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'THE DEVELO''MENTAL PROFILES OF CHILDREN WITH IDIOPATHIC TONIC-CLONIC EPILEPSY AS MEASURED ON THE GRIFFITHS DEVELOPMENTAL SCALES

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SUBMITTED TO THE UNIVERSITY OF THE WITWATERSRAND, IN PART FULFILMENT OF MSc-NEURODEVELOPMENT

DECLARATION

I Daphney Isabel Seemole Magongoa hereby declare that this dissertation is my own work and that it has not been presented for any other degree at another University

SIGNED: .....

D. I. S. MAGONGOA

DATE: .....4/10/1999.....

AT: .....Johannesburg

ABSTRACT

The effect of epilepsy on the development of children with well controlled tonic-clonic epilepsy was assessed using the Griffiths Developmental test. Twenty five subjects and twenty five controls matched for age, sex, location and socio-economic status were tested. Their ages ranged from three to six and a half years. The paired t-test and rank-sign test on a personal computer using the SAS system were used for data analysis. A p-value of 0,05 and less was regarded as significant difference. There were significant differences in the mean quotient scores in all the subscales and general quotient. The epileptic children performed at a significantly lower level than the controls.

The motor subscale scores demonstrated locomotor precocity of both groups with no significant difference between subjects and controls, when the pairs where the subjects had had status epilepticus were excluded from the analysis.

DEDICATION

1. To my husband for his unfailing support

2. To my late father - who taught me that there is nothing more valuable in life than education.

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1. Prof A Venter my supervisor

2. Nurse M Boikhutso who helped me with the booking of subjects for the study

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LIST OF CONTENTS

	Page Number
Title Page	I
Declaration	ii
Abstract	iii
Dedication	iv
Acknowledgements	v
List of contents	vi
List of tables	ix
List of figures	x
1. Introduction	1
1.1 The research problem	1
1.2 The Griffiths Developmental Test	1
1.3 Subjects and Controls	3

		Page Number
2.	Literature review	4
2.1	What is epilepsy?	4
2.2	Types of epilepsy	4
	2.2.1 Generalised Tonic-Clonic	5
2.3	Diagnosis	7
2.4	Epilepsy and the developing brain	8
2.5	Factors which may influence outcome of epilepsy	9
2.6	The Griffiths Test	11
	2.6.1 Subscale A-Locomotor	11
	2.6.2 Subscale B-Personal-Social	11
	2.6.3 Subscale C-Hearing and Speech	12
	2.6.4 Subscale D-Eye Hand Co-ordination	12
	2.6.5 Subscale E-Performance	12
	2.6.6 Subscale F-Practical Reasoning	13
	2.6.7 General Quotient	13
2.7	Literature Review of the subscales	14
	2.7.1 Subscale A-Locomotor	15
	2.7.2 Subscale B-Personal-Social	15
	2.7.3 Subscale C-Hearing and Speech	16
	2.7.4 Subscale D- Eye Hand Co-ordination	16
	2.7.5 Subscale E-Performance	17
	2.7.6 Subscale F-Practical Reasoning	17
2.8	Carbamazepine	18

3. Method 20

3.1 Subjects 20

3.2 Controls 22

3.3 Griffiths Testing 23

3.4 Analysis of Results 24

4. Results 25

4.1 General Information 25

4.2 Epilepsy Profile 25

4.3 The Griffiths Quotients Results 26

5. Discussion 33

6. Conclusions 37

6.1 Recommendations 37

6.2 Future areas of research/intervention 38

Bibliography 39

Appendices 48

LIST OF TABLES

TABLE NO.	TITLE	Page Number
I.	Epilepsy classification	5
II.	Table of original Griffiths Test Results	13
III.	Means quotients and standard deviations for subjects and controls	26
IV.	Test results with all subjects included	28
V.	Test results excluding subjects with status epilepticus	29
VI.	Low Socio-economic group results	30
VII.	Middle socio-economic group results	31
VIII.	Low versus medium socio-economic group	31

LIST OF FIGURES

No.	TOPIC	Page Number
1.	Developmental profiles using means of subjects and controls.	27

CHAPTER I

1. INTRODUCTION

1.1 THE RESEARCH PROBLEM

The effect of epilepsy on motor, cognitive and socio-behavioural development is of great importance not only to doctors but to parents of/and newly diagnosed children with epilepsy. These developmental problems may be related to the cause of the epilepsy, the effect of the disease on the developing brain or to drugs used in the treatment of the condition.

The aim of this study was to establish developmental profiles of children with well controlled idiopathic tonic-clonic epilepsy and to compare them with normal controls matched for age, sex, and socio-economic status, using the Griffiths Test.

1.2 THE GRIFFITHS DEVELOPMENTAL TEST

The Griffiths test is used to test the developmental abilities of children in the pre-school age. It has been used in different countries and found to be "culture fair" (Mothuloe, 1990; Allan, 1988).

Six areas of development are tested, namely;

I) Locomotor

ii) Social personal

iii) Hearing and speech

iv) Eye-hand co-ordination

v) Performance

vi) Practical reasoning

The principle of equality of difficulty in the various subscales was of primary importance during test construction, that is, although each subscale measures a different aspect of learning or mental growth, the scales are all equal in difficulty and statistically similar throughout (Griffiths, 1970).

When comparing children of different ages, quotients which eliminate age factors are used to assess developmental levels. From the diagnostic point of view the profiles are used which show at a glance where weaknesses or disabilities lie, or in what direction exceptional progress may be expected, with intervention.

1.3 SUBJECTS AND CONTROLS

Children from Ga-Rankuwa, Winterveldt, Mabopane and Soshanguve aged between three and below seven years were tested. The age-groups were chosen because the Griffiths Test is standardized for all these age groups. The locations were chosen because they are easily accessible and also socio-economically representative of the community served by Ga-Rankuwa Hospital.

CHAPTER 2

2. LITERATURE REVIEW

2.1 WHAT IS EPILEPSY

The word epilepsy is derived from Greek. Epi - which means upon, and Lambaneis - which means to seize. The World Health Organisation working group define epilepsy as abnormal transitory phenomena of motor, autonomic and psychiatric nature which occur as a result of a transient discharge from part or from the whole brain.

In the black population epilepsy has a stigma attached to it because it is poorly understood.

2.2 TYPES OF EPILEPSY

The International League Against Epilepsy classifies epilepsy into focal and generalised epilepsy and unclassified seizures.

TABLE I. INTERNATIONAL CLASSIFICATION OF EPILEPTIC SEIZURES*

PARTIAL SEIZURE	GENERALISED SEIZURE	UNCLASSIFIED
1. Simple partial	Abscence Atypical abscence. Myoclonic Clonic Tonic Tonic-clonic Atonic	
2. Complex partial		
3. Partial seizures evolving into generalised		

* Modified from the commission on classifications and terminology of the International League against epilepsy (1981).

2.2.1 Generalised Tonic-Clonic

As children with this type of epilepsy were investigated in this study, the rest of the discussion will highlight relevant aspects of this type of epilepsy.

It is the most common type of epilepsy in children (Gomez & Klaas, 1983; Debora & Hirtz, 1989). It may be primary or ideopathic when there is no obvious cause, or secondary to existing brain pathology.

At the onset of a grand mal seizure, a sudden discharge of neuronal excitation spreads throughout the cortex bilaterally (Debora & Hirtz, 1989.) causing loss of consciousness and altered motor behaviour. The spread of the impulse throughout the cortex depends on age related factors such as neuronal excitability, ability to inhibit the spread of the discharge and the threshold of excitation. A classical attack of grand mal epilepsy may have 4 phases, namely; prodromal, tonic, clonic and post-ictal.

Prodromal Period:

The patient may experience autonomic, sensory and even motor events preceding the attack. Parents may observe prodromal symptoms like irritability, pallor and behavioural changes.

The Tonic Phase:

There is sudden loss of consciousness as the patient falls. Often there is a brief scream or cry - the result of air being forced out of the lungs by contraction of the expiratory muscles. There is tonic contraction of all the muscle with rigidity. Cyanosis may occur as breathing stops.

The Clonic Phase:

Rhythmic clonic jerks, which gradually decrease in intensity, follow. Tongue biting may occur in this phase. There is frothing at the mouth from pooled saliva. Respiration becomes deep with stertorous breathing. Loss of sphincter control, commonly the urinary sphincter, occurs. Autonomic symptoms like pupillary dilation, pilo-erection, tachycardia and hypertension may occur.

Post-ictal Phase:

The post-ictal period follows the clonic phase. The patient may fall into a deep sleep followed by gradual awakening. Confusion, lethargy, irritability, muscle fatigue, headache or vomiting may occur. The duration of the post-ictal period usually correlates with the duration of the seizure. The longer the seizure the more prolonged the post-ictal period.

2.3 DIAGNOSIS

The diagnosis of epilepsy is made after the person has had a series of seizures. A good description of the seizure by an observer helps in classifying the type of seizure.

The electroencephalogram (EEG) is helpful as a diagnostic tool. The classical EEG in tonic-clonic seizures is characterised by a succession of a fast (>10Hz) rhythm of increasing amplitude that becomes fragmented during the clonic phase, converting to single spike-wave complexes. A flat tracing follows the clonic phase and is rapidly

replaced by slow waves that progressively decrease to merge with interictal tracing (Aicardi, 1992).

A normal EEG does not exclude the diagnosis of epilepsy. In 40% of cases the EEG may be normal, as the tracing could have been recorded when there were no epileptiform spikes in the brain. A 24 hours continuous tracing will yield more positive results.

2.4 EPILEPSY AND THE DEVELOPING BRAIN

Whether seizures are the cause or the result of brain damage is a controversial topic which has been discussed for decades (Ross & Beckham, 1980). Camfield (1977) is of the opinion that recurrent seizures do not cause brain damage. Wasterlain (1997) on the other hand states that recurrent seizures in the developing brain are harmful. He based his findings on studies made in animal models. Ellenburg, Hirtz and Nelson (1986) did not find any differences in IQ between children with epilepsy and their controls if the epileptic children did not have underlying neurological abnormalities. Bourgeous, Prensky and Palkes (1983) did not find any deterioration in IQ in a large group of children with epilepsy except in a small subgroup with toxic serum drug levels. The deterioration was due to the effects of the drugs on the children's intellect.

Glucose is an essential metabolite for the brain. One of the possible reasons for brain damage in epilepsy is related to the increased utilisation of glucose with seizures.

The developing brain has difficulty in transporting glucose across the blood brain barrier during seizures. This accelerates energy failure of the cerebral neurons (Dwyers & Wasterlain, 1988), especially if the seizures are recurrent and prolonged.

During seizures there is also inhibition of protein synthesis (Dwyeth & Wasterlain, 1984). DNA synthesis and mitotic rates are decreased, which could be detrimental to the developing brain if the seizures are prolonged.

Neuropathological studies done on patients with prolonged convulsions found changes in the neocortical small pyramidal neurons, hippocampal pyramidal neurons and cerebellar purkinje cells (Meldrum, 1983). Mauritzen (1980) also found neuronal loss in the hippocampus of epileptics.

2.5 FACTORS WHICH MAY INFLUENCE THE DEVELOPMENTAL OUTCOME OF CHILDREN WITH EPILEPSY

i. Age on onset:

The earlier the age of onset the higher the incidence of developmental problems.

ii. Severity of seizures:

The more prolonged and repeated the seizures the worse the outcome. Arcaidi and Chevrie (1970) found mental retardation and neurological abnormalities in

children who had been normal before they had status epilepticus, proving that prolonged seizures are harmful to the brain.

iii. The effect of drugs:

Most drugs used in the treatment of epilepsy have sedative effects with loss of concentration and therefore delay development. Yung Yung, Wun Ming and Warren (1996) when comparing the effects of phenobarb, valproic acid and carbamazepine found that phenobarb affected the cognitive functions of epileptic children.

Braathen, von Bahrr and Theorell (1977) found that carbamazepine in therapeutic doses can cause motor impairments with fine motor being more affected than gross motor. Curran and Java (1993) tested the effect of Oxcarbazepine, a keto-analogue of Carbamazepine, on healthy adult volunteers. He found that it improved performance on focussed attention tasks and increased manual writing speed.

iv. Psychosocial factors:

Parents of epileptic children have less expectations of their children (Long & Mare, 1979) and as such do not strive to push the children to reach their maximum potential. Children with epilepsy have poor self-esteem because seizures disrupt a sense of control (Ziegler, 1981). This poor self-esteem may lead to delayed psychosocial development.

2.6 THE GRIFFITHS TEST

The Griffiths Test (Griffiths, 1970) is a developmental test for children from age one month to seven years. It has six subscales for children over 24 months and five for younger children.

2.6.1 Subscale A - Locomotor

Gross motor development is tested in this subscale. Children are observed and requested to execute motor tasks. Any abnormality of movement, physical weakness and musculoskeletal disability is recorded.

2.6.2 Subscale B - Personal-Social

The childrens' ability to look after themselves is assessed. Social interaction with the environment and the child's dependency is also measured. The children who tend to do badly on this subscale may have:

I. emotional problems

ii. overprotective parents

iii. been neglected

iv. been under-stimulated, coming from very poor or unstable families

2.6.3 Subscale C - Hearing and Speech

This subscale tests the hearing, speech and verbal ability of children by asking the child to name objects. Verbal memory and verbal reasoning are also tested by asking the child to repeat sentences of six to ten syllables. A trough is most commonly demonstrated in children with low IQ, hearing impairments, central processing problems and children who have been poorly stimulated.

2.6.4 Subscale D - Eye Hand Co-ordination

Manipulation, co-ordination, manual dexterity, persistence and careful diligent work are tested by brick tower building, scissors manipulation and drawing of diagrams. The drawings also test the concepts of form and space relation. Intellect is also partly assessed by asking a child to copy shapes and draw a person.

2.6.5 Subscale E - Performance

In this subscale skills are assessed by timing skills of manipulation, speed of working and precision by using bricks and boxes, form boards and pattern making.

This subscale also tests concepts of spatial relations, colour and form, fine motor co-ordination and visio-perceptual skills. The ability to concentrate should also be observed.

2.6.6 Subscale F - Practical Reasoning

This subscale has been introduced for bigger children from the age of 3 years. It tests memory and reasoning abilities of children. Short term memory is tested by asking the child to repeat figures. Orientation for time, space and the concept of size and speed is tested.

2.6.7 General Quotient

The general quotient is the overall mean quotient of development. Each quotient is calculated by using the following formula = $\frac{\text{mental age in weeks}}{\text{chronological age in weeks}} \times 100$

The general quotient however tends to mask areas of excellence or below average performance, as it averages the quotients from the subscales.

During test construction 2,260 children were tested and the results were as shown in table 11.

TABLE 1I. TABLE OF ORIGINAL GRIFFITHS TEST RESULTS

Quotients and standard deviations of the subscales

SCALE	QUOTIENT	STANDARD DEVIATION	N
a. Locomotor	100.41	16.32	2,260
b. Personal-social	100.26	16.20	2,260
c. Hearing and speech	99.78	17.75	2,260
d. Hand and eye co-ordination	100.46	15.58	2,260
e. Performance test	99.87	17.21	2,260
f. Practical reasoning	99.79	17.43	1,544
General Quotients	100.18	12.76	2,260

2.7 LITERATURE REVIEW OF THE SUBSCALES

Griffiths (1970) believes that environmental factors support, inflect and modify but do not generate the progression of development. The rate at which development takes place determines the mental status at any given time. This rate appears dependent, in the early stages, to social background and related circumstances.

The Griffiths test is a useful test to use in children with epilepsy because it assesses most aspects of development which may be affected by epilepsy or drugs used in its treatment. In this study it was also an appropriate test for the ages of children assessed.

2.7.1 Subscale A - Locomotor

African children as were tested in this study, have been shown to have advanced motor development (Irwin-Carruther, 1997). This motor precocity could have a genetic basis.

Motor impairments have been found in 67% of children with epilepsy (Beckung & Uvebrandt, 1993). The motor impairments may involve co-ordination, balance and speed of movement.

2.7.2 Subscale B - Social Personal

Many children with epilepsy are overprotected (Sillanpää, 1973), ineffectively disciplined, and maladjusted. These factors may negatively affect their performance on this subscale. Smith, Craft and Collins (1986) and Dorenhaun, Cappeli and Keene (1985) also found that children with epilepsy have emotional disturbances and are socially withdrawn. Children with epilepsy also tend to have low self-esteem (Hanai, 1993; Ziegler, 1981) and are socially isolated which will lead to a delay in social and personal development. This could be as a result of the society's attitudes towards epilepsy which may be prejudicial and stigmatizing, depending on their knowledge of the disease. Camfield (1993) believes that biological factors like the genetic make-up, are predictors of social outcome of epilepsy in intellectually normal children.

2.7.3 Subscale C - Hearing and Speech

Children with epilepsy perform differently from normal children in tests of verbal learning and memory (Bortz, 1995). Büchsenschütz (1979) found severe disorders of language comprehension in children with epilepsy. The children may develop sudden or gradual loss of language or inattentiveness to sound with the onset of epilepsy during the first few years of life (O'Donnohue, 1979).

2.7.4 Subscale D - Eye Hand Co-ordination

West (1978) found that children with epilepsy had no problems with tests of creative and design copying. Morselli (1989) reported the presence of impaired visuoperceptual skills in children with epilepsy. Shaw and Cruikshank (1956) found that children with idiopathic epilepsy were slower and made more mistakes than normal children in the Bender Gestalt Test. Stores, Hart and Piran (1978) found inattentiveness in school children with epilepsy. This lack of attention, if present, could lead to poor performance on tests of eye-hand co-ordination.

Children with epilepsy have been found to have impaired perceptio-motor skills and decreased speed of processing on visuo-motor skills (Shaw & Cruickshank, 1956).

2.7.5 Subscale E - Performance

It has also been found that when normal children were compared with epileptic children, normal children made less mistakes on tests of visio-motor co-ordination (Shaw & Cruickshank, 1956). Epilepsy also affects the speed of information processing. Visio-perceptual skills in epileptic patients have also been found to be impaired by Morgan and Grola (1980). Morselli (1980) found inpairments in the performance of simple geometric patterns and memory.

2.7.6 Subscale F - Practical Reasoning

Memory is essential for practical reasoning and Gower (1981) described poor memory in epileptic children. Normal intelligence (IQ) is also essential for practical reasoning. Children with epilepsy may have normal IQ (Bourgeois, Prensky & Palkes, 1983) or even higher IQ than normal children as has been shown in study on twins (Collins, 1945). Morselli (1980) when evaluating the memory of epileptic patients, found that epilepsy particularly impaired the ability to remember lists of digits as it is tested in this subscale. The hippocampus is an essential structure for memory processes. Neuronal loss in the hippocampus has been demonstrated (Mauritzen, 1980) in epileptic patients.

Seidenberg (1986) found impairments of performance in tests of reading, spelling, arithmetic and word recognition. Bortz (1995) found differential response characteristics in non-epileptic and epileptic patients on tests of verbal learning and

memory. Children with uncontrolled epilepsy may acquire aphasia and auditory agnosia and thus do badly on this subscale.

2.8 CARBAMAZEPINE

Anticonvulsants are known to affect the cognitive functioning and behaviour of children. This is acknowledged by The Committee on Drugs of the American Academy of Paediatrics (1985).

Carbamazepine is the anticonvulsant which was used on all the subjects. It is available at all the local clinics and it is much cheaper than Valproic acid which is the other recommended drug for this type of epilepsy. It is an imminostilbine with a tricycline structure. It is moderately protein bound.(Dodson, 1989). It induces its own metabolism during early therapy. This autoinduction is dose dependent.

The most common side effects of Carbamazepine include nausea, drowsiness, vertigo, ataxia, blurred vision, diplopia and slurred speech. Other CNS effects which are seen on higher doses include tremor, headache and movement disorders. Thirty to fifty per cent of those on medication have at least some side effects, however, most are transient (Pellock, 1987). Carbamazepine has a low potential for producing adverse behavioural and cognitive side effects (Trimble. 1987). Curran and Java (1993) when testing normal subjects found that Oxcarbazine improved the alertness, clear headedness and quick-wittedness in subjective tests and also improved performance on focussed attention tasks and normal writing speed in objective tests. Braathen, von

Bahrr and Theorell (1997) found fine motor impairments in children with epilepsy, treated with Carbamazepine. Aman and Werry (1990) studied 50 epileptic children and found that Carbamazepine at peak blood levels increased auditory-visual integration but decreased short term memory. The motor performance and activity level was however improved. Forsythe and Butler (1991) when testing the cognitive effects of anticonvulsants found, that Carbamazepine impaired recent memory and the speed of information processing.

CHAPTER 3

METHOD

Ethics approval for the study was obtained from the Ethics Committee of the University of the Witwatersrand.

Ethics Approval No. M940423 May 1994.

3.1 SUBJECTS

Twenty five subjects were used in this study.

Written consent was obtained from one parent or guardian prior to testing. Subjects were tested on a routine out-patient visit so as not to incur additional costs.

Inclusion Criteria

I) Age: From three years to six years 11 months.

ii) Residence: Mabopane, Ga-Rankuwa, Winterveldt and Soshanguve which are areas served by Ga-Rankuwa Hospital where the study was performed.

iii) Subjects had to have generalised tonic-clonic epilepsy with no underlying structural lesion i.e. primary or idiopathic as diagnosed by record reviews and EEG tracing if relevant.

iv) They should have had at least more than five convulsions as epilepsy by definition is a series of convulsions.

v) They should be on monotherapy and convulsion free for at least 3 months prior to testing. All subjects were on Tegretol as this is the first line therapy at the clinic at Ga-Rankuwa Hospital for this type of epilepsy. The dosage ranged from 10 to 25mg per kilogram per day.

vi) Cat Scan of the brain and physical examination should reveal no obvious abnormality.

vii) A normal electroencephalogram was not an exclusion criteria.

The socioeconomic status of the patients was not used as inclusion or exclusion criteria for the study. However an attempt was made to determine the socioeconomic status by :

I) Occupation of parent : If neither parents were in a professional or semi-professional occupation.

ii) Family income : If total family income was less than R2000.00 (per month).

iii) Housing : If the family lived in a squatter camp with no running water and electricity.

3.2 CONTROLS

Twenty five controls matched for age, sex and socio-economic status were used. Children from the neighbourhood or those attending the same creche or preschool matched for the above were used. The examiner had no idea about the intellectual capabilities of the controls.

The socio-economic status was determined in the same way as that of the subjects

The exclusion criteria for controls were :

1. A history of convulsions.

2. A history of head trauma.

3. Physical and mental problems.

4. A previous history of meningitis and encephalitis

5. History of chronic diseases e.g. asthma and diabetes.

The controls were tested at home at the expense of the investigator.

3.3 THE GRIFFITHS TEST

I) Testing

The testing was performed by the principal investigator who is certified to perform the test.

Where possible all Griffiths subscales were administered on one occasion. The test was carried out in quiet surroundings with the mother behind a two way mirror to decrease interference and distraction to the child.

The language used depended on whether the child was North Sotho, Tswana, Zulu, Venda or Shangaan. Translators were only needed for children who were Shangaan or Venda speaking.

The subtests using bricks were tested first, followed by subtests for memory beads and paper work. In between the subjects would be asked verbal questions and finally when they were becoming tired, the motor tests would be performed.

ii) The Griffiths quotients

The quotients were calculated by using the scores which the subjects achieved. For each task performed successfully, two points are given.

The sum of the points achieved gives the mental age. This score is divided by the chronological age in weeks and multiplied by 100 to give the quotient for each sub scale.

The general quotient is the average of the six sub scale quotients. It gives the overall developmental quotient which can be equated with the intelligence quotient (IQ). The normal range of the general quotient is between 90 and 110 with a mean of 100.

3.4 ANALYSIS OF RESULTS

General quotients, instead of actual scores, were used so as to cancel out age factors. Means of all the sub-quotients and general quotients from subjects were compared with means from the controls. The paired students T test which is a parametric test and the ranksign test which is a non-parametric test were used to analyse the data. The programme used was an SAS system on a personal computer. A difference of ten points and a p. value of 0,05 or less was taken as the level to determine significance.

CHAPTER 4

4. RESULTS

4.1 General Information

Twenty five children were tested in the epilepsy and control groups. Their ages ranged from 36 months to 80 months with mean age of 56 months for both subjects and controls. The differences in ages would not affect the final analysis of the results as quotients rather than total scores were used for data analysis.

Out of each group of twenty five, six were female and the rest were males.

Twenty children from each group came from families with an average family income below R2000-00 a month. Pairs 5, 6, 16, 19 and 24 had family incomes above R2000-00 a month with one or both parents being professionals.

4.2 Epilepsy Profile

The mean duration of epilepsy was 30 months. All the children had not had an epileptic fit for 3 months prior to testing. With the exception of pairs 6, 15, 23 and 25 the other children had no history of status epilepticus.

Explorer.lnk

The results were analysed with all the patients included (n=25) and then re-analysed excluding the pairs where subjects had had status epileptics (n=21).

4.3 The Griffiths Quotients Results

The data in table IX, page 50 was used to calculate the mean quotients and standard deviations.

Table III: MEAN QUOTIENTS AND STANDARD DEVIATION FOR SUBJECTS AND CONTROLS

Sub Scale	Subjects		Controls	
	n = 25	std dev.	n = 25	std dev.
A. Locomotor	109	20.7	120	4.8
B. Personal Social	98	19.7	114	8.2
C. Hearing and Speech	97	16.2	113	8.1
D. Eye and Hand	90	20.4	105	8.5
E. Performance	86	19.5	101	9.3
F. Practical Reasoning	101	21.5	119	6.6
GQ. General Quotient	97	16.2	119	4.5

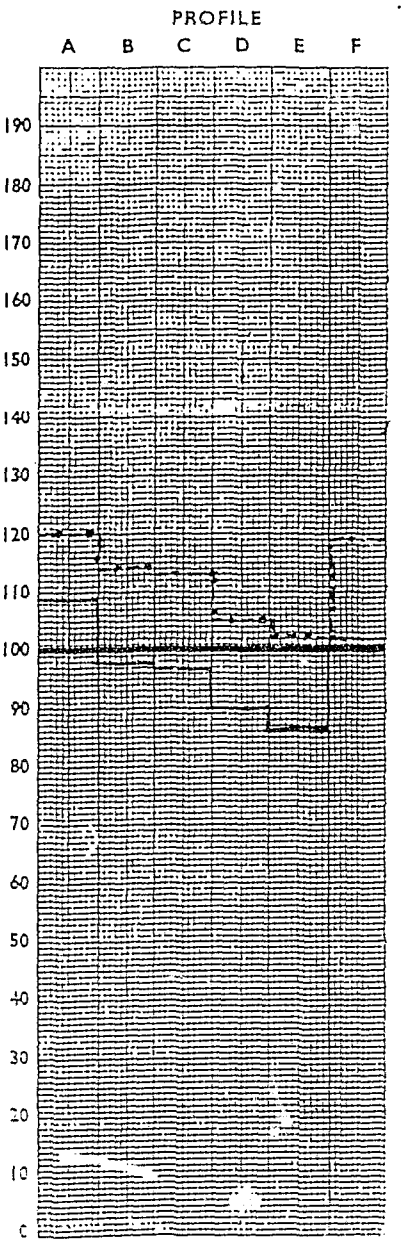
The above subscale means were used to draw developmental profiles in figure I.

FIGURE I

Developmental profiles using means for subjects and control

_____ Subjects n = 25

-.-.-.- Controls n = 25



The profiles of both the subjects and controls demonstrate a trough in the eye-hand and performance subscales. Both groups of children were generally slow and as the tests are based on time they scored poorly. When the children were given extra time for the tasks, they managed to complete the tasks with subjects taking a longer time.

The data was analysed using the paired T test and the rank sign test. The results are illustrated in Table IV.

Table IV: TEST RESULTS WITH ALL SUBJECTS INCLUDED

				p Value	
Scale	**N**	**Mean Difference**	**Std. Deviation**	**T. Test**	**Rank Sign**
A	25	- 10.4	19.4	0.0132	0.0085
B	25	- 16.4	18.4	0.0002	0.0001
C	25	-15.6	16.8	0.0001	0.0001
D	25	- 15.0	21.1	0.0016	0.0015
E	25	- 14.9	18.9	0.0006	0.0005
F	25	- 17.5	21.8	0.0005	0.0002
G. Q	25	- 15.0	15.5	0.0001	0.0001

The data in table IV shows that there were significant differences between subjects and controls on all the subscales and the G.Q. using both tests.

To rule out the effect of status epilepticus on development, all pairs where the subjects had had status were excluded and the data re-analysed. The results are illustrated in Table V.

Table V: TEST RESULTS EXCLUDING SUBJECTS WITH STATUS EPILEPTICUS

				p Value	
Scale	**N**	**Mean Difference**	**Std. Deviation**	**T. Test**	**Rank Sign**
A	21	- 7.4	12.5	0.0134	0.0093
B	21	- 12.6	16.1	0.0018	0.0017
C	21	-12.9	13.3	0.0003	0.0007
D	21	- 10.3	18.7	0.0199	0.0259
E	21	- 12.9	17.6	0.0031	0.0030
F	21	- 14.1	16.4	0.0008	0.0004
G. Q	21	- 11.9	11.1	0.0001	0.0002

Significant differences were found between the subjects and controls in all the subscales and the general quotient.

There were five subjects in the middle income group, one of which had had status epilepticus. In the low socioeconomic group there were 20 subjects, 3 of which had had status epilepticus.

The data on children from the low and high socio-economic groups were analysed separately, still excluding the children with status epilepticus.

Table VI: LOW SOCIO-ECONOMIC GROUP RESULTS

				p Value	
Scale	**N**	**Mean Difference**	**Std. Deviation**	**T. Test**	**Rank Sign**
A	17	- 7.2	10.9	0.0149	0.0093
B	17	- 12.2	15.5	0.0052	0.0057
C	17	-12.5	14.6	0.0027	0.0038
D	17	- 8.9	19.0	0.0722	0.1077
E	17	- 12.4	18.1	0.0121	0.0172
F	17	- 11.6	15.8	0.0079	0.0068
G. Q	17	- 11.0	10.9	0.008	0.0024

Significant differences were found in all the subscales with the exception of subscale D on eye-hand co-ordination. Of concern is the small amount of numbers used in the study.

Table VII shows results of the middle socio-economic group pairs analysed separately.

Table VII: MIDDLE SOCIO-ECONOMIC GROUP

				p Value	
Scale	N	Mean Difference	Std. Deviation	T. Test	Rank Sign
A	4	-8	19.9	0.4812	0.8750
B	4	-14.5	20.8	0.258	0.3750
C	4	-14.5	7.2	0.0274	0.1250
D	4	-16.5	18.5	0.1722	0.25
E	4	-14.8	17.4	0.1887	0.2500
F	4	-24.8	16.2	0.0555	0.1250
G. Q	4	-15.5	12.9	0.0951	0.2500

No significant differences were found between subjects and controls on all the subscales. The number of children in the middle socio-economic group was too small to draw a reliable conclusion.

A comparison was then made between children from the low and the middle socio-economic groups still excluding the children with status epilepticus.

Table VIII: LOW VERSUS MEDIUM SOCIO-ECONOMIC GROUP

	A	B	C	D	E	F	G.Q
p Value	0.9155	0.8025	0.7981	0.4781	0.8175	0.1541	0.4813

No significant differences were found when comparing the two socio-economic groups. However the numbers in the middle socio-economic group were too low for statistical significance. Another study, with equal numbers in each socio-economic group, is needed to

compare the effects of the socio-economic status on the development of children with idiopathic tonic-clonic epilepsy.

CHAPTER 5

DISCUSSION

The results of this study shows that children with idiopathic tonic-clonic epilepsy develop on average at a slower rate compared to controls.

The Griffiths profiles for the subjects show that the locomotor scale has the highest scores. There is a gradual drop across the subscales with the lowest score in subscale E, followed by a higher score in subscale F (Figure 1, page 27).

A similar pattern is noticed in the profiles for the controls. The performance of the epileptic children as shown by the profiles, was at a lower, though normal level, a finding similar to that of Shaw and Cruickshank (1956).

The subscale quotients as seen in Figure 1 show that the controls are performing above the Griffiths mean of 100 (Griffiths, 1970). The subjects are below the Griffiths mean in subscale B, C, D and E. The differences between the subjects and controls, are statistically significant in all the subscales although the mean quotients for the subjects in subscales A. B, C, D and F are within the normal range.

The low performance of the subjects could be due to a number of reasons:-

1. Epilepsy does cause brain damage and developmental delay, as observed by Wasterlain (1997), Sturniolo and Galletti (1994).

2. The unpredictability of the epileptic attacks makes children feel they lack control, leading to poor self-esteem. This low self-esteem (Hanai, 1993) could result in under performance as the children feel inadequate and insecure. Children with low esteem tend to give up easily when asked to perform tasks.

3. The parents of epileptic children are overprotective and this may delay their social and intellectual development (Sillanpää, 1973). Overprotected children are not allowed to experiment and explore the environment because the parents do not know when the next convulsion will occur. Subscale A and B were however normal.

4. The sedative effects of Tegretol which is found in 10-30% of patients could have accounted for the lower performance of the subjects. Braathen, Von Bahrr and Theorell (1997) found visio-motor impairments in children with epilepsy on Tegretol. These could have accounted for the low score in subscales D and E.

5. Children with epilepsy are socially withdrawn (Dorenhaun, Keen & Capelli, 1985). Withdrawn children usually under perform on most tasks because they need a period of adjustment to the environment before executing tasks given.

6. Epileptic children had underlying brain abnormalities which probably contributed to the development of the epilepsy (Ellenberg, Hirtz & Nelson, 1986). Subtle sensory and motor impairments (Beckung & Uvebrandt, 1997), if present, could also contribute to their poor performance.

7. Epileptic children have delayed speed of processing information (Mc-Guikin, 1990). In this study the epileptic children took more time than their controls to complete the tasks. This could be due to delayed speed of information processing.

Both subjects and controls under performed in the eye-hand and performance subscales. Both groups of children were generally slow and as the scores are based on time they scored poorly. The low scores cannot be due to poor intellectual functions as the scores improved significantly on the practical reasoning subscale which tests the intellect. A possible explanation for this could be:

I. The study population and controls are not familiar with manipulating toys, bricks and form boards.

ii. The study population may be having problems with visio-perceptual and spatial relationships as observed by consistent reversal of figures, signs and colours. Further tests are however needed to confirm this.

Above average scores were found in the locomotor subscale for both subjects and controls with no significant differences found when children who had status epilepticus were excluded for analysis. Irwin - Carruther (1997) found advanced motor development in African children both black and white as they spend most of their waking hours in upright positions on their mother's backs, baby slings, car and baby seats. The author's experience with Black babies is

that most walk independently within the first twelve months and sometimes as early as seven months.

When children from the low socio-economic group were analysed separately, significant differences were found between the subjects and the controls in all the subscales except in the eye-hand co-ordination.

The possible explanation could be:

1. The epileptic children from the lower socio-economic group had more emotional and psychological problems.
2. Parents from this group could not afford to come regularly for monthly treatments and thus their children could have suffered more epileptic attacks.
3. The children had less stimulation from their parents due to economic and social constraints, and to the stigma that is attached to epilepsy.
4. The children from the low socio-economic group, although they may not have had toys, they performed manual tasks at home leading to advanced fine motor development as found in subsacle D.

The children in the middle income group were not different from their controls. The numbers in this group were too low to arrive at a valid statistical conclusion. If the numbers were higher one could infer that the higher the socio-economic group the better the outcome of epilepsy in well controlled children. It could be postulated that the parents are financially equipped to give more attention medically and emotionally to their children. This may lead to a better outcome in their development.

CHAPTER 6

CONCLUSION

Children with well controlled idiopathic tonic-clonic epilepsy perform at a consistently lower level than their controls on the Griffiths developmental scales.

There is a trough in performance in the eye-hand and performance scale of both groups. This was related to delayed speed of performance, reaction time and poor manipulative skills. Spatial relations problems could have contributed to poor performance in these subscales.

6.1 Recommendations:

1. Parents of children with epilepsy and normal children should be encouraged to buy toys which enhance development of fine motor, manipulative skills, teach the concept of colour and improve concept of spatial relationships.

2. Children with epilepsy should be tested regularly for developmental delays in order to diagnose problems early.

3. Parents should be educated about epilepsy and advised against overprotecting their children to potentially encourage and speed up emotional, social and psychological development.

4. A change of anti-epileptic medication to a less suppressive drug like Epilim may be useful.

Future areas for research

1. The use of Epilim rather than Tegretol, which is less suppressive, in another study using the same subjects and controls is recommended. Adequate and appropriate anti-convulsants should be available to all epileptic children, with the diagnosis being made as early as possible.

2. The role of community education in the acceptance of children with epilepsy should be studied to evaluate if this could lead to an improvement of the patients' self steem.

3. More studies using bigger groups with children from all socio-economic groups should be done. The numbers in the middle income group were low, while children from the high income group were not included in this study.

4. The belief by parents and the community that only traditional healers can cure epilepsy whereas western medicines only control the disease, should be discouraged, unless scientific studies which prove these are done.

BIBLIOGRAPHY

1. Aicardi, J. and Chevrie J.J. (1970). Convulsive status epilepticus in infants and children. A study of 239 cases. Epilepsia, 11: 187-197

2. Aicardi, J. (1992). Diseases of the Nervous system in childhood. Clinics in Developmental Med No. 115/118: Mac-Keith Press.

3. Aldenkamp, A.P. (1993). Anti-epileptic drugs have little effect on cognitive function but have effect on motor speed. Neurologica, 43: 41-50.

4. Allan, M. (1988). A comparison of the performance of normal pre-school South African and British children on the Griffiths scales of Mental Development. Unpublished masters dissertation, University of Port Elizabeth.

5. Aman, M.G., Werry, J.S., Paxton, J.W., Turbo, S.H., Sterward, A.W. (1990). Effects of Carbamazepine on psychomotor performance in children as a function of dose, concentration, seizure type, and time of medication. Epilepsia, 28: 51-60.

6. Bagley, C. (1971). Social, psychological, neurological and behavioural disorder in epileptic children. A taxonomic study. Acta Paedopsychiatrica, 38: 78-89.

7. Beckung, E. and Uvebrand, P. (1997). Impairments, Disabilities and handicaps in adolescents with epilepsy. Acta Paediatrica, 86: 254-260.

8. Beckung, E. and Uvebrant P. (1993). Motor and sensory impairment in children with intractable epilepsy. Epilepsia, 34: 924-929.

9. Bortz, J.J., Prigamata, G.P., Blum, D. and Fisher, R.S. (1995). Differential response characteristics in non-epileptic and epileptic seizure patients on a test of verbal learning. Neurology, 45: 2029-2034.

10. Bourgeois, B.F.D., Prensky, A.C., Palkes, H.S., Talent, B.I.C. and Busch, S.G.(1983). Intelligence in epilepsy: A prospective study. Annals of Neurology, 14: 438-444.

11. Braathen, G., von Bahrr, L. and Theorell,K. (1997). Motor impairments in children with epilepsy treated with carbamazepine. Acta Paediatrica, 86: 372-376..

12. Buchsenschutz, E. (1979). Troubles severs de la comprehension du langage associes a une epilepsie. Neuropsychiatr Enfance Adolesc, 27: 361-371.

13. Camfield, P.R. (1997). Recurrent seizures in the developing brain are not harmful. Epilepsia, 388: 735-737.

14. Camfield, C. (1993). Biological factors are predictors of social outcome of epilepsy in intellectually normal children: A population study. Journal of Paediatrics, 6: 869-873.

15. Carlton- Ford, S., Miller,R., Brown, M., Nealeigh, N. and Jennings, P. (1995). Epilepsy in children: Social and psychological adjustments. Journal of Health and Social Behaviour, 36: 225-230.

16. Collins, A.J. (1990). Psychosocial well-being and epilepsy; an empirical study. Epilepsia , 31: 418-426.

17. Committee on Drugs. (1985). American Academy of Paediatrics. Behaviour and cognitive effects of anticonvulsants. Paediatrics, 76: 644-647.

18. Corcoran, R. (1992). Memory failure in epilepsy. Retrospective reports and prospective recordings. Seizure, 1: 37-42.

19. Curran, H.V. and Java, R. (1993). Memory and psychomotor effects of oxcarbazine in healthy human volunteers. European Journal of Clinical Pharmacology, 43: 529-524.

20. Debora, G. and Hirtz, M.D. (1989). Generalised tonic-clonic and febrile seizures. Pediatric Clinics of North , merica, 36: 365 - 367.

21. Dodson, W.E. (1989). Medical treatment and Pharmacology of Antiepileptic drugs. Pediatrics Clinics of North America, 36: 426-427.

22. Dorenhaun, D., Cappeli, M., Keene, D. and McGrath, P.J. (1985). Use of child behaviour checklist in psychosocial assessment of children with epilepsy. Clinical Paediatrics, 24: 634-637.

23. Ellenberg, J.H., Hertz, D.G. and Nelson, K.B. (1986). Do seizures in children cause intellectual deterioration? New England Journal of Medicine, 314: 1085-1088.

24. Forsythe, I., Butler, R., Berg, I. and McGuire, R. (1991). Cognitive impairment in new cases of epilepsy randomly assigned to carbamazepine, phenytoin and sodium valproate. Developmental Medicine and Child Neurology, 33: 524-534.

25. Gomez, M.R., and Klass, D.W. (1983). Epilepsies in infancy and childhood. Annals of Neurology, 13: 113 - 124.

26. Gallasi, R., Morreale, A., Lorruso, S., Pazzaglia, P. and Lugaresi, E. (1988). Epilepsy presenting as memory disturbance. Epilepsia, 29: 624-629.

27. Griffiths Ruth. (1970). The abilities of babies, London University Press. London.

28. Griffiths Ruth. (1970). The abilities of children, London University Press. London.

29. Gower, W.R. (1981). Epilepsy and other chronic convulsive diseases, Churchill, London .

30. Hanai, T. (1993). Quality of life in children with epilepsy. Epilepsia, 37 Suppl 3: 28-32.

31. Heimes, L. (1983). The comparison of the JSAIS and Griffiths Developmental scores of 3-5 year old boys and girls. Unpublished masters dissertation, University of Port Elizabeth.

32. Holmes, G.I. (1991). Do seizures cause brain damage? Epilepsia, 32 Suppl 5: 514-528.

33. Irwin - Carruthers, S.H. (1997). African Infant Precocity fact or fallacy - A Review. Physiotherapy, 43: 41 - 44.

34. Jacoby, A. (1993). Measuring the infant of epilepsy: the development of a novel scale. Epilepsy Residence, Sept 16(1): 83-88.

35. Lennox, W.G. and Collins, A.L. (1945). The intelligence of normal and epileptic twins. American Journal of Psychiatry, 10: 764-769.

36. Long, C.G. and Moore, J.R. (1979). Parental expectations for their epileptic children. Journal of Child Psychology and Psychiatry, 20: 299-312.

37. Luiz, D.M. (Ed). (1988). Griffiths scales of Mental Development. South African studies. (Research paper C25). University of Port Elizabeth.

38. Mala, M. (1996). Learning and memory skills in patients with cryptogenic epilepsy. Neurologica. 8: 280-286.

39. Matsumoto, A., Watanabe, B., Sugiura, M., Negro, T., Tackaesu, E. and Iwase, K. (1983). Long term prognosis of convulsive disorders in the 1st year of life: Mental and physical development and seizure persistence. Epilepsia. 24: 321-329.

40. Mauritzen Dan, A. (1980). Epilepsy and neuron loss in the hippocampus. Epilepsia. 21: 617-729.

41. Meldrum, B. (1983). Metabolic factors during prolonged seizures and their relation to nerve cell death. Status Epilepticus. Advances in Neurology. 34: 261-275.

42. Mitchell, W.G., Zhou, Y., Chavez, J.M. and Guzman, B.L. (1993). Effect of antiepileptic drugs on reaction time, attention and impulsivity in children. Paediatrics. 91: 101 - 105.

43. Morgan, A.M.B. and Grola, C. (1980). Visual perceptual deficits in young children with epilepsy. In Epilepsy and behaviour, 1979. eds. B. Kulig, Meinardi H, Stores G. p 169-171. Swets and Zietlunger B.V. Lisse .

44. Morselli, P.L. (1980). Evaluation of memory function in a population of epileptic patient and matched controls. Acta. Neurologica Scandinavia. 62, Supp 80: 58-61.

45. Mothuloe, V.B. (1990). The Aptitude test for school beginners and the Griffiths Scales of Mental Development. An investigation into the assessment of the cognitive abilities of Grade I children. Unpublished M Sc dissertation. (BF431) Medunsa.

46. Needham, W.E. (1969). Intelligence and ECG studies in families with idiopathic epilepsy. Journal of American Medical Association, 207: 1497-1501.

47. O'Donnohue, N.V. (1983). What will a child with epilepsy be allowed to do. Archives of Diseases in Childhood, 58: 937-938.

48. O'Donnohue, N.V. (1979). The epilepsies of childhood. Butterworth . Great Britain.

49. Pellock, J.M. (1987). Carbamazepine side-effects in children and adults. Epilepsia, 28, Suppl 3: 564 - 570.

50. Rodin, E., Schmaltz, S. and Tuitly, G. (1986). Intellectual function of patients with childhood onset epilepsy. Developmental Medicine and Child Neurology, 28: 25-33.

51. Ross, E. M., Peckham, C.S., West, P.B. and Buttler, W.R. (1980). Do seizures in children cause intellectual deterioration? Epilepsy in childhood, findings of the National child development study. British Medical Journal, 1: 207-210.

52. Ross, E.M. and West, P.B. (1978). Achievements and problems of British eleven year olds with epilepsy. Advances in Epileptology , 1977 (Eds) Menardi, H. and Rowan, A.J. pp 34-37. Swets & Zeitlinger B.V. Amsterdam .

53. Rutter, M., Graham, P. and Yule, W. (1970). A neuropsychiatric study in childhood. Clinics in Developmental Medicine No 35/36. Blackwell Scientific Publishers. Oxford.

54. Seidenberg, M., Beck, N., Geisser, M., Giordani, B., Sackellares, J.C., Berent, S., Dreifuss, F.E. and Bolt, T.J. (1986). Academic achievement of children with epilepsy. Epilepsia, 27: 753-759.

55. Sillanpää, M. (1992). Epilepsy in children. Prevalence, disability, and handicap. Epilepsia, 33: 444 - 4449.

56. Sillanpää, M. (1973). Medico social prognosis of children with epilepsy. Acta Paediatrica Scandinavia, 62, Suppl. 237: 3-104.

57. Shaw, M.C. and Cruichshank, W.M. (1956). The use of Bender Gestalt test in epileptic children. Journal of Clinical Psychology, 12: 192-193.

58. Smith, D.B., Craft, B.R., Collins, J., Matison, R. H. and Cramer, J.A. (1986). Behavioural characteristics of epilepsy patients compared with normal controls and the VA comparative study. Epilepsia, 27: 760-768.

59. Stores, G., Hart, J. and Piran, N. (1978). In-attentiveness in school children with epilepsy. Epilepsia, 19: 169-175.

60. Sturniolo, M.G. and Galletti, F. (1994). Ideopathic epilepsy and school achievement. Archives of Diseases in Childhood, 5: 424 - 428.

61. Trimble, M.R. (1987). Anticonvulsant drugs and cognitive function : A review of the literature. Epilepsia, 28: S37-45.

62. Vinning, E.E.G.and Freeman, J.M. (1985). Epilepsy in children. Paediatric Annals, 14: 705-706.

63. Ward, F. and Bower, B.D. (1978). A study of certain social aspects of epilepsy in childhood. Developmental Medicine and Child Neurology, 20, Suppl 39.

64. Wasterlain, C.G. (1997). Recurrent seizures in the developing brain are harmful. Epilepsia, 38: 728-734.

65. West, R. J., Odom, R.D. and Aschkenasy, J.R. (1978). Perceptual sensitivity and conceptual coordination in children and younger and older adults. Human Development, 21: 334-345.

66. Ziegler, R.G. (1981). Impairment of control and competence in epileptic children and their families. Epilepsia, 22: 339-346.

APPENDICES

1.	Ethics approval number and date	49
2.	Raw data - scores	50
3.	Sex of pairs and areas of residence	52
4.	Parental information and consent forms in English/and North Sotho	53
5.	Consent by Hospital Superintendent	57
6.	Questionnaire for controls and subjects	58
7.	Consent form for pre-school principal/owner	59
8.	North Sotho translation of instructions and verbal items of the Griffiths Test.	60
9.	Socio-economic status classification table.	73

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TITLE: The profile of cognitive development in children with idiopathic epilepsy as measured on the Griffiths Mental Developmental Scales.

DATE OF ETHICS COMMITTEE APPROVAL: May 1994, No. M940423

TABLE IX

GRIFFITHS SUB-QUOTIENTS AND GENERAL SUBJECTS AND CONTROLS

	AGE IN	A		B		C		D		E		F		GENERAL S	
	MONTHS	S	C	S	C	S	C	S	C	S	C	S	C	QUOTIENT Cad1q	
1	45.00	128.00	120.00	120.00	110.00	112.00	112.00	92.00	100.00	76.00	92.00	120.00	130.00	108.00	111.00
2	47.00	126.00	125.00	118.00	120.00	103.00	122.00	79.00	115.00	81.00	110.00	103.00	120.00	102.00	119.00
3	75.00	112.00	120.0	97.00	110.00	85.00	115.00	85.00	98.00	85.00	115.00	96.00	122.00	93.00	113.00
4	64.00	106.00	115.00	91.00	115.00	97.00	120.00	83.00	100.00	69.00	118.00	100.00	124.00	91.00	115.00
5	50.00	112.00	120.00	80.00	112.00	96.00	115.00	92.00	100.00	96.00	100.00	80.00	120.00	93.00	111.00
6	57.00	109.00	115.00	84.00	116.00	84.00	120.00	63.00	102.00	81.00	108.00	88.00	118.00	85.00	113.00
7	40.00	115.00	118.00	90.00	115.00	105.00	122.00	80.00	98.00	90.00	100.00	115.00	120.00	99.00	112.00
8	63.00	130.00	122.00	104.00	118.00	104.00	115.00	126.00	110.00	130.00	108.00	133.00	118.00	121.00	115.00
9	69.00	110.00	120.00	84.00	115.00	87.00	122.00	110.00	116.00	75.00	110.00	87.00	124.00	92.00	118.00
10	74.00	114.00	122.00	103.00	108.00	103.00	110.00	127.00	112.00	119.00	98.00	108.00	118.00	112.00	111.00
11	80.00	110.00	120.00	105.00	110.00	105.00	116.00	115.00	110.00	115.00	118.00	115.00	118.00	111.00	115.00
12	72.00	100.00	108.00	100.00	125.00	105.00	100.00	122.00	103.00	100.00	108.00	86.00	97.00	102.00	107.00
13	76.00	105.00	115.00	92.00	100.00	95.00	112.00	100.00	100.00	82.00	102.00	98.00	110.00	94.00	108.00
14	36.00	128.00	120.00	144.00	118.00	122.00	115.00	78.00	98.00	94.00	94.00	144.00	120.00	118.00	111.00
15	37.00	142.00	122.00	121.00	126.00	121.00	126.00	99.00	116.00	110.00	100.00	137.00	120.00	122.00	118.00
16	38.00	131.00	128.00	131.00	120.00	110.00	115.00	95.00	90.00	95.00	92.00	116.00	120.00	113.00	111.00

	AGE IN	A		B		C		D		E		F		GENERAL S	
	MONTHS	S	C	S	C	S	C	S	C	S	C	S	C	QUOTIENT Cadiq	
17	61.00	98.00	115.00	92.00	119.00	91.00	118.00	102.00	115.00	98.00	110.00	85.00	118.00	94.00	115.00
18	40.00	90.00	126.00	100.00	126.00	100.00	122.00	80.00	118.00	80.00	90.00	120.00	122.00	95.00	116.00
19	66.00	82.00	118.00	79.00	110.00	79.00	100.00	73.00	100.00	75.00	98.00	85.00	120.00	79.00	108.00
20	59.00	119.00	122.00	105.00	108.00	122.00	100.00	105.00	98.00	81.00	90.00	112.00	116.00	107.00	106.00
21	69.00	104.00	110.00	87.00	92.00	87.00	98.00	90.00	89.00	72.00	92.00	90.00	110.00	88.00	99.00
22	57.00	102.00	122.00	85.00	115.00	91.00	108.00	67.00	112.00	84.00	87.00	91.00	116.00	87.00	110.00
23	37.00	58.00	118.00	65.00	120.00	89.00	102.00	[illegible].00	115.00	49.00	90.00	65.00	122.00	65.00	110.00
24	38.00	137.00	128.00	116.00	122.00	95.00	108.00	74.00	110.00	63.00	98.00	110.00	130.00	99.00	116.00
25	59.00	61.00	120.00	58.00	102.00	44.00	110.00	51.00	100.00	51.00	96.00	54.00	125.00	53.00	109.00
TOTAL SCORE		2729.00	2989.00	2454.00	2839.00	2432.00	2823.00	2250.00	2625.00	2150.00	2524.00	2530.00	2977.00	2423.00	2798.00
MEAN		109.00	120.00	98.00	114.00	97.00	113.00	90.00	105.00	86.00	101.00	101.00	119.00	97.00	112.00

TABLE X

SEX OF STUDY PAIRS AND THEIR AREAS OF RESIDENCE

	SEX	VENUE
1	Male	Soshanguve
2	Male	Ga-Rankuwa
3	Male	Winterveldt
4	Female	Brits/Ga-Rankuwa
5	Male	Soshanguve
6	Male	Ga-Rankuwa
7	Male	Ga-Rankuwa
8	Male	Maboloka/Mabopane
9	Male	Ga-Rankuwa
10	Female	Soshanguve
11	Female	Madidi/Mabopane
12	Female	Soshanguve
13	Male	Mabopane
14	Male	Soshanguve
15	Male	Mabopane
16	Male	Ga-Rankuwa
17	Male	Madidi/Mabopane
18	Male	Ga-Rankuwa
19	Female	Brits/Mooinooi/Ga-Rankuwa
20	Female	Soshanguve
21	Male	Soshanguve
22	Male	Soshanguve
23	Male	Soshanguve
24	Male	Mabopane
25	Male	Soshanguve

PARENTAL INFORMATION AND CONSENT FORM FOR GRIFFITHS DEVELOPMENTAL MENTAL SCALES

INVESTIGATOR: DR D.I.S. MAGONGOA

PARENT: _____

CHILD'S NAME: _____

I agree that my child can participate in the Griffiths Developmental Mental Scales study. I understand that my child is epileptic/normal. I have been told that this study compares the mental development of children with epilepsy with that of normal ones.

This study is intended to help professionals in increasing the knowledge, understanding, early diagnosis and intervention of mental abnormalities in children with epilepsy. Your child's ability to perform motor and social tasks, his hearing, speech and memory and his reasoning capabilities will be assessed. This involves the use of small bricks, toys, pictures, form boards, questions and requesting him to perform certain tasks.

I understand that participating in this study will include my completing a questionnaire and that the test will require two hours of his/her time. It is agreed that the information concerning his/her participation in this study will be kept confidential and that the reports will contain no identifying information regarding my child.

I understand that there are no risks and discomfort involved in this study. I understand that possible benefits of my participation is helping people to learn more about epileptic children and their related mental developmental problems and also that the results of the test will be available to me on school entry or on request.

Participation in this study is voluntary and I am free to refuse to participate or to withdraw my consent and to discontinue participation at any time. Such refusal or discontinuance will not affect his/her regular treatment or medical care in any way. A signed copy of this consent will be made available to me.

I understand that my signature means that I have been informed and read this form, understand the test to be done and voluntarily agree to participate in this study.

SIGNATURE: _____ DATE: _____

PARENT OR GUARDIAN

_____ _____

INVESTIGATOR

_____ _____

WITNESS

TSEBISO YA BATSWADI LE TUMELLO YA GO DIRWA GA GRIFFITHS DEVELOPMENTAL MENTAL SCALES

MOHLAHLOBI: DR D.I.S. MAGONGOA

MOTSWADI: _____

NGWANA: _____

Maikemišetšo ya teko ye ke go thuša go oketša tsebo, kwišišo, go phekola le go alafa mathata a monagano go bana ba bolwetši ba seebana. Go tla nyakišišwa gore ngwana a ka kgona go kwa, go bolela, go sepela le go šomiša monagano go ya kae? Mo tekong ye, go tla šomišwa ditenanyana, dipotšišo, le go kgopela ngwana go dira mediro ye mengwe.

Ke hlaloseditšwe gore mo ditekong tše, go tla nyakega gore ke arabe dipotšišo le gore teko ye e tla tšea dihora tše pedi. Leina la ngwana le dipoelo tša teko ye di ka se botšwe motho yo mongwe.

Ke boditšwe le gore teko ye ga e bohloko goba kotsi. Ke kwišiša gore diteko tše di ka thuša batho go kwišiša maemo a monagano wa bana ba seebana le mathata a ona ge ba gola. Dipoelo tša diteko nka di fiwa ge ngwana a thoma sekolo goba ge ke di kgopela.

Ke dumela gore ngwana waka a ka tsenela diteko tše tša Griffiths Developmental Mental Scales. Ke tseba gore ngwana waka o na/ga a na bolwetši ba seebana.. Ke boditšwe gore diteko tse di lekagantšha tšhomo ya monagano wa bana ba go lwala le ba ba sa lwalego.

Diteko tše ga di gapeletšwe. Ke na le tokelo ya go di gana goba go tšwa mo go tšona nako efe le efe. Go gana gaka goba go tšwa gaka, go ka se tshwenyane le kalafo goba hlokomelo ya ngwana waka. Ke tla fiwa bohlatse bjo bo saennwego ba tumellano ye.

Ke dumela gore tshaeno yaka e ra gore ke boditšwe, ke badile le gore ke kwišiša teko ye e tla dirwago ebile ke dumela ntle le kgapeletso.

TSHAENO: _____ LETŠATŠI: _____

MOTSWADI

_____ _____

MOHLAHLOBI

_____ _____

WITNESS

CONSENT FORM BY THE HOSPITAL SUPERINTENDENT

I hereby give consent to Dr D. I. S. Magongoa to perform the Griffiths test on patients with idiopathic epilepsy who are seen at the Paediatric Out Patient Clinic. I also give her permission to use the hospital Griffiths test kit.

SIGNED: _____

DATE: _____

QUESTIONNAIRE FOR CONTROLS AND SUBJECTS

NAME: _____ AGE: _____ SEX: _____

HIGHEST STANDARD ACHIEVED BY: MOTHER: _____

FATHER: _____

OCCUPATION: MOTHER: _____

FATHER: _____

AREA OF RESIDENCE: _____

BUSINESS IF ANY : _____

DEVELOPMENTAL MILESTONES :

CRAWL: _____ WALK:

_____ SPEECH

_____

SPHINCTER CONTROL: _____

PAST MEDICAL HISTORY:

DIABETES MELLITUS	YES	NO
SEVERE MALNUTRITION	YES	NO
OTHER ILLNESSES	YES	NO

EXPLAIN ANY BOX MARKED YES:

_____

_____

_____

INFORMATION: _____

RELATIONSHIP TO SUBJECT: _____

CONSENT FORM FOR PRE-SCHOOL PRINCIPAL/OWNER

I _____ preschool principal/owner of

_____ preschool, hereby give consent to Dr. Magongoa to test my a charges only after she has obtained written consent from the parents/guardians.

SIGNED: _____

DATE: _____

TRANSLATION OF INSTRUCTIONS AND VERBAL ITEMS OF THE GRIFFITHS SCALES OF MENTAL DEVELOPMENT

NORTHERN SOTHO

	ENGLISH	N. SOTHO
A.111.3	Now stand up; one, two!	Emella nngwe, pedi!
A.111.4	Can you do this? See if you can cross one foot over the other	A o ka dira bjale Thathetša leeto godimo ga le lengwe
A.1V.5	Can you hop? You can stand on one foot, can't you? Well, let me see you hop!	A o ka tshela Ema ka leoto le letee Tshelatshela
A.V.3	Now, just touch your shoes, keeping your knees straight	Kgoma dieta tša gago, o hlopollotše mangwele
A.VI.3	Can you throw this ball up a little way and catch it again?	A o ka phošetša bolo ye gannyane godimo wa e kama gapė?
B.111.1	What is your name?	O mang? Leina la gago ke mang?
B.111.2	Do you use a spoon to eat your dinner at home? Well, what do you use?	A o šomiša leswana ge o fihlola kwa gae? O ja ka eng?
B.111.3	Do you put your own toys away at home when mother asks you to?	O phutha dilo tša gago tsa go raloka ge mmago a go botša gore o di phuthe
B.111.4	Are you a little boy or a little girl? Are you a little girl or a little boy?	O mošimanyana goba ngwanenyana O ngwanenyana goba o mošimanyana

	ENGLISH	N. SOTHO
B.111.5	Can you look after yourself? Do you dress yourself? Can you undo buttons and do them up? Never mind the other one. Now, can you do them up again?	O kgona go ihlokomela O a ikapeša? O kgona go ngamela le go ngamolla dikonopi? Lesa yeo. Dingomele gape
B.111.6	That's right, have you another name?	Gabotse! Na ona le leina le lengwe
B.IV.2	Can you put your shoes on by yourself? Who puts your sock on? Who puts your shoes on?	A o kgona go ikapeša dieta? Ke mang yo a go apesago masokisi? O apeŝwa ke mang dieta?
B.IV.3	How old are you? You are getting to be a big boy (girl); how old are you now?	O na le mengwaga e mekae? O a gola e, mengwaga ya gao ke e mekae bjale
B.IV.4	Do you like playing with other children? Are they nice to you? Do they hit you?	O rata go raloka le bana ba bangwe? Ba go swara gabotse? A ba ya go betha?

	ENGLISH	N. SOTHO
B.IV.5	Do you help mother to put things on the table for tea?	A o thuša mmago go teka tafola go nwa tee?
	What do you put on the table?	O beya eng godimo ga tafola?
	Do you carry them from the kitchen?	O di rwala go tšwa ka moraleng
	Does mother let you carry them?	Mmago o go dumelela go di rwala?
	Who carries the tea things in?	Ke mang ya a tlišago dibyana tša tee?
	Can you lay the table?	A o kgona go teka tafole?
	What do you put on it?	O bea eng godimo ga yona?
B.V.2	Where do you live?	O dula kae?
B.V.6	Can you put on your biggest coat all by yourself?	Na o kgona go ikgapheša jase?
	And do it all up?	Wa ba wa e ngomela?
B.VI.2	Can you tie a knot like that?	O ka bofa lehuto bjale?
	Now you try?	Leka?
B.VII.1	Now, make me a very nice bow	Ontirele lente le le botse
B.VII.2	Who cuts up your meat?	O segelwa ke mang nama?
C.III.1	What is this?	Ke eng se?
C.III.3	What do we have a cup for?	Komiki ke ya go dirong?
	What does a knife do?	Mphaka o dira eng?
	What do I want a chair for?	Ke dirang ka setulo?
C.III.4	Listen I want you to say something for me ..... Listen!	Theeletša ke nyaka gore o bolele sengwe ..... theeletša!
	Say this	Nkekiše .....
	I have a little cat	Ke na le kátsaná
	My pussy caught a mouse	Katsana yaka e tshwere legotlo
	The mouse had a long tail.	Legotlo le be le ba le mosela o motelle

	ENGLISH	N. SOTHO
C.IV.1	Tell all about it What can you see? What are they all doing?	Laodiša O bona eng? Ba dira eng kamoka?
C.IV.2	What is this? What do we call it?	Ke eng se? Re se bitša eng?
C.IV.4	What should you do if you feel tired?	O dira eng ge o ekwa o lapile?
C.IV.6	What colour is this? What do we call this colour	Ke mmala mang o? Re o bitšang mmala o?
C.V.2	Listen to this: A boy is big, a baby is ?	Theeletša - Mošimane o mogolo, ngwana o .....?
C.V.3	What is a table made for? What is a window made of? What is a house made of?	Tafole e dirilwe ka eng? Lefenstere/lehlabaphefelo le dirilwe ka eng? Ntlo e agilwe ka eng?
C.V.4	I wonder if you can say this. Listen! ..... My dog is a very good friend to me I take my dog when I go for a walk	O ka kgona go nkekiša? Theeletša Mpya yaka ke mogwera waka wa potego Ke sepela le mpya yaka, ge ke otlolla maoto
C.VI.4	Tell me the name of this letter; I don't want just to hear the sound it makes	Mpotše leina la hlaka ye; ga ke nyake fela modumo wa yona
C.VII.1	It will be my birthday next week; mother will give me a party	Ke matswalo a ka beke e tlago; mma o tlo ntirala monyanya/phathi

	ENGLISH	N. SOTHO
C.VII.4	You know a carrot and you know a potato? Tell me how they are like one another	O tseba carrot gotee le letsapane. Di tshwana bjang?
	You know a tiger and you know a cat? Tell me how they are like one another	O tseba nkwe le katse; Di tshwana bjang?
	You know a cent and you know a button? Tell me how they are like one another	O tseba cente le konupi, di tshwana bjang?
	You know a tree and you know a daisy? Tell me how they are like one another	O tseba sehlare, le letsoba/leblomo mpotse gore di tshwana bjang?

	ENGLISH	N. SOTHO
C.VIII.5	You know a fly, and you know a bee? They are not both alike, are they? How are they different? You know ice, and you know glass? They are not both alike are they? How are they different?	O tseba ntsi, le nose? Ga di tshwane a kere? Di fapana bjang? O tseba aise, gape o tseba galase. A kere ga di swane? Di fapana bjang?
	You know string, and you know thread? They are not both alike are they? How are they different?	O tseba thapo, le hlale Ga di tshwane a kere? Di fapana bjang?
	You know salt, and you know sugar? They are not both alike, are they? How are they different?	O tseba letswai, gomme o tseba sukuri, Ga di tshwane a kere? Di fapana bjang?
D.III.2	Look at the pattern	Lebella setshwantsho se
D.III.4	See, I am going to cut my paper in half	Lebella, ke yo sega pampiri yaka ka bogare
D.III.5	Stop when you have finished	Emisa ge o feditse
D.IV.1	See, it is like a little book!	Bona, o ka re ke puku, e nnyane!
D.IV.6	Fold it like a letter	E phuthe bjale ka lengwalo
D.IV.6	Can you draw a man? Draw daddy.	O ka thala monna? Thala papago
D.V.5	Can you draw a house, a nice little one, over here.	O ka thala ntlo, e nnyane e botsana mo
D.VI.4	Have you finished the house? Do you want to do any more?	O feditse ntlo? O nyaka go tswela pele?

	ENGLISH	N. SOTHO
D.VIII. 7/8	I want you to draw the nicest house you can - just here - and over here, please draw the people who live there	Ke nyaka gore o thale ntlo e botsana botsana - mo - le mola - leka go thala batho ba ba dulago mola
E.III.2	I want to see how quickly you can put these bricks back into this box and put the lid on Ready ..... Go!	Ke nyaka go bona gore o ka phakisa go busetso ditena tse ka lepokising gomme wa le tswalela Etokise ..... Thoma!
E.III.3	I want to see if you can put all these squares back again I am going to see how quickly you can do it	Ke nyaka go bona gore na o ka di busetsa gape na? Ke nyaka go bona gore na o ka phakisa?
E.III.4	I want to see if you can put all these blocks back again. See how quickly you can do it	Ke nyaka go bona ge o ka tsentsha ditena tse kamoka. Dirisa ka pele
E.IV.2	See, this little box has a little ridge all round it; this makes a good strong railway bridge Do you think you could make one just like that, and make the train and send it back to my station	Lebella, lepokisana le le na le morumo. Morumo yo o dira leporogo la go tia O bona gore o ka kgona go dira wa go tshwana nao? Dira setimela o se romela setitshing saka

	ENGLISH	N. SOTHO
E.IV.3	Can you put them away now, the red ones in the red box, the blue in the blue box and the yellow in the yellow box, and put the right lid on?	Dibeye byale, ehubedu ka gare ga lepokisi le lehubidi, e tala gole letala le ye modipa gole modipa o khurumele?
E.V.3	I am going to see if you can make patterns Do you think you can make that pattern with these bricks, just her? See, the three red ones are at the top, then the yellow, then the blue. Now you make it.	Ke nyaka go bona ge o dira ditshwantsho O bona gore o ka kgona go dira ditshwantsho ka ditema tse, gona mo? Bona tse tharo tse hubedu di ko godimo, gwa latela tse modipa(yellow) gomme tse tala Nkekise
E.V..4	This is a big gate Have a good look at it. The cars can go through here ..... and through here ..... and this is like a window on top Do you think you could make it now?	Ye ke yeke e kgolo E lebelele gobotse Dikoloi di feta ka mo le mo ..... go na le lefenstere/ lehlabaphefo ko godimo A o ka kgona go e dira?
E.VI.3	Now, look what I am going to do. See! I am making a stair-case. Do you think that you can build the stairs like that?	Lebelela se ke tlogo se dira Bona! ke aga setepisi A o ka aga ditepisi ka mokgwa o?

	ENGLISH	N. SOTHO
F.III.1	I am going to say numbers. I want you to say them when I've finished Now listen. Say B.	Ke tlo bolela dihlaka. O di bolele ge ke feditše Theeletša. Ere B.
F.III.2	What is this? Tell me what we call it?	Ke eng se? Mpotše gore re e bitša eng?
F.III.4	One of these is bigger than the other. Which is the bigger one?	Enngwe e feta e nngwe. E kgolo ke efe?
F.III.6	This one is big, and this one is.....?	Ye e kgolo, gomme yee .....?
F.IV.1	Here are two towers. One of these is higher than the other Which is the higher one?	Meago e mebedi še Ye nngwe e feta enngwe Ke efe e lego godimo?
F.IV.2	One of these lines is longer than the other. Which is the longer one?	E nngwe ya methalo ye e telle Ke ofe o leng telle?
F.IV.4	Can you count these? How many are there?	A o ka bala dilo tše Ke tše kae?
F.IV.6	One of these is heavier than the other. Which is the heavier one? This is one heavy, and this is .....?	Ye nngwe ya tše e boima go feta e nngwe Ke efe ye e lego boima kudu? Ye e boima, gomme ye e .....?

	ENGLISH	N. SOTHO
F.V.1	This is money. Do you know the names of money? What is this? What do we call it? It's a cent, isn't it? Tell me some of the others. What is this one?	Se ke tšhelete O tseba maina a tšhelete? Ke eng ye? Re e bitša eng? Ke sente kgane? Mpotše maina a tše dingwe Ye e bitšwa eng?
F.V.2	How many have I put there? Go on, you count these bricks. How many was that?	Ke beile tše kae mola? Thoma, bala ditena tše Ke tše kae?
F.V.3	Is this the morning or the afternoon? Is this the afternoon or the morning?	Ke goseng b ga ke manthapama Ke manthapana goba ke goseng?
F.V.5	Which goes faster, a big boy running or a little boy running? Which goes faster, a bird flying or an aeroplane? Which goes faster, a car or a bicycle?	Ke ofe aleng kapele mošimane o mogola ge a kitima goba o monnyane? Ke eng e kapela, nonyane ge e fofa goba sefofane? Ke eng e leng kapela, sefatanaga goba paesekele
F.V.6	How many was that?	Ke tše kae?
F.V1.1	How many fingers have you on this hand, counting the thumb? How many is that altogether	O na le menwana e mekae mo letsogong le, ge o bala o mogola? Ke e mekae kamoka?
F.VI.6	This one is high, then this one is .....?	Ye e ko godima, ye yona e .....?

	ENGLISH	N. SOTHO
F.VII.2	Which is your right hand?	Letsogo la gago la goja ke lefe?
	Hold up your right hand	Emiša letsogo la go ja
	Which is your left ear?	Tsebe ya gago ya molema ke efe?
	Show me your left ear?	Mpontšhe tsebe ya gago ya molema
F.VII.3	Can you count backwards?	Na oka kgona go balela morago?
	Listen: Begin with 10 and count downwards until you get to 1.	Theetša: Thoma ka lesome o balele morago gofihla ga tee.
	Can you do that?	A o ka dira bjalo?
F.VII.4	Do you know the names of all the days of the week?	O tseba maina kamoka matšatši a beke
	Say them for me.	Mpotše ona
	You know, begin with Sunday	Thoma ka sontaga
	That's right.	Gabotse
	What comes after Tuesday?	Go tla eng moraga ga labobedi?
	What comes before Saturday?	Go tla eng pele go mokibelo?
F.VII.5	Can you tell the time?	O tseba nako?
	Well, we'll see.	A gaa re tla bona
	What time does this clock say it is?	Ke nako mang bjale?
F.VII.6	This line is long, so this line is ....?	Mothalo o o motelele, bja yo ona o .....?

	ENGLISH	N. SOTHO
F.VIII.1	What comes after Thursday? What come before Thursday?	Go tla eng morago ga labone? Go tla eng pele ga labodedi?
F.VIII.3	I am going to say some numbers and I want you to say them backwards. You will begin with the last one I say Listen: 1 8 6.	Ke tla bala dinomoro gomme wena o di balele morago Thoma ka ya mafelelo ye ke e boletsego Theetša 1 8 6.
VERBAL DETAILS RELEVANT TO SCALE C V.		
	I have a little cat	Ke na le katsana
	My pussy caught a mouse	Katsana yaka e swere legotlo
	The mouse had a long tail	Legotlo le be le na le mosela o motelele
	My dog is a very good friend to me	Mpya yaka ke mogwera waka wa potego
	It will be my birthday next week, Mother will give me a party.	Ke matswalo aka beke e tlago. Bomma ba tlo ntirela moletlo
	What should you do if you feel tired?	O swanela go dira eng ge o lapile?
	What should you do if you are cold?	O swanela go dira eng ge o kwa phefo?
	What is the thing to do if it is raining when you want to go out?	O swanela go dira eng ge pula e ena gomme o nyaka go tšwela kantle?
	What should you do if you are going somewhere and you have missed the bus?	O swanele go dira eng ge o ya felo gomme bese ya go tlogela?
	What do you do if you feel lonely?	O dira eng ge o jewa ke bodutu
	What is the best thing to do if you are on your way to school, and you find it is getting late?	Se se kaone ke go dira eng ge o eya sekolong gomme wa hwetša o latetšwe?
	What should you do if you were lost?	O ka dira eng ge o timetše?

	ENGLISH	N. SOTHO
	A boy is big, a baby is .....?	Mošimame o mogolo, ngwana o .....?
	Coal is black, snow is .....?	Malahla a mantsho, semathane se .....?
	A lion is fierce, a lamb is.....?	Tau e bogale, konyana e .....?
	How are a carrot and a potato like one another?	Carrot le letsapole di swane bjang?
	How are a tiger and a cat like one another	Nkwe le katse di tshwana bjang?
	How are a cent and a button alike	Sente le kunipi di tshwana bjang?
	How are a tree and a daisy alike?	Sehlare le leblomo di tshwana bjang?
	What is the difference between a fly and a bee?	Ntšhi le nose di fapana bjang?
	What is the difference between ice and glass?	Ice le galase di fapana bjang?
	What is the difference between string and thread?	Thapo le hlale di fapana bjang?
	What is the difference between salt and sugar?	Letswai le sukiri di fapana bjang?

SOCIO - ECONOMIC STATUS CLASSIFICATION.

PAIR NO.	SOCIO-ECONOMIC STATUS
1	Low
2	Low
3	Low
4	Low
5	Middle
6	Middle
7	Low
8	Low
9	Low
10	Low
11	Low
12	Low
13	Low
14	Low
15	Low
16	Middle
17	Low
18	Low
19	Middle
20	Low
21	Low
22	Low
23	Low
24	Middle

Author Magongoa Dr D L S
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