4.1.2 Incomparable demographics affecting children raised in Biological families.

Here we present certain demographics that were only valid for children from biological families. These include family socio economic status. 80% of the parents of the children growing in natural biological families were unemployed. 49% of those that were employed were casual laborers. We sought to find out whether the economic status of their families affected their neurocognitive scores. Though all responding parents/ caregivers responded to the question of employment or non-employment, 97% of them did not reveal their monthly income margin. From the responses however, the employment status of the parents did not have any effect on the children's neurocognitive scores.

4.2 The comparative Neurocognitive Scores of the study participants

In assessing the neurocognitive deficits among institutionalized children in this study, The Kaufman Assessment Battery for Children-Second Edition (KABC-II) was used. The KABC-II tool comprises of four domains which measure either the Fluid-Crystalized Index (FCI) or the Mental Processing Index (MPI). This study sought to compare the MPI scores rather than the FCI scores because one domain in the FCI is not culturally sensitive to the participants therefore would be biased. The MPI consists of four domains and each of these domains comprises of 3-4 subdomains. The domains we are reporting in this study are: (1) Sequential Processing, (2) Simultaneous Processing, (3) Planning (4) Learning. We calculated the Standardized KABC-II cores (See Table 4.4)

Table 4.4. Overall participant performance on KABC-II battery including the scaled indexes and standard scores (MPI; Scale indexes) range of 40-160.

Variable	Institutionalized children					Children Raised in Natural/ Biological Families					P. Value
	N	mean	SD	min	Max	N	Mean	SD	Min	Max	
Sequential Processing	56	59	6.16	13	45	56	62	5.39	25	47	0.013
Simultaneous Processing	56	65	7.61	24	56	56	72	11.20	26	90	0.013
Planning	56	64	9.95	25	64	56	61	7.57	22	59	0.114
Learning	56	118	33.04	29	175	56	127	36.16	25	175	0.01
Overall MPI	56	70.25	-2SD				75	-2SD			0.01

MPI: Scale indexes) range of 40-160

≤ 69 - Lower Extreme, -3SD;

69-84 below Average, -2SD;

85-115 Average, -1SD;

116-130 above Average, +1SD;

≥ 130 Upper Extreme, +3SD

This study compares the mean scores of institutionalized children and those raised within biological natural families. On average, the participants in the study that were raised in biological families had consistently higher KABC-II scores compared to those raised in the institution.

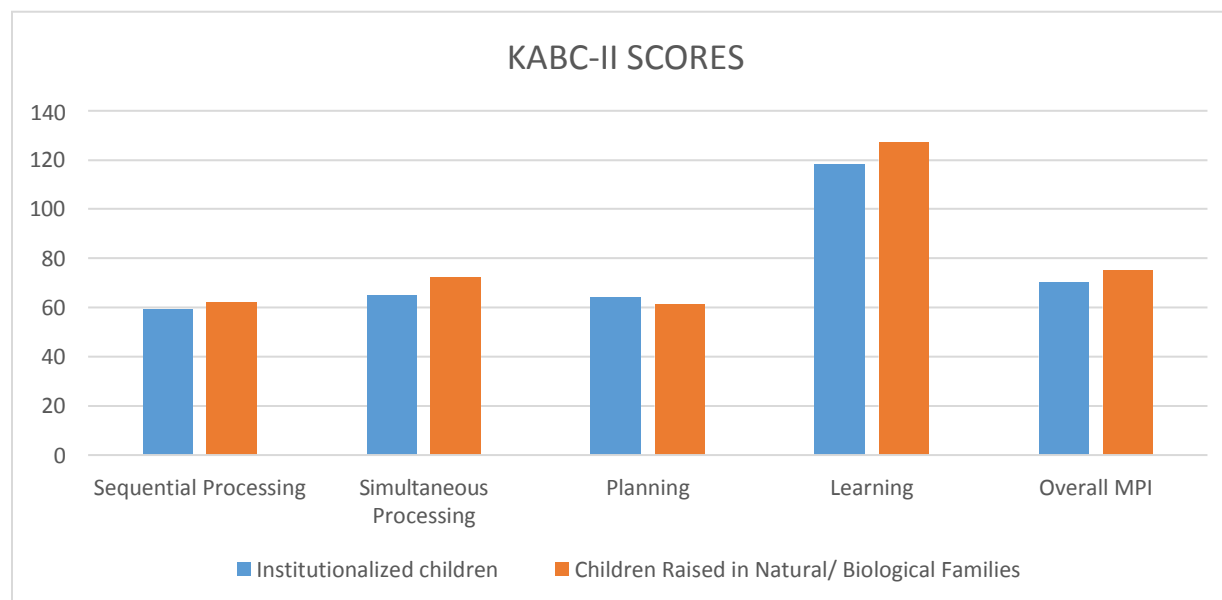


Figure 4.2: Comparing the mean standardized KABC-II scores between the institutionalized children and those raised in natural Biological families

The Neurocognitive scaled scores for the children in the biological homes were significantly higher than the institutionalized children in the 3 subdomains. Sequential Processing (Mean score = 62 versus 59); Simultaneous processing (Mean Score= 72 versus 64); and Learning (Mean Score= 127 versus 118). The institutionalized children however scored higher in the Planning domain with a Mean score of 64 compared to the children raised in biological families who had a mean score of 60. There was a significance association between being raised in an institution and the following neurocognitive performance; the Sequential processing was significant with a p value (0.013), Learning was significant with a p value (0.01) and Simultaneous

Processing was significant with a p value (0.013). Although children in institutions scored higher on planning compared to children from biological families, the difference was not significant, p value (0.114).

The overall the Global MPI (Mental Processing Index) for children raised in biological families was (Mean= 75 which is -2SD (Below Average) while that of the institutionalized children was Mean= 70 which is -2SD (Below Average). Comparing the MPI therefore, though both they both within the -2SD (below average) the children raised in natural biological families have better neurocognitive development compared to institutionalized children. (Figure 1).

4. To determine the association between neurocognitive deficits and sociodemographic factors of institutionalized children and children brought up in biological homes/families

We sought to find out whether there was any significant statistical difference in gender on the neurocognitive scores in both groups. We found out that being Female had a statistical difference on the Learning domain with a p value of (0.03) as shown in the table below. There was no significant statistical difference in the rest of the 3 domains.

Table 4.2 Female respondents Social-demographic data

FEMALE							
Institutionalized Children				Children Raised in Natural/ Biological Families			
Variable	N	Mean	SD	N	Mean	SD	P-Value
Sequential Processing	32	59	6.89	28	63	4.73	0.07
Simultaneous Processing	32	65	6.39	28	75	13.145	0.54
Planning	32	64	6.42	28	61	8.594	0.17
Learning	32	118	28.59	28	127	28.483	0.03

Table 4.3 Male respondents Social-demographic data

MALE							
Institutionalized Children				Children Raised in Natural/ Biological Families			
Variable	N	Mean	SD	N	Mean	SD	P-Value
Sequential Processing	24	61	5.025	28	61	5.94	0.19
Simultaneous Processing	24	64	9.13	28	71	8.5	0.07
Planning	24	61	38.14	28	65	11.60	0.40
Learning	24	112	38.15	28	119	42.011	0.07

We sought to find out whether underlying medical conditions had any effect on the neurocognitive scores among the institutionalized children.

Table 4.4: Medical History

Medical Condition	Variable		P. Value			
	F	Percentage	Sequential Processing	Simultaneous Processing	Planning	Learning
Malnutrition	17	30.36%	0.028	0.152	0.030	0.891
Chest/cold problems	10	17.86%	0.141	0.947	0.142	0.676
Malaria	6	10.71%	0.259	0.676	0.215	0.542
HIV/AIDS	6	10.71%	0.286	0.715	0.456	0.307
Untreated Wounds	16	28.57%	0.061	0.114	0.003	0.241

Malnutrition was found significantly associated with Sequential Processing and Planning with a P value of (0.028) and (0.030) respectively. Children who had been admitted with malnutrition were found to have lower scores on sequential and planning irrespective of age.

CHAPTER 5: DISCUSSION

We compared the neurocognitive functioning of the respondents. In the overall score, the Global MPI was significantly higher in children raised in natural biological families with a Mean of 75; -2SD (Below Average), compared to the children raised in a children home who had a (Mean score of 70; -2SD (Below Average), though they both lied in the Below Average range. Previous studies have shown that, relative to children raised in natural family environment, children raised in institutions (orphanages) demonstrated significant neurocognitive deficits/ impairments (Rutter, M. et al 2012). Another study revealed that children raised in institutionalized settings showed neurocognitive deficits on tests of visual memory and attention, as well as visually mediated learning and inhibitory control. (Pollak, Seth D et al, 2010).

The institutionalized children however scored higher in the Planning domain with a Mean score of 64 compared to the children in the raised in natural families who had a mean score of 61. Although this was not statistically significant, an earlier study on the neurodevelopmental effects of early deprivation in post institutionalized Children reported that children raised in institutions performed at a developmentally appropriate levels on similar tests where auditory processing was also involved and on tests assessing executive processes such as rule acquisition and planning. (Pollak S. D, Nelson, 2010).

The findings of this study revealed that institutionalized respondents from that group seemed to come from families with low social economic status. Their higher scores could be explained from a study by Lipina, S. J. (2014) who postulated that, parental responsivity, family companionship and enrichment activities mediated the association between family social economic status and children cognitive flexibility and inhibitory control.

Children from the institution had been rescued from different situations including homelessness, being orphaned, different forms of abuse, risk of early marriage and poverty. Though the study did not assess for PTSD amongst the institutionalized respondents, there was evidence enough that children had been rescued from maltreatment and some had suffered severe trauma. This may have affected their neurocognitive scores. A study by Raquel A., Dante Cicchetti et al (2015) showed that children who were Maltreated performed more poorly than non-maltreated children on working-memory and inhibitory control tasks. In addition Beers and De Bellis (2009) found that children with a history of maltreatment and PTSD performed poorly in abstract reasoning, learning vigilance), and executive functioning (sustained attention, compared to those without. Furthermore, the findings of a study by Eagle et al 2013, which reported that some specific areas of the brain together with their neural-pathways associated with cognitive and language functioning could be damaged due to prolonged exposure to stress

All children had a form of medical condition at the time of rescue. The medical conditions included malnutrition, untreated wounds included burns from cigars and assault. We sought to determine whether these past and sometimes persisting medical conditions affected their neurocognitive mean score. A study that focused on the neurocognitive deficits in children with severe falciparum malaria concluded that impairment of the executive function in children suffering from severe malaria was linked to specific neurological phenotypes especially complex seizures. (Kariuki, Abubakar & Newton et al 2014). In our study children who had been admitted with malnutrition were found to have lower scores on sequential and planning irrespective of age. Evidence suggests that nutritional deficiencies can significantly affect brain development moreover, malnourished children have less energy and interest for learning that negatively influences cognitive development (Engle, 2010). The scores of 3 domains; Sequential processing,

Simultaneous reasoning and Learning scores which were statistically significantly affected, would have been affected by the social demographics. Children who were admitted with HIV/AIDS showed no statistical difference in their scores. This differs with the studies by Otsetswe and Kumar 2017 who showed that the prevalence of neurocognitive deficits among HIV positive children attending CCC at KNH was 60% with neurocognitive performance of 54 children being at least 2SD below the mean based on KABC-II scores. The difference could be explained by the fact that the number of HIV/AIDS respondent was low N=6 Compared to N=54.

Though the effects in social economic status in the children raised in natural biological families cannot be determined by the minimal information given by the parents of the respondents. The parents' employment status did not have any effect on the child's neurocognitive mean score. In addition, though the children raised in families scored significantly higher in 3 domains the global MPI revealed that their range lied in the below average. The sample population was picked from a public primary school where most of the children came from relatively low economic status. These findings therefore are in line with a study done by Lounghan & Perna (2012) on 65 children in public school system from a low SES household. It indicated that these children scores way below average across all measures of intellect (memory, executive functions and academic ability). In addition, Lounghan and Perna, (2012) continued to postulate that children from low SES were twice more likely to repeat a grade school than their middle-class counterparts. They were also 1.4 times more likely to be diagnosed with a learning disability in elementary or high school than their middle-class counterparts.

CHAPTER 6: CONCLUSION

6.1 Conclusion

This study revealed higher neurocognitive deficits among children raised in institutional care than their counterparts raised in natural biological homes. Further, the social demographic data revealed a direct effect on the children raised in the institutional care. This study therefore suggests that environmental factors including abandonment and institutional care can affect not only the infancy period, but also the preschool and beyond, thus providing new insights into our understanding of neurocognitive development.

6.2 Recommendations

1. Based on the findings the mean among the children raised in institutional care was significantly lower compared to the children raised in biological families. Institutional care affects the neurocognitive development in children. The recommendation is that more children be placed in long and stable foster care or even better, in adoption. These settings have been found to be more stimulating environments for neurocognitive development.
2. Further findings of this study found that children from raised in biological families also scored -2SD below the mean. This is because they came from low SES. It is recommended that a further comparative study with greater samples be done to confirm this findings. Further children be routinely screened for cognitive deficits for early intervention.
3. Though KABC-II tool has been used in Kenya and other African countries before, future researchers should consider developing a more culturally neurocognitive assessment tool to increase its cultural sensitivity and reliability in establishing the neurocognitive deficits in children in Kenya.

6.3 Limitations

This study had a number of limitations. First it is difficult to generalize the findings to a wider population given that the study was only conducted in one school and one children home. The findings are therefore not a representative of the entire population in Kenya. Secondly, the sample size was insufficient, a larger sample would have provided more statistical power and thus more better conclusions. Further there was no prior published study from Kenya conducted using KABC-II on this specific study that could be used as guidance. This study solely depended on studies from other countries. Finally the KABC-II tool administration is both time consuming and expensive. The researcher recommends for one to seek funding for this kind of study to minimize the personal costs and expenses incurred.

6.4 Financial Disclosure

This research was financially self-sponsored.

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APPENDIX A: Study Budget

Category	Remarks	Units	Unit Cost	Total in Ksh
Proposal	Kenyatta National Hospital Ethics Research Committee Fee	1	2000	2000
Data Collection	Stationary Pack (pens, paper, pencil)	4	500*4	2000
	KABC-II complete Kit- Includes 4 Easels, 1 manual, all necessary stimulus and Manipulative materials, Record forms, brief case	1	1*1000	1000
	Printing the Socio-demographic questionnaire	1	120*10*2	2400
	Refreshments for the participants	96	120*50	6000
Data Analysis	Statistician-For data result interpretations	1	25000*1	25000
	Printing Thesis (final copy)	4	1100*4	4400
Logistics	Transport and lunch to the stations		2000	2000
Contingency Fund(10% of total expenses)				4484
Total				49284

APPENDIX B: Consent Form (English)

You are invited to take part in a research study entitled; **Neurocognitive deficits in children aged between 7-12years: A comparative study between institutionalized and community children.**

The researcher is inviting children in Help Kenya Children Rescue Centre and Children from Enoomatasiani primary school to take part in this study. It is important that you understand why this research is being done and what it will involve. Please ask the researcher about anything that you may not understand or even if you need more information to help with your decision to participate.

This study is being conducted by **Monica N. Nguata** (Msc Clinical Psychology); Department of Psychiatry, school of Medicine, University of Nairobi, Kenya.

Purpose of the study

The purpose of this study is to compare the Neurocognitive deficits in children aged between 7-12 years raised in families, with those raised in a children home using the Kaufman Assessment Battery for children (KABC-II).

Method/ Procedure:

If you agree to take part in this study;

As a parent/ guardian you will fill the social-demographic questionnaire in relation to the child's social background and that will take at most 15 minutes

Your child/ child under your care will take approximately 75 minutes to complete the KABC-II.

The Research team is composed of the following persons;

Principal Investigator: Monica N. Nguata

Voluntary Nature of the Study

This study is voluntary. No one in Help Kenya Children Rescue Centre/ Enoomatasiani Primary School will treat you differently if you choose not to be part of the study. If you choose to be part of the study now, you can still change your mind later. You may stop at any time you wish to without any penalty.

Risks and Benefits for Being in the Study

Participating in this study will not pose any physical risk to your safety or well-being. Being in this type of study however may expose you the risk of some minor discomforts that can be encountered in daily life such as fatigue and distress. To reduce this, your child were free to ask for breaks of up to a total of 15 minutes during certain times in the study. By your child participating in this study, you will have an opportunity to learn more by asking questions on neurocognitive deficits and obtain a referral for further assessments and counseling. The results were grounding information on the neurocognitive deficits in children in Kenya and may advice policy and intervention to address these deficits in children.

Confidentiality

The information that you provide in this study were kept confidential. The researcher will not use your personal information for any other purposes outside this research project. The researcher will not include your name or anything that could identify you in the study reports. Data were kept safe by coding information such as names. Contact details were kept away from the personal identifying data on the files. Notes and any other identifying participant information were locked in a safe file cabinet in the personal possession of the researcher. Only the researcher and the relevant and the relevant authorities will review the collected data. The information from this

research were used solely for the purpose of this study and any other subsequent related publications. When all the materials will no longer be useful for the study, they shall be destroyed.

There were no payments or thank you tokens given to the participants for their participation in the study. However juice and biscuit were provided to all the participants. Your response is valuable as it will contribute towards the understanding the neurocognitive deficits among children in Kenya. I would like to therefore invite you to participate in this research.

Contacts and Questions

If you have any further questions about this research please contact;

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If you would like to privately talk about your rights as a participant, email or call;

Prof. M. L. Chindia, The secretary KNH/UoN ERC

uonknh-erc@uonbi.ac.ke; Tel: +254-020-2726300 (Kenya)

Extension: 44355.The Ethics Research Review Committee's (ERC)

Statement of Consent:

By signing to consent form, I give permission for my child _____ to participate in this study. I have read and understood this consent form. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my child's participation in this study is voluntary and that I may choose to withdraw any time without any penalty. I freely agree to participate in this research study.

Name of the participant _____

Signed _____ **(Parent/Guardian)**

Date _____

Researcher's signature _____

APPENDIX C: FOMU YA IDHINI

Umekaribishwa kuhusika katika utafiti unaoitwa **Neurocognitive deficits in children aged between 7-12years: A comparative study between institutionalized and community children**. Huu ni utafiti ambao unalinganisha makundi mawaili ya watoto. Kundi la kwanza ni kundi la watoto ambao wamekua katika nyumba ya yatima na la pili ni kundi la ambao wamelelewa katika familia za kawaida. Mtafiti anakaribisha Help Kenya Children Rescue Centre na watoto wa shule ya msingi ya Enoomatasiani katika utafiti. Ni muhimu uelewe utafiti huu na vitu ambavyo unahusisha. Ngingekuomba uulize jambo lolote lile ambalo hautawelewa ama jambo ambalo utahitaji maelezo Zaidi.

Kusudi la Utafiti.

Kusudi la utafiti huu ni kulinganisha makundi mawaili ya watoto wanao miaka 7-12. Kundi la kwanza ni kundi la watoto ambao ni yatima na wamekua katika children's home na la pili ni la wale ambao wamelelewa katika familia za kawaida. Utafiti huu utafanywa kutumia chombo kinachoitwa Kaufman Assessment Battery for children Second Edition- (KABC-II).

Utaratibu

Ukikubali,

Kama mzazi utajaza fomu ambayo inahusisha mambo kadhaa kuhusu mtoto wako na hii itachukua dakika 15. Baadaye mtoto wako atahusishwa katika utafiti ambao utachukua dakika 75 kujaza fomu ya KABC-II.

Utafiti unafanywa na

Mtafiti Mkuu: Monica N. Nguata

Hiari ya Utafiti

Utafiti huu ni wa hiari. Hakuna yeyote yule kutoka Help Kenya Children Rescue Centre ama kutoka shule ya msingi ya Enoomatasiani atakaye fanyiwa jambo lolote mbaya akiamua kutohusika katika utafiti huu. Waweza kubali kuwa katika utafiti huu, na baadaye ukabadilisha mawazo. Waweza kuachia uhusika katikati bila adhabu yoyote.

Hatari na Faida ya kuhusika katika utafiti

Hakuna madhara yoyote ya kiafya kwa Mwanao atakapokubali kuhusika katika utafiti huu. Huenda mtoto wako atachoka kidogo tu labda kwasababu ya Maswali ya utafiti huu. Kupunguza uchovu, mwanao atapewa mapumziko ya dakika kumi na tano katikati ya maswali. Ukikubalisha mwanao ahusike katika utafiti huu, utakua na nafasi muhimu ya kuelewa nguvu ya utambuzi wa mwanao. Hali kadhalika utapata nafasi ya kuelezwa jinsi mwanao anaweza saidika Zaidi kwa kupewa rufaa ifaayo. Matokeo ya utafiti kwa ujumla itasaidia kuongeza ujuzi kuhusu upungufu wa utambuzi wa watoto katika nchi ya Kenya. Ujuzi huu utashauri wanaotengeneza sera za masomo ya watoto.

Usiri

Habari utakazonipa kujihusu ama kuhusu mwanao zitawekwa katika siri. Mtafiti hatatumia jambo lolote lile ambalo laweza fanya wewe ujulikane. Mtafiti hatatumia jina lako mahali popote katika kupeana repoti ya utafiti. Namba za simu ama zingine zozote zitawekwa mbali na majina ama vitu vingine vyote amabvyo vyaweza kuelekeza mtu kukutambua. Nakala zingine zozote zitafungiwa katika kabati ambalo ni mtafiti peke yake atakua na ufunguo. Kila jambo ama nakala itakayokusanywa kutoka kwako au mtoto litatumika kwa utafiti pekee. Utafiti ukiisha, vile vitu amabvyo havitatumika tena vitaharibiwa.

Hapatakua na malipo yoyote baada ya utafiti huu. Biskuti itapewa kwa kila mtoto atakaye husika. Ukikubali mwanao ahusike utakuwa umechangia kuelewa Zaidi kwa upungufu wa Utambuzi katika watoto Kenya. Kufikia sasa, ningependa kukualika kuhusika katika utafiti huu.

Anwani na Maswali

Ikiwa ungependa kuuliza maswali Zaidi kuhusu utafiti huu. Pigia ama andikia;

Msimamizi mkuu: Dr. Muthoni Mathai (MBCHB, MMED, PhD)

**Mhadhiri mkuu Clinical Psychology, Department of Psychiatry
University of Nairobi**

**Dr. Lincoln Khasakhala (MBCHB, MSC, PhD)
Mhadhiri Clinical Psychology, Department of Psychiatry
University of Nairobi.**

Dr. Anne Mwayo (PhD)

**Mhadhiri Clinical Psychology, Department of Psychiatry
University of Nairobi**

Mtafiti Mkuu:

Monica N. Nguata

University of Nairobi, Kenya

monica.nguata@gmail.com

+254725440783/ 786942977

Ikiwa ungetaka kuzungumza kwa kibinafsi kuhusu haki zako kama mhusika, piga simu au andikia barua pepe kwa;

Prof. M. L. Chindia, The secretary KNH/UoN ERC

uonknh-erc@uonbi.ac.ke; Tel: +254-020-2726300 (Kenya)

Extension: 44355. The Ethics Research Review Committee's (ERC)

Kauli ya idhini

Kwa kutia sahihi katika hii fomu, nimepeana ruhusa kwa mtoto wangu

_____ kuhusika katika utafiti huu. Nimesoma na kuelewa utafiti huu. Nimeuliza maswali na yakajibibwa vilivyo. Nimeelezwa Madhara na manufaa ya kuhusika katika utafiti huu na nikaelewa. Ninaelewa kwamba mwanangu kuhusika katika utafiti huu ni kwa idhini yake na anaweza amua kutoendelea kwa wakati wowote ule. Nimemkubalisha kuhusika katika utafiti huu.

Jina kamili _____

Sahihi: _____ **(Mzazi/mlezi)**

Tarehe: _____

Sahihi ya Mtafiti _____

APPENDIX D: Child Assent form (English)

Hello,

My name is Monica Njeri Nguata. I am a Master's of Science Student Clinical Psychology at the University of Nairobi conducting a study at **Help Kenya Children Rescue Centre/Enoomatasiani Primary School**. I would like you to take part in this study but I will need your permission before you participate. If you agree to participate, you were required to name certain objects and repeat a series of words, numbers, count numbers of blocks, move a toy to a bone on the check board, do some hand movements and many other puzzles. The puzzles are fun to do and many children your age often find it enjoyable. If you are unable to solve or complete one puzzle or game, we move to the next one. Whenever you are tired, you can say that you need a short break to reenergize or go to the toilet. You were asked some questions about your home environment, school activities, exercise, sleep and peers and other related things around your home and living. The entire activity will take approximately 75 minutes. You will only take part if you want to and if you do not wish to you are allowed. There were no penalty if you choose not to participate in this research. At the end of the puzzles and games, you were given some juice and a packet of biscuit.

Would you like to participate? (Please tick one)

- Yes I want to
- No, I do not want to

Signing at the bottom of this form means that you agree to take part in this research. Thank you very much for your time.

Name of the child _____

Participant signature _____

Date _____

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher's Name: _____ **Date:** _____

Signature _____

APPENDIX E: Consent Form for the Officer at the children's Department (English)

My name is Monica Njeri Nguata. I am a Master's of Science Student Clinical Psychology at the University of Nairobi. In order to complete my schooling, I am required to conduct a study. I am therefore conducting a research study on the **Neurocognitive deficits in children aged between 7-12years: A comparative study between institutionalized and family raised children.** I would like to invite you to consent on behalf of the Children under your jurisdiction in this study. The researcher is inviting children from Help Kenya Children Rescue Centre (Remember Nhu Kenya) and Children from Enoomatasiani primary school to take part in this study. It is important that you understand why this research is being done and what it will involve. Please ask the researcher about anything that you may not understand or even if you need more information to help with your decision to participate.

This study is being conducted by **Monica Njeri. Nguata** (Msc Clinical Psychology); Department of Psychiatry, school of Medicine, University of Nairobi, Kenya.

Purpose of the study

The purpose of this study is to compare the Neurocognitive deficits in children aged between 7-12 years raised in families, with those raised in a children home using the Kaufman Assessment Battery for children (KABC-II).

Method/ Procedure:

The procedure involves Parents, guardians and children home in-charge who will consent on behalf of the children; and t children who will assent as the participants. At the Children's home, the researcher after introducing the study to the person in-charge, will get general permission (for all children under care) and a list of all the children including information on age, gender, duration

of stay and whether any of the children has mental retardation. The researcher will then compile a list of all the children who meet the inclusion criteria. She will then request to know the best time to meet and assess children of different age groups.

The Research team is composed of the following persons;

Principal Investigator: Monica N. Nguata

Voluntary Nature of the Study

This study is voluntary. No one in Help Kenya Children Rescue Centre/ Enoomatasiani Primary School will treat the child differently if they choose not to be part of the study. If they choose to be part of the study now, they can still change their mind later. They may stop at any time they wish to without any penalty.

Risks and Benefits for Being in the Study

Participating in this study will not pose any physical risk to the children's safety or well-being. Being in this type of study however may expose them to the risk of some minor discomforts that can be encountered in daily life such as fatigue and distress. To reduce this, the child were free to ask for breaks of up to a total of 15 minutes during certain times in the study. By the child participating in this study, the home in charge will have an opportunity to learn more by asking questions on neurocognitive deficits and obtain any referral for further assessments and counseling. The results were grounding information on the neurocognitive deficits in children in Kenya and may advice policy and intervention to address these deficits in children.

Confidentiality

The information that provided in this study were kept confidential. The researcher will not use any personal information for any other purposes outside this research project. The researcher will not include a name or anything that could identify the child in the study reports. Data were kept safe by coding information such as names. Contact details were kept away from the personal identifying data on the files. Notes and any other identifying participant information were locked in a safe file cabinet in the personal possession of the researcher. Only the researcher and the relevant and the relevant authorities will review the collected data. The information from this research were used solely for the purpose of this study and any other subsequent related publications. When all the materials will no longer be useful for the study, they shall be destroyed. There were no payments or thank you tokens given to the participants for their participation in the study. However juice and biscuit were provided to all the participants.

Your response is valuable as it will contribute towards the understanding the neurocognitive deficits among children in Kenya. I would like to therefore invite you to consent on behalf of the children to participate in this research.

Contacts and Questions

If you have any further questions about this research please contact;

Supervisor: Dr. Muthoni Mathai (MBCHB, MMED, PhD)

**Senior Lecturer in Clinical Psychology, Department of Psychiatry
University of Nairobi**

Dr. Lincoln Khasakhala (MBCHB, MSC, PhD)

**Senior in Clinical Psychology, Department of Psychiatry
University of Nairobi.**

Dr. Ann Mmbwayo (PhD)

**Senior in Clinical Psychology, Department of Psychiatry
University of Nairobi**

Principal Investigator:

Monica Nguata

University of Nairobi, Kenya

monica.nguata@gmail.com

+254725440783/ 786942977

If you would like to privately talk about your rights as a participant, email or call;

Prof. M. L. Chindia, The secretary KNH/UoN ERC

uonknh-erc@uonbi.ac.ke; Tel: +254-020-2726300 (Kenya)

Extension: 44355.The Ethics Research Review Committee's (ERC)

Statement of Consent:

By signing to consent form, I give permission on behalf of the children under my jurisdiction at House of Grace formerly **Help Kenya Children Rescue Centre (Remember Nhu Kenya)** to participate in this study. I have read and understood this consent form. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that the children's participation in this study is voluntary and that they may choose to withdraw any time without any penalty. I freely agree for their participation in this research study.

Name of the Officer _____

Signed _____ **County** _____

Date _____

Researcher's signature _____

APPENDIX F: Socio-Demographic Questionnaire

(Information from the parent/ guardian)

I am going to start with asking you a few questions about your home and family

General Background information

1. What is your relationship with this child?
 - Father
 - Mother
 - House Parent
 - Relative
 - Friend
 - Other (specify)_____
2. Is the mother of the child Alive?
 - Yes
 - No
 - Don't Know
3. Is the father of the child Alive?
 - Yes
 - No
 - Don't know

NB: If No to both Questions 2 and 3 above; code as FULL Orphan

School-Related Information Background

4. Has this child repeated any grade in school?
 - Yes
 - No
 - Don't know
5. Describe the child's performance in school this year
 - Excellent
 - Very good
 - Good
 - Average
 - Below Average
 - Poor
6. How can you explain your answer in the above question
 - Generally smart kid
 - Hard working
 - Unmotivated/ lazy
 - Lack of resources

- Lack of food
- Illness/sickness
- Death of a loved one
- Other....

Home background information

I am going to ask you a few questions about the home background of this child

7. Who lives with the child at home?

	YES	NO	
Mother			
Father			
Grandmother			
Grandfather			
Relative			
Sister			How many?
Brother			How many?
Neighbor			How many?
Any other			

Personal Background information

8. What is the mother's marital status of the child
- Married
 - Single
 - Widowed
 - Separated
 - Cohabiting
 - Other _____
9. What is the child's mother Education level
- Didn't complete primary school
 - Completed primary school but not post primary school
 - Didn't complete High school
 - Completed High school but didn't attend post high school training
 - University/college
 - Tertiary training
10. What is the child's father Education level
- Didn't complete primary school
 - Completed primary school but not post primary school
 - Didn't complete High school
 - Completed High school but didn't attend post high school training
 - University/college
 - Tertiary training
11. Is the mother of the child employed?

- Yes
 - No
12. If Yes, What kind?
- Formal employment
 - Self-employment
 - Casual laborer
 - Other _____
13. If not employment, what is the main source of income for the family?

14. Is the father of the child employed?
- Yes
 - No
15. If Yes, What kind?
- Formal employment
 - Self-employment
 - Casual laborer
 - Other _____
16. If not employment, what is the main source of income for the family?

17. What is the monthly income of the child's family?
- Less than 10000sh per month
 - Between 20000-30000sh per month
 - Between 31000-59000sh per month
 - Between 60,000-79900sh per month
 - More than 80,000sh per month

For the Children's home only

Am going to ask you some more confidential Information about the child

18. How long has this child been in this children's Home?
- 0-2 years and a few months
 - 3 years
19. Has the child been to another children's home before?
- Yes
 - No
20. If yes, for how long had they been there? _____
21. What was the source of referral for this child?
- Relative
 - Neighbor
 - Good Samaritan
 - Children's Department
 - Police
 - School
 - Other _____
22. What was the reason for referral?
- Orphaned
 - Homelessness
 - Financial problems
 - Illness
 - Abuse (any kind)
 - Early marriage risk
 - Other _____
23. Did the child present any medical problem at the time of rescue? (Yes) (No)
- If Yes, what kind
- Malnutrition
 - HIV/AIDS
 - Malaria
 - Chest and cold problems
 - Untreated wounds
 - Other (Please describe)

24. Does the child have any known relatives? Yes () No ()

25. If Yes, are they involved in any way of care for this child (Briefly Describe).....

26. If No, why are the known relatives uninvolved? Briefly Describe why?

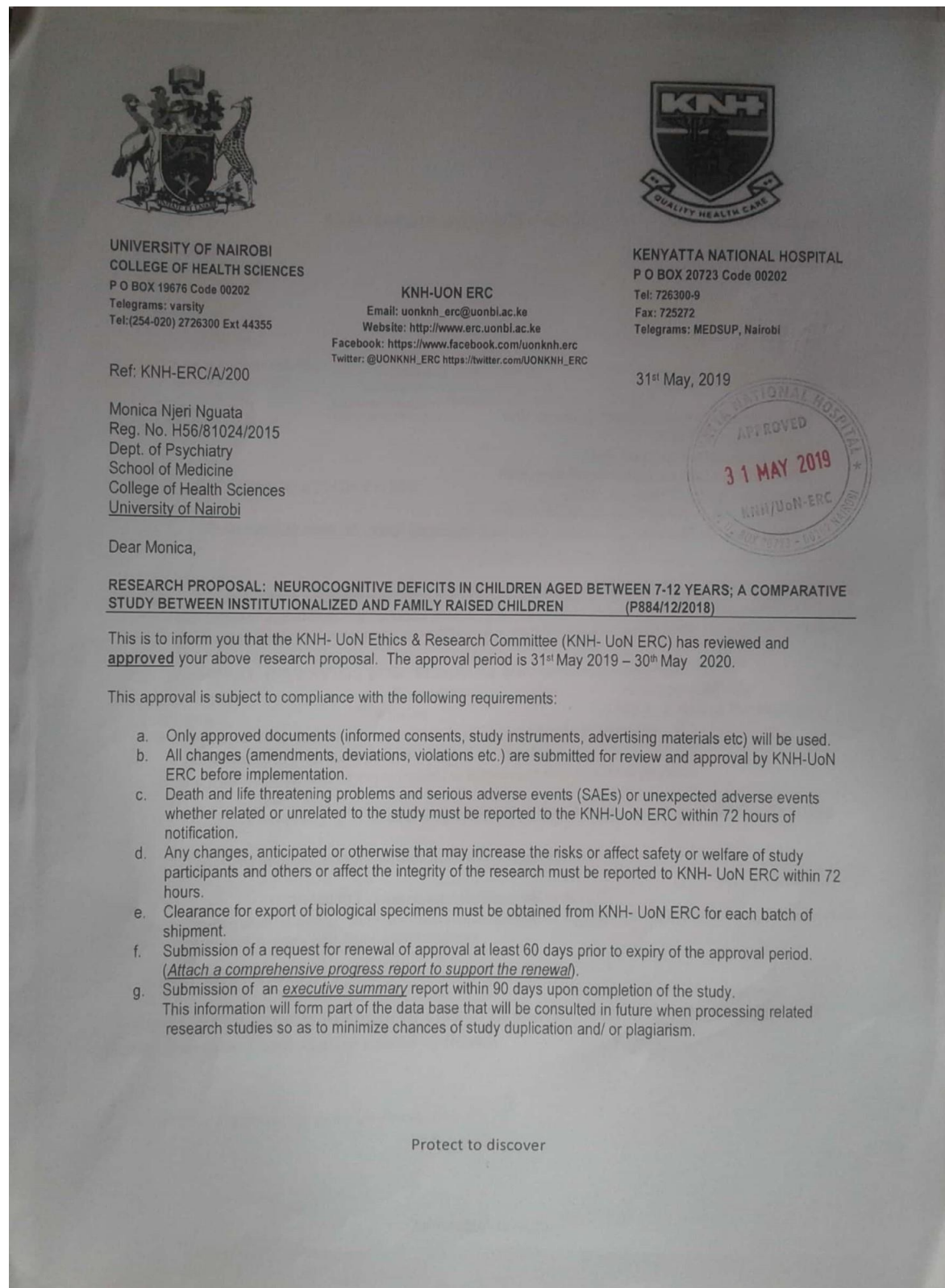
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.....b. Do you think this affects the child in any way?

Describe.....
.....
.....

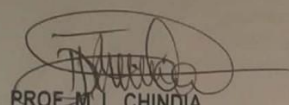
Thank you for participating in this study

APPENDIX G: ETHICAL APPROVAL KNH/UON ERB



For more details consult the KNH- UoN ERC website <http://www.erc.uonbi.ac.ke>

Yours sincerely,



PROF. M. L. CHINDIA
SECRETARY, KNH-UoN ERC

- c.c. The Principal, College of Health Sciences, UoN
 The Director, CS, KNH
 The Chairperson, KNH- UoN ERC
 The Assistant Director, Health Information, KNH
 The Dean, School of Medicine, UoN
 The Chair, Dept. of Psychiatry, UoN
 Supervisors: Dr. Muthoni Mathai (UoN), Dr. Lincoln Khasakala (UoN), Dr. Anne Mwayo (UoN)

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