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THE SUPPORTIVENESS OF THE ENVIRONMENT AND VISUAL-MOTOR INTEGRATION OF CHILDREN RESIDING IN A RESIDENTIAL CHILD CARE FACILITY IN MAURITIUS

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Occupational Therapy.

Johannesburg,

November 2014

DECLARATION

I, **Anne Tait** declare that this dissertation is my own work. It is being submitted for the degree of Master of Science in Occupational Therapy to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

Signed: 

14th Day of November 2014

DEDICATION

This report is dedicated to all the children who are not loved, and have been neglected through our imperfect society through our failing as adults, to prioritise their needs above our own. May these findings help in highlighting the needs of the most vulnerable in our society.

ABSTRACT

Part 1 of this study determined the demographic factors, including body mass index (BMI) associated with development, and the environmental supportiveness, as determined by the HOME Inventory, of 50 typical children living in the community in Mauritius. Their normally distributed developmental status, using the Beery-Buktenika Developmental Test of Visual-Motor Integration (Beery VMI) confirmed their demographic and environmental factors were within acceptable limits, and were not associated with developmental delay.

Based on the results of Part 1 as a standard for assessing development, Part 2 of the study considered the developmental status of 50 children living in a residential child care facility in Mauritius. Demographic information indicated exposure to factors associated with developmental delay, with HOME inventory scores falling below the accepted medians for the majority of the subscales. The below average scores on the Beery VMI, indicated developmental delay in child care group which should be further researched and addressed by occupational therapy.

ACKNOWLEDGEMENTS

I would like to thank the residential child care facility who agreed to the use of their facilities, and the participation of the children in this study. I would also like to thank my supervisor, Denise Franzsen, who spent many hours (after hours) helping to complete this study.

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OPERATIONAL DEFINITIONS

Environment: The physical (1–3), social, (2,3), cultural (2) and attitudinal (2) surroundings of an individual or group.

Child development: The growth and resultant changes a child progresses through as he/she masters increasingly 'complex levels of moving, thinking, feeling, and relating to others' (4).

Visual-Motor Integration (VMI): The term visual-motor integration (VMI) refers to the interaction of visual skills, visual-perceptual skills, and motor skills (5). It describes the degree to which an individual can combine the visual image of shapes with the matching motor output, in an activity such as handwriting (6,7).

Residential Child Care Facility: The term 'residential child care facility' refers to a place or facility, which provides care for children who can no longer be cared for in the community. In Mauritius, residential care institutions are charitable/non-governmental, although work in collaboration with the Ministry to provide care and safety as per the Child Protection Act (8).

Body Mass Index (BMI): Body mass index was used in this study to measure nutritional status (9). BMI was calculated using weight (kg) divided by height (m^2), and compared to the WHO growth standards (10).

ABBREVIATIONS

Beery VMI = Beery-Buktenica Developmental Test of Visual Motor Integration

BMI = Body mass index

HDI = Human Development Index

HOME = Home Observation for Measurement of the Environment

LOS = Length of stay

NICHD = National Institute of Health and Human Development

OT = Occupational Therapy

RCCF = Residential child care facility

SES = Socioeconomic status

SD = Standard deviation

USA = United States of America

VP = Visual perception

WHO = World Health Organisation

W/H = Weight for height

Ns = Not significant

MUR = Mauritian rupees

CHAPTER 1
INTRODUCTION

1.1 Introduction

Deprivation, in its various forms, may have serious and lasting consequences for developmental outcomes in children (10). Sherr (2005) states that 'early experiences and development affect [a child's] future socialisation, maturation, achievement and emotional qualities'(11, p. 3). In many of the developed counties of the world this would include intervention by an occupational therapist. However there are a limited number of occupational therapists as the training in Mauritius was only started in 2003. Assessing development to facilitate better educational outcomes for children, especially those who have been deprived should be a major concern for occupational therapists working in the community setting.

For occupational therapists to understand developmental delay associated with deprivation a number of risk factors must be considered. Those identified as most influential on development in young children include the environment and family unit (12) in which the child lives, their socioeconomic (13) and nutritional status. These factors rarely operate in isolation and therefore prevention and intervention strategies used to facilitate development must be multi factorial. It is widely accepted that a functional family unit (14) and a stimulus rich environment are important for an infant's typical brain development (15–18) and essential if the child is to reach their normal developmental milestones (14). For adequate development it is imperative that children feel safe, are healthy, are responded to sensitively and appropriately, and are encouraged to reach their potential (19). Unfortunately many families are unable to provide for these needs, due to a lack of resources (20–22), and children may experience deprivation if they live in a low socioeconomic environment (14,20,23). This also holds true for many children placed in residential care who are often deprived of 'expected experiences', and the 'typical environment', experienced by other children (12).

A low-income, deprived environment has been shown to affect a child's ability to develop optimally, as their home life has been reported to be more chaotic and less well resourced (22)' with fewer stimulating experiences (24). A lack of parental and particularly maternal factors has been shown to result in less than optimal development, including lower education levels (25,26), health and stress levels (27,28), with consequences for the care provided to these children (29).

If exposure to these environmental risk factors occurs in the first 3-5 years of life,the consequences appear to be more detrimental (30), as small disruptions at this stage in development may have long-term implications for the developing brain, and its capacity to function optimally (16), which continue to impact on development (31), even after this crucial period. This occurs not only because the continual lack of resources in the physical environment affecting the child's socio-emotional development but is also due to poor nutrition where the lack of adequate nutrients also can have long-term effects on the developing brain's structure (29). Research on low socioeconomic groups in Mauritius, where this study was done, has shown that both chronic underweight and obesity exists when body mass index (BMI) is used to determine the nutritional status in children. This has been ascribed to restricted access to adequate and suitable food (9).

It has been found that in countries with economic constraints, there is an increase in admission to residential child care, as the circumstances of communities and families result in parents no longer being able to care for their children at home (32). The situation in Mauritius is no different and children are placed in residential child care facilities if they are found to be from deprived 'utterly non-stable families' (8).

Children in residential care often suffer a double burden deprivation, where institutionalisation is combined with the effects of a low socioeconomic status (SES), either prior to or during their placement in the facility. Research has confirmed that neglect, chronic stress, poor environmental circumstances, and institutionalisation of children in residential care, can result in even greater delay in development (12,14,17,19,33,34). The negative consequences of residential child care on development have been attributed to the culture of institutions and lack of environmental supportiveness, as the institutions often care for large numbers of children, frequently placing the primary focus of concern on the physical care of children, and establishing routines, with insufficient attention being given to interaction with children (35). High child to caregiver ratios often limit the physical experiences of the children, as well as the time they spend in interaction with any adult (33). Not unexpectedly family type of group homes has been shown to be preferable to larger institutions in which a large number of children co habit (36,37).

Length of stay in a residential child care facility (38,39) and age of admission (40,41), have also been shown to play a role in the degree to which the environment of the institution impacts development. Negative correlations between length of institutionalisation and cognitive abilities have been found in several studies quoted by Maclean (2003)(39), although later research states that a longer stay in the residential

child care facility does not necessarily lead to greater developmental delays. Age of admission was found to be more important than length of stay as children who were younger at the time of placement, seemed to lag behind more than those placed when they were older (42). This may be due to the pre-placement experiences being more stimulating than the residential child care environment (43). There are also limited international publications on the impact of extended periods of time in residential child care on children living in such facilities, especially on those who were admitted after the age of six years (37).

The risk factors for child development described above, have been found to be strong predictors of later outcomes, in terms of academic performance, social, emotional, and cognitive ability of children from deprived environments (44). Studies using data from The International Human Dimension Programme on Global Environmental Change (IHDP), found that the impact of family income could be strongly linked to intelligent quotient (IQ) scores, which is supported by the lower Peabody Picture Vocabulary Test (PPVT) scores of children from families with low incomes.

Children from low socioeconomic circumstances have been shown to be at-risk for school failure (45), although low income has been shown to have little influence on the number of years of schooling completed (46). Johnson, Browne and Hamilton-Giachritis (2006)(47) found that the majority of studies investigating intellectual development reported that institutional care was also associated with poor cognitive performance and lower IQ scores, showing that the environmental supportiveness in family care was preferable to residential child care facility living, when considering cognitive development. Some of the studies indicated however that early removal to very poor family care could result in improved cognitive functioning.

Noble, Norman, and Farah (2005)(48) proposed that poor academic achievement in children from low-income situations, might be related to the development of certain skills fundamental to learning, and basic academic skills. These developmental deficits could have a cumulative effect on later development and learning. Measures of fundamental skills associated with outcomes of cognitive and academic abilities, include visual perception and visual-motor integration (VMI) . These skills are assessed and facilitated in occupational therapy, in children who have developmental delay, with the view of improving their ability to achieve at school (49).

Visual motor integration refers to the interaction of visual skills, visual-perceptual skills, and motor skills (5). It represents the ability to combine the visual image of shapes with the matching motor output. Delay in the development of VMI has been associated with

poor academic performance caused by underlying visual-cognitive deficits, including poor fine motor ability, visual discrimination problems, or inability to integrate these various functions (6,23,50). The Beery-Buktenica Developmental Test of Visual Motor Integration (Beery VMI) is frequently used in clinical practice to assess visual analysis and VMI skills (5). Research has demonstrated that the ability to copy geometric forms can be correlated with reading readiness and academic achievement (51). Recent studies by Pienaar, Barhorst and Twisk (2013)(52), and Carlson, Rowe and Curby (2013)(53) have confirmed this relationship, especially in children from low SES groups.

1.2 Statement of the problem

Since occupational therapy education only started in Mauritius in 2003 there has been no published research examining the factors and standardised tests used internationally to assess development, or their appropriateness for and applicability to the population of Mauritius. Thus assessments to determine the client factors and performance skills related to the occupational performance area of education and academic performance, like visual perceptual abilities and visual and motor abilities have not been determined for typical children living in the community in Mauritius. In addition the demographic and environmental factors associated with development of children living in a typical community in Mauritius need to be established, so that the effects of residential care on development can be examined.

There is also limited information on the developmental delay of children living in residential child care facilities in Mauritius or on the intervention provided. Literature indicates that children living in residential child care facilities are likely to have been exposed to factors that place them at risk for developmental delay, but no published studies on the supportiveness of the environment, or development of the children in the 10 residential child care facilities listed on the island of Mauritius, by the Mauritius National Progress Report of the Special Session of the General Assembly on Children (2006) were found (54).

Delay in the development of performance skills in older school going children in residential care (41) of VMI in particular, has been shown to impact on the occupational performance area of education, and the level of this delay needs to be determined (55). However, there is little information available on such factors or skills and their association of the quality of the environment on VMI in older children living in residential child care facilities. The lack of studies conducted leaves relevant authorities and therapists with limited knowledge on the extent of or the specifics of the problems, which may need intervention.

1.3 Purpose of the research

The main purpose of the research was to determine the supportiveness of the environment in a residential child care facility in Mauritius, using the HOME inventory, for children between six and 16 years of age, and to establish to what extent these children experience delays in VMI. Other factors which influence development, such as BMI, length of stay in the residential child care facility, as well as caregiver education and income, were also considered. The association between the quality of the environment, the VMI scores and these factors was established. To determine if living in a residential child care facility impacts on the development of these children, these same factors were assessed in a typical group of children in the same age range, living in a typical community setting to determine the normative values for these factors for children in Mauritius.

1.4 Aims of the study

The study was comprised of two parts

Part 1

To establish the demographic factors associated with development of typical children living in the community in Mauritius and to establish if normative values on standardised tests can be used to assess their environmental supportiveness and VMI developmental status and if there is any association between these factors.

Part 2

To establish the demographic data, environmental supportiveness and VMI developmental status for children living in a residential child care facility in Mauritius and to establish if there is any association between these factors.

1.4.1 Objectives of the study

Part 1

1. To determine the factors associated with development in typical children living in the community in Mauritius. The factors measured included the demographics: BMI (as an indication of nutritional status) and caregiver characteristics, as well as the environmental supportiveness as determined by the HOME inventory.
2. To establish if the Beery VMI can be used to determine the developmental status of children between six and 16 years living in a community in Mauritius

3. To determine association between demographic factors and environmental supportiveness and the Beery VMI for children between six and 16 years living in the community in Mauritius

Part 2

4. To determine how factors associated with development differ for children living in a residential child care facility in Mauritius. The factors measured included the demographics: care history, BMI (as an indication of nutritional status) and caregiver characteristics, as well as the environmental supportiveness as determined by the HOME inventory.
5. To determine the developmental status of VMI in children between six and 16 years living in a residential child care facility in Mauritius.
6. To determine association between demographic factors and environmental supportiveness and the Beery VMI for children between six and 16 years living in the community and in a residential child care facility in Mauritius

1.5 Justification for the Research

There is limited research internationally related to the development of older children living in residential care. There is also no published research on the effects of living in residential child care facilities in Mauritius.This research investigated the supportiveness of the environment and other factors impacting on the development for children between six and 16 years, both in a residential child care facility and the surrounding community.

The results of this research were intended to highlight the role that the environment plays in influencing the development of the children in the community and residential child care facilities, and the possible association of the environmental factors on the performance skill of VMI, which may impact on the performance area of education. The evidence from this research can thus raise the awareness of child development in Mauritius with particular emphasis on the residential child care facilities. Exploration of some of the environmental factors will assist in guiding interventions, aimed at alleviating the problems faced,and in addition, the results of this study will be of value to occupational therapists in Mauritius, in understanding the environmental context in which children from residential child care facilities live, and the specific developmental challenges of the children in relation to VMI and performance in the education occupational performance area. The study will provide guidance for the occupational therapists, in facilitating improved developmental outcomes in these children.

CHAPTER 2
LITERATURE REVIEW

This literature review will consider the adverse effects of environmental factors related to the contexts of child care facilities, low SES and social environment. In addition, the association between these factors and the development of visual-motor integration (VMI) performance skills needed for achievement in the occupational performance area of education will also be reviewed. For the purpose of this review, demographic information and the specific external factors measured by the HOME inventory as well as the internal factors that have been associated with developmental delay in children were also considered. These included nutritional status (measured using BMI) and age of the participants.

2.1 Introduction

Research shows that the factors influencing a child's development and their ability to perform their occupations are numerous including external or environmental factors, such as: pre-birth and birth circumstances (18,56), culture (57), religion and physical, social and cultural contexts of the child. All these factors may be influenced by SES(14). Internal influencing factors include: the sex of the child (14,18), the child's race (14,18,58), the birth order of the child (17,18,59), the personal characteristics of the child (57), genetic inheritance (14,56), biological differences (60), chronic illness (16), and physical impairments, such as reduced vision or hearing ability (56,61). Development is affected by an interplay of these external and internal factors, which work together towards a child's maturation (62). External and internal factors differ, as the external factors can be influenced, and therefore changed or modified by amongst others, occupational therapists, and are therefore the focus of this study.

Occupational therapists therefore need to understand the environmental impact on a child's occupational performance, as they often make recommendations to structure, alter, or adapt the environment in order to optimise and support occupational performance (2,63).

2.2. The environmental context

The effect of environmental factors and their influence on occupation are as complex as they are numerous, with different environments helping as well as hindering satisfactory occupational performance (2,64). The development of the brain is influenced by the quality of environment, with animal studies showing that the early environment, including:

nutrition, presence of toxins, stress and limited stimulation and social interaction, can affect brain structure and function, with lasting cognitive and emotional effects (16). Poor environments resulting in deprivation, including the age when deprivation occurred, duration and life history prior to deprivation, may also affect the way a child responds to the environment (60). A disadvantaged unsupportive environment, either in the home or outside of the home has been shown to exert a negative influence on child development. It is not clear however if this effect is global or specific with different aspects of the environment influencing different aspects of development (59).

2.2.1 Home environment

It has already been shown that from infancy the home environment begins to play a role in influencing development (9,16). Specific environmental factors such as a mother's educational level, resources in the home, social (14,58) and emotional aspects of the home environment (58), family size, household crowding and presence or absence of a father (7,23), have all been linked with risk for delays in child development. Chronic stress (14,66), a child's behavioural repertoire (67), and life experiences (17,58), have also all been shown to impact development. In addition, it was found by Mistry, Benner, Tan and Kim (2009)(28), amongst a sample of 444 Chinese American adolescents, that a child's perception of family economic stress and financial constraints, which affect them directly, result in emotional distress, depression and poor academic performance.

There is evidence that the home environments of families with a low SES are more likely to be disorganised, with the parents being more stressed. They are thus less able to be responsive and sensitive to their children, and to meet their needs (27), increasing the likelihood of children being placed into residential child care facilities. The United Aid for Azerbaijan (UAFA) report (2007)(68) found the primary reasons for children's placement in residential care, were low income or poverty, and broken family structures, when parents were no longer able to provide for their children.

2.2.2 Effect of the home environment on development

With no perfect comparison groups in nature, reasons for differences between family-reared children and children in residential child care cannot be definitively explained (39). It has however been found that family care is preferable to other forms of care for many children, even in disadvantaged circumstances, due to the presence of a consistent caregiver, giving the child a perception of security and stability, and a positive identity. This is supported by data gathered by the National Institute of Health and Human Development (NIHHD) from a large sample children (n= 1916) in the United States of

America (USA), which showed that the best levels of positive care-giving were seen when children were cared for in home based care settings, with small numbers of children, or alone at home (69).

Vorria, Wolkind, Rutter, Pickles, and Hobsbaum (1998)(70) in their comparison of nine and 11 year old children living in institutions or the community, attending the same state primary schools, found the boys in child care had more emotional and behavioural problems and were more hyperactive than the family reared boys. Similarly, a comparison of family reared infants with institution-reared infants found a high rate of disorganised attachment among the institution-raised infants (71). Thus it has been concluded that even in poor circumstances in a family home, most young children will have less physical under-development, reduced intellectual, social and behavioural abilities, and emotional and attachment disorders, than those in residential institutional care (72). The majority of research conducted on institutionalisation of children (including paid child care) (19) supports the concept that environmental factors in institutional care are linked to developmental delay (5,19,21,33,35,73–75). However, Giagazoglou, Koulioussi, Sidiropoulou, and Fahantidou (2012) state that ongoing research is required "to explore the institutional factors and their influence on children's development, as it seems that a combination of factors, rather than a single one, causes the developmental differences observed between family and institutionally raised preschoolers" (57, p. 969).

2.2.3 The residential child care facility environment

Research confirms the existence of different forms of residential care for children (30). These include conventional institutions in which children are cared for in a large group, and family-type homes, in which children are cared for in small family groups. When children enter residential child care later in life however, the environment prior to admission and reason for admission has been important in determining their developmental outcomes (39).

A number of factors have been described in relation to developmental delay, seen in children living in residential child care. These include the culture and management of the facility, the caregiver characteristics and the length of stay in the facility. Developmental delays in children in residential care are mostly associated with the culture of institutions. Most residential child care facilities care for large numbers of children, and the children cared for may have to contend with poverty, poor health, poor nutrition, deficient care and recurrent infections (76). In general, staff working in these facilities, have been reported to prioritise the physical care of children, and the establishment of routines as their primary concern. The insufficient focus on interaction with children (35) is probably related to the

lack of resources as a result of socio-economic problems related to residential care, resulting in poorly trained and underpaid carers (75). There is however a large variation in the type of care offered by different facilities, and research describing the institutions is limited (73).

In 2003 it was reported that the facilities in Romania were characterised by a fixed daily routine, a high ratio of children to caregivers, and a management led by medical personnel (30). An extreme example of poor care, reported by Fisher, Ames, Chisholm, and Savoie (1997)(38), in a Romanian residential child care facility, included severe deprivation in children, who spent 20 out of 24 hours in their cots, rocking themselves, and shifting their weight from foot to foot, while holding onto the cot rails. The walls were not decorated and the children did not have their own toys. The caregiver-to-child ratio was 1:10 to 1:20, and the routine was rigid, with minimal interaction between caregivers and children. It was found that these children had more eating problems, medical problems, and stereotyped behaviour problems than children in institutions which provided better care, and a more supportive environment. Similar findings emerged in a Russian study on the characteristics of children and caregivers in residential child care facilities for young children, where a lack of warm, caring, sensitive, reciprocal interaction between caregiver and child were found. These factors were reported as most likely to produce higher rates of social, emotional and mental limitations (73). The resultant social-emotional problems in these children have been shown to lead to poor self-awareness (33), difficulty forming secure relationships (21,35), attachment difficulties (77), indiscriminate friendliness (21), and behavioural difficulties (73,78). Frank, Klass, Earls, and Eisenberg (1996)(74) reported that living in a residential child care facility during early childhood, leads to a greater chance that the children will develop into psychiatrically impaired, and economically unproductive adults.

A study by Giese and Dawes (1999)(33), involving preschool children (n=15) in South Africa, who had been placed in a residential child care facility after being removed from circumstances where they were seen to be at risk, due to sexual and physical abuse and neglect, found similar social-emotional problems, as well as communication problems in the children. These receptive and expressive communication problems were attributed to a lack of social interaction. Other problem areas assessed using the Grover developmental Charts, included poor interaction with objects and fine motor co-ordination; as well as body management and mobility. This is supported by other research where gross and fine motor problems have been associated with institutional care (77), and

attributed to high child to caregiver ratios, which limit the physical experiences of young children (33).

Thus living in residential care has been identified as one of many variables that are associated with the coexistence of perceptual, social, intellectual, and emotional delay due to deprivation (39). Little et al. (2005)(37) pointed out, that children living in institutions in the USA tended to be children from low socio-economic backgrounds, which in itself can result in delay (20), resulting in two environmental contexts affecting the development of these children.

2.2.3.1 Culture of or type of residential child care facility

Sinclair and Gibbs (1998)(79, p. 114) reviewed the culture of 48 different homes and found them to range from the 'benign' to the 'malignant'. Due to the lack of perfect comparisons (39), the high degree of variability between institutions, and the lack of descriptions in published studies of the institutions in which the children live (73), it is difficult to be specific about which factors, related to the culture within residential child care facilities, contribute to developmental delays (39,80).

Studies that established the importance of the physical environment showed that more stimulating care occurred in centres and child care homes that were spacious and well equipped, with better organized space, and more varied materials, and in child care homes that provided soft, comfortable areas for the children to carry out their daily occupations (69).

It has also been found that the way the facilities were managed had an effect on the impact that institutional living had on a child. Fewer developmental delays were evident amongst children who were in an environment, where staff was allowed more autonomy and the routine was less strict, when compared to residential child care facilities where staff were forced to follow a strict routine. In environments with a strict routine, staff were involved primarily with physical care, and issued instructions instead of talking to the children through conversation (81). These findings were supported by the South African study by Giese and Dawes (1999)(33), who suggested that the very regulated care limited opportunities for the development of skills needed for appropriate social interaction, participation in co-operative play in free play sessions and excursions.

The last two decades however, have seen a transition toward family-type living in residential child care, based on studies which indicate family care is preferable. Devine (2004)(82) reported that youth felt a sense of belonging in family type homes, that they had never previously experienced in large dormitory type child care facilities. Sinclair and

Gibbs (1998)(79) found that some of the damaging effects of institutional living can be diminished by children living in small homes, if staff are in agreement about aims and methods of care, and managers having control of admissions. Taneja, Siriam, Beri, Sreenivas, Aggarwal, and Kaur (2002)(76) also showed that the development of deprived infants and toddlers in residential child care facilities improved enormously when their surroundings become more stimulating.

These findings were supported by Wolff and Fesseha (1998)(83) who compared the cognitive development and mental health of Eritrean war orphans, living in two orphanages, in which the staff to child ratio was 1 to 17. They confirmed that the management style in the child care facility, and the way in which staff interacted with the children, correlated significantly with the cognitive outcomes and emotional state of both the groups of orphans. In orphanage A, in a large town, younger children lived in a dormitory while the older children, grouped according to chronological age, lived separately. Orphanage B however was in the country near a large town, and the children were mixed, so that the older children could help the younger ones with chores and homework. Both groups attended school, mixing freely with children living in the local community. Evaluations included a staff organisation questionnaire, child management inventory, behavioural symptom questionnaire, projective picture and various cognitive measures. It was suggested that the more autonomous style of child care in orphanage B was more effective in addressing the emotional needs of the children. They also showed that if personal relationships with an adult or a coherent community can be maintained, then this could mitigate the adverse effects of the lack of a parent.

Another study showing that the effects of residential care are less if children are cared for in a family type setting, was completed by Munoz-Hoyos, Augustin-Morales, Ruiz-Cosano, Molina-Carballo, Fernández-García, and Galdó-Munoz, (2001)(36), who compared two groups of children who were cared for in institutional settings in Spain. The first group included 101 children in a large traditional institution (in 1986), and the second group comprised 66 children (in 1996) in a smaller institution based on a family model. Growth and nutrition, along with development, were found to be favourable in the second group but these results were affected by a flawed methodology and interfering variables. The groups were assessed ten years apart, and 84% of the second group had stayed in the institution less than two years and no longer than three years, whereas only 37.62% of the first group had stayed for less than two years, with the majority having stayed for two to nine years. The children who had stayed longer (in the second group) probably had more exposure to risk factors related to group living. The methodology was further affected by

observable changes in the ten year period acknowledged by the researchers, These changes included an improved economic climate, greater nutritional capacity and awareness, better health care, improved communication (i.e. via the media) and legal reforms protecting minors, all of which may have affected the study results. Different tests were also used for children aged over the age of eight years with the reason given that children's reasoning ability matured as they grew. This resulted in smaller groups, making results less generalizable to larger populations.

However, other factors such as age of admission (40,41), family stability prior to admission to the residential child care facility (37), and length of stay in the institution (37,38), have also been shown to play a role in determining the effects of living in a residential child care facility.

As the children in the current study had only female caregivers, a literature search was conducted to establish if this could influence child development. Literature available was lacking. Ball and Moselle (2007)(84) wrote a review on fathers' contributions to children's well-being, which highlights the important role that a father plays in the development of a child, with children from single parent families being at an increased risk of becoming single parents themselves, and more likely to have children at a younger age. The presence or absence of a father figure therefore needs to be considered when addressing developmental difficulties.

2.2.3.2 Length of stay in a residential child care facility

Length of stay and the age of admission into a residential child care facility, are two interrelated factors which have been shown to impact child development (38,40,41). Rutter (1998)(40), found that children who were institutionalised for longer than six months were delayed in intellectual and social development, as well as being smaller and less well nourished. When Fisher et al (1997)(38) measured internalising behaviours characterised by withdrawal, and externalising behaviours such as temper outbursts, and destructive behaviour, they found these behaviours all correlated positively with the total time the children had spent in a residential child care facility. Their participants were children who had spent at least eight months in a Romanian orphanage offering poor care, prior to adoption in Canada. Results also showed that the adopted children had higher internalising scores and no significant differences on their externalising scores, when compared to Canadian-born children (matched for sex and age) who were not adopted. Flanagan (1999)(41) also showed that children admitted as infants and removed from a residential child care facility after the age of four years, presented with more delays than those removed earlier.

Later research however, found that length of stay does not impact developmental delay. Van Ijzendoorn, Luijk, and Juffer (2008) (75) in their meta-analysis, showed that children placed in care before 12 months, performed less well than their peers raised in families, thus coming to the conclusion that it is the age of admission to a residential child care facility, that played a role in developmental delay. They showed no association between longer stays in residential child care facilities and intellectual delays, a finding which was supported by Giagazoglou et al. in their study in 2012, which showed length of stay in a residential child care facility was not a predictor of developmental delay (57).

Thus it would appear that culture of, or the type of residential child care facility, and age of admission, must be considered when reviewing the studies on length of stay in residential child care facilities, with many studies having shown that the quality of care in institutions is as important as it is in families in the community (70). However, since every residential child care facility is different and operates differently (80), the factors described above, as well as the quality of care offered, must be considered for each unique environment.

2.2.3.3 Quality of care giving in a residential child care facility

Factors contributing to delay of children in residential care facilities have also been shown to be related to the quality of care giving, and have been associated with the lack of a nurturing relationship with a single caregiver (21,81), the lack of one-on-one stimulation, and care-giving being inconsistent. A high child/caregiver ratio has been a consistent factor, common in most institutions, when reporting poor quality care (19,30,33,76,77,81), and has been linked to the socio-economic circumstances of the institution (43), and the size of the group (69). Help from volunteers and professionals, has also been shown to be lower in institutions with a low SES (43).

Vorria, Papaligoura, Dunn, Van Ijzendoorn, Steele, Kontopoulou, and Sarafidou, (2003)(71) pointed out that children reared in residential settings often experienced frequent changes of caregivers, and these caregivers had several infants to care for, and knew that the children they cared for would eventually leave. These factors may have reduced the caregivers' emotional involvement with the children, resulting in the children presenting with emotional and relationship problems. Roy, Rutter, and Pickles (2004)(78) noted that attention deficit hyperactivity disorder was frequently associated with experiences of multiple caregivers in residential child care facilities.

In a study by Vorria, Papaligoura, Sarafidou, Kopakaki, Dunn, Van Ijzendoorn, and Kontopoulou, in 2006, it was found that children raised in residential care facilities were less able to comprehend emotions, were less secure than children raised in a family

environment, and had more cognitive delay. They reported this was probably due to the environment being under stimulating, and the limited opportunities the children had to form relationships, due to low infant/caregiver interaction, and decreased social interaction between the children and the caregivers. These children had also had adverse early experiences, and were separated from the caregivers, who were their initial attachment figures (21). However, research indicates that the effects of long-term separation from initial attachment figures have most often been seen to reduce with time (37). Frequent separations related to shift changes (a common practice in child care facilities), were more of a concern, but were not as damaging among older school going children, as this would be happening even among family reared children (21).

Specific factors that have been associated with positive care-giving (77), improved adult-child interactions and more desirable child outcomes include the caregiver's years of experience, qualifications of staff, higher wages, group size with favourable adult/child ratios (19,33), a child-centred approach, and the provision of care in safer and more stimulating environments (76,77). It would appear however, that the type and management style of the institution, and staff/child ratios override the caregiver experience (69). Giese and Dawes (1999)(33) found poor staff/child ratios resulted in the 'block treatment' of children, where interactions between staff and children were very regulative with communication limited to adult dominated exchanges, made up of short responses or commands, which lasted an average of three seconds.

Wolff and Fesseha (1998) (83) concluded that it was possible to create satisfactory humane social environments, for large numbers of children. The success of such efforts is greatly enhanced, when the social environment is organised to guarantee close and stable personal relationships between staff members and children, distributed responsibilities for decisions affecting the children, and a style of child management that reflects the individuality and autonomy of each child. Studies by Vorria et al. (2003)(71) and Groark, Muhamadrahimov, Palmov, Nikiforova, and McCall (2005)(85) confirmed the importance of caregiver sensitivity and individual attention and communication, leading to better socio emotional and cognitive development in children in residential care. Little et al. (2005)(37) found that the quality of the relationship with a consistent adult figure, in a group living care facility, could counteract negative or damaging family relationships, even when material resources were very limited, and child development experts were in short supply, promoting development, and emotional well-being.

2.2.3.4 Factors protecting against developmental delay in the residential child care facility environment

Protective factors shown to reduce the negative impact of institutional living on developmental delay included not only a good quality relationship with a consistent caregiver, but also high IQ and low severity of presenting problems (37). A higher SES can also be a protective factor, as the impact of residential care was found to be less when the socioeconomic level of the community the child came from was considered. The effects of SES per se have been shown to affect child development irrespective of whether they live in residential care or at home. In a meta-analysis on the IQ of children in children's homes, Van IJzendoorn et al. (2008)(75), found those in countries with a low Human Development Index showed smaller differences in intellectual development between family and institution reared children, with the three lowest scoring countries (Eritrea, Ethiopia and Kenya) showing no difference. Whetten, Osterman, Whetten, Pence. O'Donnell, Messer, and Thielman (2009) (80) confirmed this in a study across the poorer countries (Cambodia, Ethiopia, India, Kenya and Tanzania), when they assessed 1357 institution-living and 14 community-living orphans aged 6-12. Cognitive functioning, emotion, behaviour, physical health, and growth were examined using survey analytic techniques, and found in favour of institution-living. This is because resources in the institution in terms of food, shelter and schooling were superior compared to the abject poverty from which these children were removed.

In the occupational performance area of social participation, positive peer relationships have been identified as a factor which can ameliorate the effects of institutional living (37,86), and thus, overall, only one third of the 13 children in the ethnographic study by Emond (2003)(86), appeared to respond negatively to institutional rearing. The children were between the ages of 12 and 18 years and lived in two small residential child care facilities in Scotland. In this qualitative study the author lived with the children for at least six months, during which she observed that the group had their own values and strove for power or attention from others. The group was a source of external support as they had familiar shared experiences, which attributed to a 'sense of collective isolation' (p. 331), resulting in the children 'standing up for each other' when threatened, and supporting one another. They felt a 'sense of belonging' (p. 335), and relied on one another for 'support and advice' (p. 335), in a way not possible from adults and staff. The age of the children became important when older children gave advice and support to the younger children, encouraging them not to make the same 'mistakes'. Unacceptable behaviours were challenged by the group. 'Bullying', for example was not tolerated and the group would unite against a perpetrator. Isolation and withdrawal of support was often used as a way

of punishing peers. Although this study was small it provides some valuable insights into the relationship dynamics when many children live together. Roy et al. (2004)(78) had similar findings. They found that children in institutional care fared better in the area of relationships and the social environment, relative to their peers in foster care. Both groups (each comprising 19 children) were admitted before the age of one. Assessments of the children were comprehensive as multiple assessment methods were used to evaluate the social environment, including questionnaires for teachers and caregivers, interviews and classroom observations. This was associated with a fifth of children living in the residential child care facility showing a marked lack of selective attachment in relationships with their caregivers, although this was evident only in the boys living in the institution. This may have been due to a lack of male caregivers.

The National Scientific Council on the Developing Child (2012)(87) state that responsive relationships in a child's life are essential for a child's well-being. These include relationships within and outside the home, with positive peer relationships being a protective factor and negative peer relationships characterised by bullying and sexual abuse, said to be risk factors for some aspects of child development (37,88). Liew, Chen, and Hughes (2010)(89), confirmed the need for positive relationship outside of the home, stressing the importance of positive teacher-child relationships at school for the children who were considered academically 'at-risk'.

2.2.3.5 Caregiver characteristics

Brown, Dewey and Allen in 1998 outlined major factors that are likely to affect the caregiver's ability to provide care. These included:

— Caregiver education, knowledge and beliefs

— workload and time constraints

— health and nutritional status

— mental health, stress and self-confidence

— autonomy, control of resources and intra-household allocation

— social support from family members and community (90, p. 111).

Research has shown that characteristics of a caregiver play an important role in providing a resourced and supportive home environment (17). Specific characteristics such as the caregiver's intelligence, education level (8,51,83), age, education in child rearing (8,51), emotional state (17) and the way they structure and arrange the child's experiences (7) have all been shown to influence development to some degree. In a review published by

the World Health Organisation (WHO)(1999)(84, p. 2), they state that 'Chronic stress, associated with poverty and other environmental challenges, can also disrupt the capacity of adults to give loving care.'

Certain factors related to caregiving have however been shown by past research to mitigate the effects of low SES. These include parental educational level and home support variables such as literacy resources in the home, and discussion of school matters, which resulted in better reading achievement in homes with lower SES (15). The review published by the WHO (1999)(84, p. 3) states that 'a strong caring relationship can protect a young child from the effects of deprivation and disadvantage. The caring relationship is the strongest explanation for why some children who grow up under wretched conditions nonetheless grow well, are healthy, are able to be productive in school and work, and have good relationships with other people'.

This is supported by literature, which shows evidence of parental involvement in even low SES groups, decreasing disparities in development, particularly in the area of literacy. A study focusing on low income and minority groups, by Chang, Park, Singh, and Sung (2009)(88), discovered that parents that attended parenting courses and support meetings, provided more language and mental stimulation at home. An earlier study by Conners, Edwards, and Grant (2006)(86) found that participants of six week parenting programmes (Parenting the Strong-Willed Child for ages 2-8) demonstrated a change in parenting behaviours, with related improvements in their children's behaviour, as well as experiencing reduced stress levels.

2.3 Socioeconomic status (SES)

Many researchers have used the terms SES and social class interchangeably, without explanation, when referring to social and economic characteristics of individuals (92). The American Psychological Association note that SES is relevant to all realms of behavioural and social science, including research, practice, education, and advocacy, and that SES can be explained as the 'class' or 'social standing', of a group or individual. Financial status has also been used as a measure of SES (29). However, low income alone is not sufficient to impact child development, although families with low income tend to live in lower quality home environments, than families with a higher income (27).

There is currently no standard method of measuring SES (93), although in a meta-analytic review of research in 2005 it was said to be most often measured by combining education, income and occupation (92). A later meta-analysis by Letourneau, Duffet- Leger, Levac, Watson and Young-Morris (2013)(20) extended the factors to be considered when

examining SES and child development and used parental education level, parental marital status, parental employment status, parental occupation prestige, and household income as defining factors (20). They did not include home resources, a factor that is not used as often, although researchers have shown that it is a significant indicator in terms of child development (14).

In Mauritius the average monthly income in 2011 was lower for women than for men, (94). Statistics for Mauritius show that in 2010 the lowest average wage for non-government employees was 7436 MUR for those working in the 'wearing apparel' sector, servants in hotels earned 8253 MUR, primary education teachers 22700 MUR and carpenters 14866 MUR. Higher wages were earned by those in the 'Financial Intermediation' and in the 'Transport, storage and Communications' sectors with the highest wage being 48 194MUR (95, p. 133), with the average wage earned in 2010 being 18 268 MUR and 2011 being 20 050 MUR (96).

2.3.1 Effects of socioeconomic status (SES) on child development

Internationally low SES of individual families is generally accepted as negatively affecting the development and well-being of children and adolescents (14,20). Community-level SES must also be considered, due to evidence that the area of residence is associated with the health, behaviour, and achievement of children in the area, even when individual-level income and education are accounted for (97). Letourneau et al. (2013)(20)state that SES can have variable influences on child and adolescent development at different life stages, and through different routes, some of which include social support, parental resources, and parental mental health.

Other research has also indicated problems unrelated to relationships, in children who come from under resourced low SES groups, and low income home environments. They were found to be more likely to have poor adaptation skills, behaviour problems, higher school failure rates, anxiety, depression, poor language development as well as cognitive delay (29).

2.3.2 Effects of socioeconomic status (SES) on childhood nutrition

In addition to the effects of the mother's health on the development of the child in the post natal period, the child's nutrition must become a matter of concern, due to lack of resources in households in lower SES groups. In the 1990's in Russian residential child care facilities, poor nutrition was listed as one of the contributors to later developmental deficits (73). A Kenyan study published in 2013 used BMI to measure the nutritional status of three groups of children (n = 1337 in residential care, 1425 in randomly selected

households, and 100 street youth), and compared the results to the WHO criteria. The children living on the street, as well as those in residential child care were found to be less well nourished than those in the institutions (98).

Body Mass index was used in this study as an indicator of nutritional status. It was used by Munoz-Hoyos et al (2001)(36) as one of the measures of growth and nutrition in residential child care facilities when comparing two different facilities. Due to past research using BMI to measure nutritional status (36, 93,99,100), and the existence of the WHO growth charts for comparison purposes, it was decided that BMI would be used for this study to measure nutritional status. BMI was calculated using weight (kg) divided by height (cm^2) and compared to the WHO growth standards (60). Research has found that SES is the best predictor of body mass index (BMI) followed by physical activity and dietary habit, in indicating a child's nutritional status. Studies in developed countries have shown a consistently strong negative association between SES and BMI, with the opposite usually being seen in some developing countries (93). However, in their study in Mauritius investigating the effect of SES on obesity, Fokeena and Jeewon (2012)(93) showed a significant negative relationship between SES and BMI, in this country with a medium human development index (HDI) ranking (9). The mean BMI for the low SES participants was higher than that of those in the high SES group, with the percentage of underweight, overweight, and obese participants being higher among the low SES group. They found a significant difference in the mean total dietary guideline scores between the low and high SES groups. The authors indicated a higher consumption of more refined grains and added fats in lower SES groups while higher income groups consume whole grains, lean meats, fish, low-fat dairy products, and fresh fruit and vegetables. Cost was the reason given as the cost of wholegrain cereals and high fat protein is almost twice that of refined cereals and low fat protein. Cost per calorie was five times more per weight of vegetables, compared to fatty and sweetened foods. This 'calorie-cost relationship' associated with the cost of food, may account for the high calorie intake by low SES groups, with more disposable income in emerging countries, than those in under developed countries. This has resulted in malnutrition related to paediatric obesity becoming no longer only a problem in developed countries, but is becoming more prevalent in the urban areas of some developing countries (93).

Of particular relevance to this study is data for Mauritius (n = 840), from 2006, published in 2012, which indicates the island is currently in a 'nutritional transition', with both a high incidence of overweight and underweight children aged 9–10 years. Of the findings, it was

reported that almost 20% of the children were overweight, 5.0% were obese, and 12.7% of the children were underweight (100).

The impact of nutritional status on motor and mental development was confirmed by Walker, Wachs, Meeks, Lozoff, Wasserman, Pollitt and Carter (2007)(101) in their literature review, which reported that randomised trials in which food supplements were given to improve children's nutritional status and development resulted in benefits to motor and mental development, as well as cognitive ability. This is supported by a study by Alaimo, Olson, and Frongilo (2001)(102, p. 45) on the impact of food insufficiency, on 5349 American school-aged children's cognitive, academic and psychosocial development. 'Food insufficiency' was defined as 'an inadequate amount of food intake due to a lack of money or resources'. They found that children who did not receive an adequate diet, had significantly lower arithmetic scores, and were more likely to have repeated a grade, or to have been suspended from school. They were also more likely to have seen a psychologist and have difficulty getting along with other children, demonstrating the negative effect of inadequate nutrition linked to SES, on child development (102).

Wachs and McCabe (2001)(103), in their study conducted in Egypt, investigating children of school going age, included maternal education into the dynamic. They found that maternal education level is positively linked with family socioeconomic resources, and diet, indicating the important interplay of these factors in the child's environment. The relationship between maternal education and higher SES was supported by Forns, Julvez, García-Esteban, Guxens, Ferrer, Grellier, Vrijheid, and Sunyer, (2012)(104), who found a positive trend between maternal education, and occupational social class.

2.4 Effects of the environmental context and socioeconomic status (SES) on the education occupational performance area

Literacy along with language skills were found in a meta-analysis by Letourneau et al. (2013)(20), to increase or decrease with the level of family SES, and a low literacy environment, often associated with low SES, has been shown to negatively impact a child's pre-academic skills. The gap between the reading levels of the low and high SES students, were found to increase with time (13).

Children's grade, minority status, and school location, were found to be moderators in the SES and academic achievement relationship (92). The relationship between low and high SES, and academic achievement, in the occupational performance area of education, has been shown, with a gradual decrease in academic achievement with age in children from

low SES groups. This relationship has been referred to as the socioeconomic gradient or gap, as it suggests a gap between children from high and low SES families. This has been shown to have permanent effects, which tend to worsen as children get older (105), with underachievement perpetuating the low-SES status of the community.

Aikens and Barbarin, (2008)(13) stated that early interventions are therefore required to assist in reducing poor academic performance, and other risk factors associated with low SES. This includes addressing the quality of schooling, which has also has been shown to influence academic outcomes. They also stated that many schools in low-SES communities are deprived in terms of resources, impacting learner's academic outcomes. Morgan, Farkas, Hillemeier, and Maczuga, (2009)(106) point out that other family related factors, like the mother's SES, can be related to her child's inattention, disinterest, and lack of cooperation in school. Children from lower SES households were found to be twice as likely as those from high-SES households, to exhibit learning-related behaviour problems and develop academic skills more slowly. Despite the evidence demonstrating the negative effect of low SES, family income, education level, or cultural background, these factors have been shown to be less important than an environment that promotes learning in influencing achievement at school (107). Family participation in education was shown to be twice as predictive of academic learning, as family SES. This was true even in the absence of educational toys and other home resources, such as books and computers, which promote ongoing cognitive growth (108). Thus, multiple factors related to SES influence a child's performance in education, and specific aspects of development need to be considered by professionals when dealing with children from lower SES groups who come from poor environments.

Studies have reported an association between problems in all areas of cognition, impacting a child's ability to learn, and children living in child care institutions (33,73). Deprivation in terms of access to material objects and adult relationships, has been shown to be related to poor stimulation in the environment, and consequent cognitive delay (30). Taneja et al. (2002)(76), found that a lack of access to toys and play materials was associated with cognitive delay, due to poor stimulation with Rutter (1998)(40) showing that prolonged deprivation could result in further deficits in cognitive and perceptual function. Giagazoglou et al. (2007)(57) assessed children using the Griffiths Test No II (roman numerals) and attributed the differences they found in fine motor skill performance between 3 groups of pre-school children, to a lack of access to appropriate play materials for the training of these skills. Children brought up in residential care, when compared to those brought up in families, performed more poorly on scales of the Griffiths' test, with

‘‘low’’ scores for group institutional homes, and ‘‘average’’ scores for family type villages. Family raised children achieved ‘‘high average’’ scores. This study however had a small sample size (n=96).

In the occupational performance area of education, children in residential care have been found to have lower performance than children raised in families. Educational problems at school have been associated with lower intelligence quotients, and with delays in adaptive cognitive development. It is not clear however if this is the effect of institutionalisation, or because children in residential care usually come from deprived backgrounds, and families with problems (109). A possible explanation for difficulties experienced could be sensory processing problems, which were found by Cermak and Daunhauer (1997) to be more prevalent amongst Romanian children who had been institutionalised and those who had not (110).

On the other hand, Ringle, Ingram, and Thompson (2010)(111) showed that the longer children from deprived home situations were in residential child care, the more likely they were to complete their schooling. This study was however conducted in the USA in a relatively well-resourced facility, that implemented a programme based on family-type living, with a strong emphasis on education, and where staff were specifically geared to assisting the children. These findings were supported by Little et al. (2005)(37), who found that once children living in an institution start to attend school less delay is observed, and Thompson and Smith (1996)(112), who found that the academic achievement of children living in institutions improved when they participated in a specialised programme.

Occupational therapists involved in education facilitation and remediation, focus on function at school; and remediation of performance skills that underlie the academic abilities (113) of reading, writing and mathematics. These skills include motor and sensory perceptual skills, one of which is visual motor integration (VMI)(112). The greatest benefit is achieved through the early identification and remediation of problems (62).

2.4.1 The effects of environmental contexts on Visual Motor Integration

The term visual-motor integration is used when referring to the interaction of visual skills, visual-perceptual skills, and motor skills (5). It represents the ability to combine the visual image of shapes with the matching motor output, in an activity such as handwriting (6).

Problems with visual motor integration have therefore been associated with poor academic performance (6) and may be caused by ‘underlying visual-cognitive deficits, including visual discrimination, poor fine motor ability’, or inability to integrate these various functions (50, p. 427).

Visual-motor integration scores have been shown to relate to a child's academic achievement in the early school years (114). This is supported by Kulp (1999)(23) (n = 191) who found a significant relationship between scores of reading, spelling and math, and Beery VMI scores amongst 5 to 9 year old children. While a small study (n = 37), by Barnhardt et al. (2005)(115) found VMI impacted spatial organisation of written work in children in the 8 to 13 year age group. Occupational therapists are often involved in aiding with handwriting difficulties (116). Thomassen and Teulings (1983) (117) discuss handwriting as a complex visual-motor task resulting in the development of the skill. It incorporates a range of coordinated movements with visual monitoring. Tseng (1991)(118), when investigating the relationship of certain perceptual motor measures to hand writing legibility in children, found that the Beery VMI was the best predictor of hand writing, and accounted for a 30% variance on scores for legibility. Daly (2003)(119) came to a similar conclusion. He found that the ability to copy letters was related to visual-motor integration abilities. Tseng and Chow's article, published in 2000 stresses the importance of proficiency at the complex skill of handwriting for children and adolescents, in order to meet the requirements of the teacher and the curriculum (118). 'Since it is a very obvious area of need to the teacher and is easy to describe, it is listed in about 95% of cases as the reason for referral. Closer observation of the children who are referred indicates, however, that they also have difficulty managing scissors, handling a ruler, doing up their zippers and buttons, and erasing. Most of these children also have trouble participating in gym class, getting ready for recess, playing games in the schoolyard or participating in structured and unstructured sports and leisure activities' (120, p. 1).

The environmental context has been found to influence VMI (113,113,121), and the early detection of environmental problems affecting VMI, has therefore been suggested, as a means of improving VMI deficiencies. The results of a study in South Africa by Van Heerden, De Kock, Larsen, Knopjes, Singh and Franzsen (2011)(43), showed that children in residential child care facilities of middle SES had significantly higher scores on the Beery VMI ($p<0.05$) than those in institutions of low SES. Therefore the SES context of those in residential child care facilities also appears to be related to the VMI scores. The lowest scores obtained were for the Visual Perception (VP) supplemental test, whereas 98% of the participants scored average for the Motor Co-ordination (MC) supplemental test. This indicates that in South Africa there is little effect of living in a residential child care facility on fine motor function.

When examining the effects of the environment, the resources within the environment, as well as the relationships, support and care received, were all influencing factors. Access

to training for staff, and availability of resources, such as toys, play space, family and extended family visits, as well as the availability of extramural and sport facilities, may also have had an effect on the Beery VMI scores of participants. The researches remarked that certain types of activities offered to the children, (such as sport, excursions and holidays) were somewhat dependent on the financial resources of the residential child care facility, supporting the link between SES and optimal child development (43).

Frey and Pinelli (1991)(122), and Bowman and Wallace (1990)(123) had shown a correlation between the development of VMI and SES, with children from a higher SES scoring higher on tests of VMI. Beery and Beery (2006) also indicated in the development of the Beery VMI test, that there was a statistically significant difference in the scores for children whose families had annual incomes above and below the poverty line. However in 1997, only about 3% of score variance could be attributed to income level (51). More recently, a study in 2011 in Turkey, a country with a similar HDI ranking to Mauritius, found children with low socio-economic status scored significantly lower on the Beery VMI test ($p<.01$) and motor co-ordination (MC) supplemental test ($p<.05$), but that there was no significant difference for the scores of the visual perceptual (VP) supplemental test (95).

It is therefore clear that SES and the entire environmental context must be considered together, when exploring and addressing the influences on child development.

2.5 Summary

The factors affecting child development are numerous and it is therefore often difficult to ascertain which factor/s is/are resulting in adverse developmental outcomes. This literature review focuses on environmental factors, including SES, and nutritional status, which are related to one another, and have all been shown to impact child development. The impact of institutional living on child development is also addressed, as it has been shown to impact all developmental domains, including visual-motor integration. Children who are admitted into residential child care facilities are most often from low income families, so are therefore subjected to a double burden of low SES and residential care living. When considering environmental influences, it is as important to consider the environment of the home or institution, as well as the school and other external environmental influences, as the quality of schooling can exacerbate or mitigate an unsupportive home environment. Relationships with peers and teachers have also been shown to play an important role in helping children cope in difficult circumstances.

When living in a care facility is the only option it is important to consider what factors help or hinder a child’s growth and development. The quality of care, including; caregiver

characteristics, child to caregiver ratio, availability of resources and consistency of relationships with adults, have been shown to affect the degree to which children are affected by their circumstances.

As opposed to facilities caring for large numbers of children, family style living has become more popular in the last century, as it has become evident that children cope better in environments which are more able to cater for their individual needs. The age of admission as well as length of stay in the facility have both been shown to influence the effect the facility has on the child. In some cases children have been seen to benefit from residential care, although only in more specialist units with focused intervention.

VMI has been associated with academic performance, due to underlying visual-cognitive deficits, and has been shown to be influenced by the environmental context of a child. Performance in VMI has therefore been chosen as the measurement of environmental impact for this study.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Research design

A descriptive quantitative, cross-sectional and correlation research design was used for each part of this study. A cross sectional study does not require follow up, so there were no limitations in relation to loss of follow up in this study. The design was useful at identifying associations, and in this study the correlation between the supportiveness of the environment, the VMI abilities, and other demographic factors affecting development in the research groups were established. The descriptive research design was further a suitable research design, as there was no need for manipulation of the variables and was used for both parts of the study

Part 1

The cross-sectional design was used to determine the factors associated with development and to determine the validity of the supportiveness of the environment, and the visual motor integration (VMI) abilities of children living in the community in Mauritius The effect of environmental and demographic factors, which could influence developmental outcomes, was also measured and analysed.

Part 2

The cross-sectional design was used to determine the factors associated with development and to determine the supportiveness of the environment, and the visual motor integration (VMI) abilities of children from low socioeconomic circumstances, living in a residential child care facility in Mauritius. The effect of environmental and demographic factors, which could influence developmental outcomes, was also measured and analysed.

3.2 PART 1 Assessment of children in the community in Mauritius

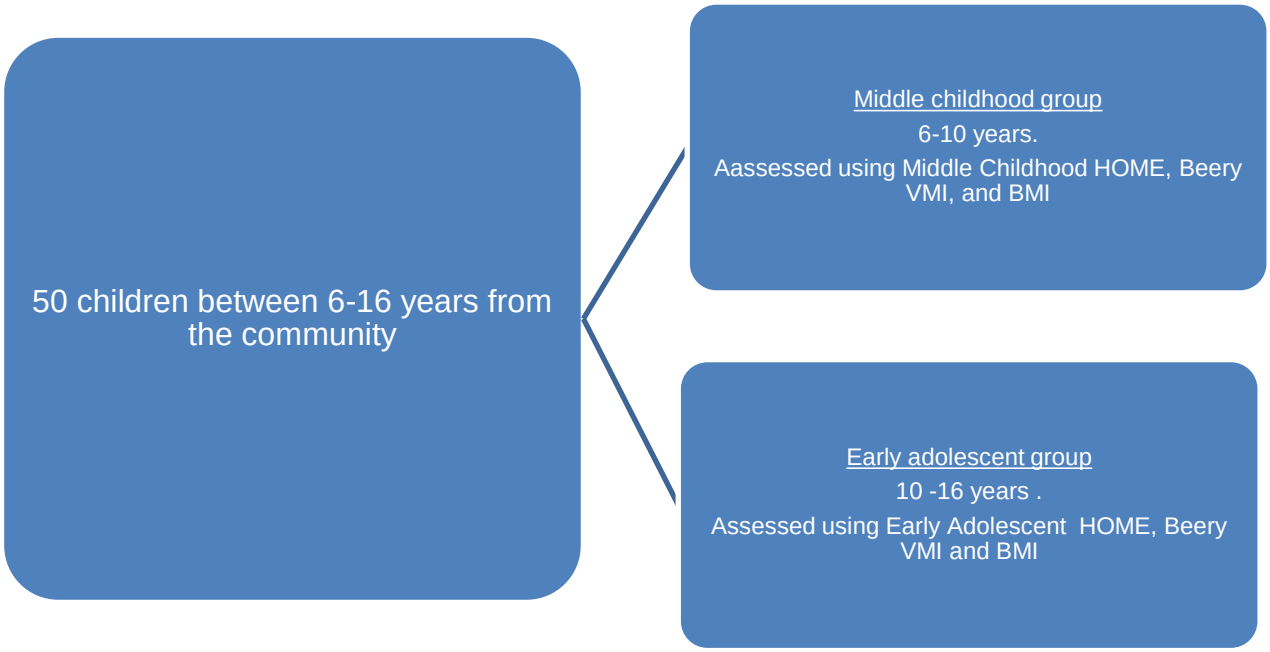


Figure 3.1 Outline of research design for Part 1

3.2.1 Context of the study

The children recruited to make up the community group of Mauritian children, lived in the Mahebourg area, located in the southern area of Mauritius. They lived with their parents and siblings in single family units and all children attended different schools in their communities, as well as after school tuition, which is common practice in Mauritius.

3.2.2 Sampling

Children between the ages of six and 16 years in the community group were selected using convenience quota sampling for gender and age group, and were evenly distributed across the age range. There were 10 children from every two-year age range recruited (e.g.10 children between six and eight years of age, 10 children between eight and 10 years of age etc.). The children were either known to the research assistant or were recruited through an after-school tutoring programme, which most children would typically attend.

3.2.2.1 Inclusion criteria

Any child between the ages of six and 16 years

- with no known illness or disability
- who was willing to participate
- whose parents/legal guardian gave informed consent.

3.2.2.2 Exclusion criteria

The HOME inventory has a separate and different version, designed for children with disabilities (124). As only the standard HOME inventory was used, children with disabilities, identified by a medical practitioner, were excluded. Research confirms that certain conditions may affect development so the following resulted in exclusion:

- a sight or hearing impairment (56,61),
- severely delayed cognitive development (61),
- chronic illness (16),
- disability such as cerebral palsy (125),
- genetic conditions (e.g. Down's Syndrome) (56),
- illness at the time of the study (16),

3.2.2.3 Sample size

A sample size of 50 children, between the ages of six and 16 years, from the community, were recruited. At least 50 children were needed to ensure that sampling error is limited to a probability of 0.05 according to Cochrane's formula, at the power of 90%.

3.2.2.4 Recruitment of community participants

The participants were recruited by a research assistant who assisted with the data collection and lived in the community. He telephoned family and friends, and contacted an after school tutoring centre, who helped to identify children in the six to 16 year age group. It is quite typical for Mauritian children to attend after school tuition and is not only for children who are having difficulties (126).

The research procedure was similar for both Part1 and Part 2 of the study and is described in section 3.4

3.3 PART 2: Assessment of children in residential child care facilities in Mauritius

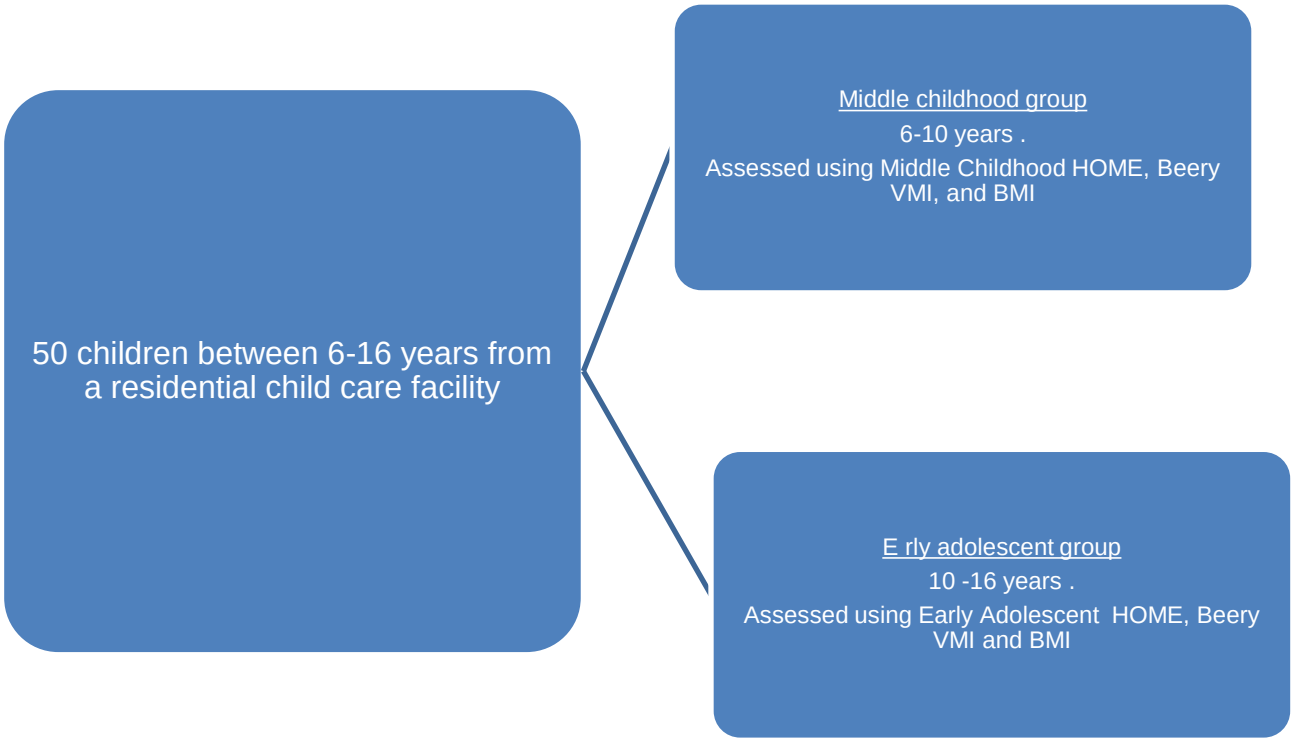


Figure 3.2 Outline of research design for Part 2

3.3.1 Context of the study

The residential child care facility from where the group of children were recruited for the study provided long term care to children who could no longer be supported by their families. This facility was operated by a non-governmental organisation, which was part of a larger international organisation, and is one of the largest residential child care facilities in Mauritius. It is located in Beau Bassin, on the west side of the island of Mauritius. Care was provided in a family-type setting, with no more than nine children in each house. Each house was supervised by a woman who acted as the mother figure for the children. Other women employed by the organisation, provided relief for the 'mothers' when they were ill, or needed to spend time with their own families. The residential child care facility employed psychologists who provided counselling and support for those children with psychosocial and academic difficulties. After school tuition was available to all the children in the residential child care facility group.

3.3.2 Sampling

Children between the ages of six and 16 years were randomly selected, using a web-based random number generator, from all the children living in the residential child care facility, in the designated age group. This was done to ensure a good representation of the residential child care facility population. The children were therefore not evenly distributed across the age range or gender.

3.3.2.1 Inclusion and exclusion criteria

The criteria for inclusion and exclusion were the same as for the community group.

3.3.2.2 Sample size

A sample size of 50 children was selected to match the number of participants in Part 1 of the study.

3.3.2.3 Recruitment of participants

The residential child care facility used in the study was selected as it was the largest on the island. The other facilities were smaller with insufficient numbers in the school-going age bracket. Permission to involve the specific children in the residential child care facility was granted by the assistant operations manager of the facility (Appendix A).

Children were randomly selected from those between the ages of six to 16 years, had been in the facility for more than 12 months and had stayed for a minimum of 12 months. Each child provided verbal assent (Appendix B) for participation in the study. Information sheets were given to the caregivers in the residential child care facility for the purposes of the HOME administration, and signed consent was obtained from each (Appendix C2).

3.4 Research methods

The measurement techniques, research procedure, data management and analysis and ethical considerations were similar for both Part 1 and part 2 of the study and therefore are not presented separately.

3.4.1 Measurement techniques

Demographic information concerning the child and parent/caregiver participants was collected. This included information on the child's weight and height, so that their BMI could be determined. The Home Observation for Measurement of the Environment inventory (HOME) was used to measure the supportiveness of the environment, and the Beery-Buktenica Developmental Test of Visual-Motor Integration (Beery VMI)(51) was used to measure VMI, visual perception and motor co-ordination.

3.4.1.1 Demographic questionnaire (Appendix D)

Demographic information on the child, required on the Beery VMI and HOME forms was collected, as well as additional information about the child, caregivers and the institution, on a questionnaire designed by the researcher. Information obtained about the children included age and gender as well as family ethnicity, language spoken, and school grade.

Past research has used other indicators of SES including occupation prestige, occupation status (20) and home resources (14), but without a standard measure of SES (93) and to eliminate subjectivity and simplify administration, only income and parent/caregiver education were documented. Additional information collected about the caregivers in Part 2 included education (if any) in child rearing and the SES of the home (16,17,58), which was determined by caregiver's education and income. Additional information related to SES obtained about the children included family composition and child caregiver ratio.

The HOME inventory does address home resources, so this information could contribute to a measure of SES. Additional information collected on the child participants in Part 2, included: date of admission to institution and age of admission.

Although it had been planned to include aspects like prior place of residence, medical history, time spent in hospital (if any), history of therapy received, significant life experiences, the weight at birth (18,58), and gestational age at birth, this information was not available for most of the children in the residential child care facility, so was not included in the data analysis.

3.4.1.2 The Beery-Buktenica Developmental Test of Visual-Motor Integration, 5th Edition (Beery VMI) (Appendix E, E1)

The Beery VMI is a norm-referenced test, which measures an individual's ability to integrate their visual and motor abilities. Various publications of the Beery VMI have been released between 1967 and 2007. It provides a screen for children aged two to 18, allowing for the early detection of problems of visual-motor integration. The authors state that the newest (5^{th}) edition is the best visual-motor screening battery available for preschool to adult ages, due to its low administration cost and high validity (51).

The test includes a short and a full form and takes 10 to 15 minutes to administer. The full form (used in this study) consists of 30 items and can be used with children from age two through to 18 years.. In addition there are two standardised supplemental tests: the Beery VMI Visual Perception test, and the Beery VMI Motor co-ordination test, which use the same geometric forms as the Beery VMI. The purpose of the additional tests is to provide

separate and more specific information about visual and motor performance. The test can be administered to individual children or as a group (51).

The Beery VMI requires the child to copy a series of geometric forms. Either a “1” or a “0” are awarded for the forms copied depending on accuracy, and scoring is stopped when three forms are copied incorrectly. There is a time limit set for the two supplemental tests. Raw scores are derived from the total number of forms drawn, completed or identified correctly. Raw scores are converted to standard scores, scaled scores, percentiles, and z scores.

Norms for the current version of the Beery VMI were derived from a study involving 2512 children in the United States of America (USA), from a range of backgrounds. Information related to validity and reliability has largely been derived from earlier studies on earlier versions of the Beery VMI. Internal consistency results were obtained using the 3rd edition. Despite this, it is felt that these reliability analyses are within an appropriate range. The overall test-retest reliability is in the mid-to-high 80’s and mean inter-rater reliabilities range from 0,90 to 0,92 for the VMI and its subtests (51).

The Beery VMI has been used frequently in clinical practice to assess visual analysis and visual motor integration skills (5,51). It has also been used in research to evaluate the effectiveness of interventions (127), and to measure the extent to which visual and motor abilities can be integrated (128). The Beery VMI has been shown to relate to a child’s academic achievement in the early school years (23). Sanghavi and Kelkar (2005) found that when comparing raw scores and age equivalents on the Beery VMI of Indian children, to the scores provided in the Beery VMI manual, Indian children achieved mean raw scores at a younger age. This was said to indicate that the test needs to be standardized on a larger Indian population. These results need to be considered when analysing the results of the Beery VMI (7).

3.4.1.3 Home Observation for Measurement of the Environment inventory (HOME) (Appendix F)

The HOME inventory was used in addition to demographic information to determine the supportiveness of the environment for child The HOME measures the quality and quantity of stimulation, as well as the support given to the child in their home environment (129,130), and has been used in countless studies on child development (130,131), for more than 30 years (129). The HOME has also been used to measure changes in a child’s environment, as well as the quality of parenting, as a result of intervention programmes (129,131). Bryant (1985)(132) felt that the HOME was the most highly regarded measure of the child’s home environment, and no new assessments for this age

group have been developed. Scores from the HOME Inventory, have been shown to be related to cognitive development (17,73,133) validating that the instrument measures factors in homes, which promote learning and thinking (129). In addition, HOME scores of children from low-income families have been shown to be significantly lower than those from children belonging to higher income families. This confirms the impact of SES, and illustrates that the HOME is sensitive to SES (129).

The CC-HOME designed to be used in child care facilities is only available from three to six years (124,130), and therefore the HOME which is designed for use in the home of children from six to 16 years, was used for both Part 1 and Part 2 of the study.

This was possible as the main difference between the CC-HOME and the HOME is that the word 'parent' has been changed to 'caregiver' (124). This was not considered enough of a change to influence the assessment findings, if the HOME was used in the child care situation, and so 'caregiver' was simply substituted for 'parent' at the time of administration in the residential child care facility.

The Middle Childhood (MC) HOME is designed for use between ages six and 10 years. It contains 59 items clustered into eight subscales: Parental Responsivity, Physical Environment, Learning Materials, Active Stimulation, Encouraging Maturity, Emotional Climate, Parental Involvement, and Family Participation (Appendix F1).

The Early Adolescent (EA) HOME is designed for use from ages 10 to 15 years (129). It contains 60 items clustered into seven subscales: Physical Environment, Learning Materials, Modeling, Instructional Activities, Regulatory Activities, Variety of Experience, and Acceptance & Responsivity (Appendix F2).

Credit for the majority of the items in a subscale usually indicates that the family is providing an adequate support for development, in that particular area; whereas credit for only a few items in a subscale, suggests that that aspect of the home environment is not adequate for development.

The information for this assessment was obtained through interviewing the parent/caregiver or parent, with the child present. The score distributions on subscales are skewed to the left, as extremely low scores are not well represented in the standardisation sample. Thus, when interpreting the scores on the HOME, a subscale score 2-3 points below the median, should raise concerns. Concerns are also raised if total scores are more than 7-8 points below the median (124).

The HOME focuses on a particular child and the quality and quantity of environmental support afforded to him/her, in terms of the influence of objects, events and transactions

related to the family child care home setting, and can be administered in a relatively short visit to the informal care environment. The binary scale used by the HOME limits the depth of information obtained, e.g. the scale asks if the child eats at least one meal per day, on most days, with mother and father but does not cover how many times the child does this in a day. The scale can therefore not be used for making well- informed judgements or decisions.

The mean, SD and median for each scale are provided in the HOME manual (Appendix F3, F4)(124), and they were used as a comparison in this study. The total score for the HOME indicates the quality of the home environment. The higher the total HOME score the more enriched the home environment is likely to be, and scores in the lower quarter of the range, indicates a risk to some aspect of the child's development (131). Data for the norming of the MC HOME was compiled from 124 HOME assessments conducted in the USA, between 1982 and 1983whilst data for the norming of the EA HOME was compiled from 331 HOME assessments, conducted in the USA, between 1995 and 1996 (124).

3.4.1.4 Assessment of nutrition – Body Mass Index (BMI) (Appendix D)

Anthropometric indicators based on body measurements (height or weight related to age and sex) are often used to measure nutritional status. Weight-for-height (W/H) measures body weight relative to height and can be used to measure current nutritional status, aiding in screening for at risk children, as well as measuring short term changes in nutritional status (134). BMI was calculated using weight (kg) divided by height (m^2), and compared to the WHO growth standards (10). Height was measured with a ruler, specifically designed for this purpose. The child was asked to remove his/her shoes, or hair accessories, which would affect the measurement. The length of the ruler was placed against the wall, and the flat sliding section (90 degrees to the ruler) was placed on top of the child's head. Height was recorded in centimetres, to one decimal place. The children were weighed on a portable digital bathroom scale, after removing their shoes and any heavy clothing. Weight was recorded in kilograms, to one decimal place.

The BMI was scored according to the WHO growth reference (2007), a reconstruction of the 1977 National Center for Health Statistics (NCHS)/WHO). This uses the original NCHS data along with data from the WHO child growth standards for under-fives. The growth standards are presented as z-scores with 'cut-offs' of – 3 standard deviations to identify children with severe acute malnutrition, and -2 to record stunting(134). Some reasons given for this cut off were that children below this cut-off have a massively increased risk of death compared to those who are above, and in a well-nourished population there are virtually no children below -3 SD (<1%). The growth standards

confirm that ethnic differences among groups, as well as genetic differences between individuals are not considered large enough to invalidate the WHO growth standards being used as a standard in any population (135).

Body mass index was calculated from the children's height and weight and standardised according to WHO growth charts (10,135). As BMI varies with age for children and teenagers, it was interpreted in relation to BMI-for-age reference charts (Appendix G)(134) used by Whetten et al, (2009)(80), taking the child's age and gender into account.

3.4.2 Research procedure

A research assistant recruited through the University of Mauritius, was a qualified occupational therapist, who was employed by the researcher to assist with recruitment of the typical children and to administer the assessments. He was not employed elsewhere at the time. All assessments, as well as data collection, were done by the research assistant. Ten community children (known to the assistant through family and friend connections) were assessed using the Beery VMI, to ensure that he was familiar with the tool. The research assistant also practiced the administration of the HOME Inventories, prior to using them, although did not receive formal training in HOME administration. The HOME administration manual provides clear guidelines as to how to administer the tool.

3.4.2.1 Assessments of child participants

The research assistant made the necessary arrangements with the families for all the assessments, and obtained the necessary consent from the parents, caregivers and children, prior to beginning the Beery VMI assessments and HOME interviews.

Demographic information was collected on each child, by the research assistant, during the session when the Beery VMI was conducted (Appendix D).

The Beery VMI assessments were conducted with the children at the residential child care facility, and the tutoring centre in or at the children's homes. Where possible the Beery VMI was administered in groups of up to three children at a time, while the supplemental tests were administered individually. Testing was done in a separate room, with limited distractions, with the child using a standard HB pencil and no eraser. The research assistant assisted the children with understanding the instructions for the Beery VMI, in the language they were familiar with, if necessary, in Creole or English as required. He also recorded the height and weight of each child during one of the assessments.

3.4.2.2 Assessments with caregivers, parents and child participants

Appointments were made with the caregivers at the residential child care facility, and the parents or caregivers of the children in the community, prior to the HOME inventory interview. These interviews were carried out at a time and place convenient to the caregivers, during a visit to the child care facility, in the home of the child concerned, and with the parents/caregivers in the community in their own homes. The research assistant was able to administer these in the language with which the parents and caregivers felt most comfortable during their interviews, in Creole and English as required, to ensure the questions were understood. The assessments were not formally translated.

The child participant concerned was present and awake when the caregiver was interviewed. Interviews took between 45 minutes and an hour, during which time the parent and child were also observed. The research assistant did his best to ensure that the process was relaxed and non-threatening, so as to allow for interactions that were as close to normal as possible, to be observed between parents or caregivers and their children. In some cases in the community group in Part 1 more than one child participant was present during the interview.

In Part 2 in the residential child care facility caregiver interviews, a maximum of three child participants were present within either the Middle Childhood or Early Adolescent age groups. **This was consistent with the administration of the Beery VMI which was conducted with up to three children at a time'**

3.4.2 Data management

The researcher scored all the Beery VMI tests and supplemental tests as well as calculating the BMI for each child, and interpreting this according to the BMI-for-age reference charts (134)(Appendix G), and WHO child growth standards (135).

The HOME inventories were also scored by the researcher, for each section, and a total score determined. All the data was entered into an Excel spreadsheet which was checked for errors and missing data.

3.4.3 Ethical considerations

Ethical approval was granted by the Ministry of Health and Quality of Life in Mauritius (Appendix H1), as well as the Human Research Ethics Committee at the University of the Witwatersrand (Appendix H2). Permission for the study was obtained from the residential child care facility for the children to be assessed and for the caregivers to participate in the research (Appendix A).

Verbal assent was obtained from the children and was witnessed by a caregiver employed by the home or the parent (Appendix B). Each parent or caregiver had been given an information sheet to sign informed consent for their demographic information to be collected, for the purposes of completing the HOME inventory. Parents and caregivers gave permission for the other assessments to be completed on the children (Appendix C1, C2).

It was made clear that a child could be withdrawn at any stage – due to his or her own wish, or that of a caregiver or parent.

Confidentiality was maintained by using only codes on all data sheets, with the names of the children and caregivers being available only to the researcher and the occupational therapist completing the assessments.

At a meeting between the researcher and the manager of the residential child care facility, he was given the results of the Beery VMI assessments, as well as the HOME inventory. A discussion was held as to how best to approach the problems found. The residential child care facility had connections with a centre where the children can receive remedial input and the residential child care facility also have psychologists who can assist where appropriate. When problems were identified amongst the children in Part 1 of the study, the parent was notified in writing (via the research assistant), and names of resources for assessment and treatment of the child, were compiled and provided by the research assistant.

A copy of the research findings and recommendations was given to the residential child care facility.

4.3.4 Data Analysis

Descriptive statistics were used to analyse the demographics of the children and their parents/caregivers. The scores were divided into Middle Childhood and Early Adolescent groups, as the HOME inventories are slightly different for the two age groups. The mean BMI and z scores for the total sample and the Middle Childhood and Early Adolescent groups, were calculated and compared to the WHO five-19 years Growth Reference.

The total HOME scores and scores for individual categories, were tabulated and analysed. Scores were also compared to those provided in the HOME inventory administration manual (Appendix F3, F4). Raw scores for the Beery VMI and the subtests were converted to standard scores and the total group scores and the Middle Childhood and Early Adolescent groups' results were examined to determine if age played a role in influencing VMI. Standard scores and z scores of the Middle Childhood and Early Adolescent groups were compared for Part 1 and Part 2 of the study separately.

Results were further analysed to determine if a relationship existed between the demographic factors, the Beery VMI scores and HOME inventory scores for the group as a whole, as well as for the Middle Childhood and Early Adolescent groups using the Pearson's correlation coefficient. Significance was set at $p \leq 0.05$.

In Part 2 data gathered regarding the children in the residential child care facility group (age of admission and length of stay) was examined for the presence of correlations between Beery VMI scores, HOME scores and the BMI scores. The relative risk for the experimental residential child care facility group in terms of their delay in VMI was also established.

CHAPTER 4
RESULTS

4.1 Introduction

Fifty children between the ages of six and 16 years, from the community in Mauritius and 50 children in the same age group living in a residential child care facility in Mauritius were involved in this study. The supportiveness of the environment for child development was established by interviewing the primary caregivers using the HOME inventory and analysing demographic information such as BMI scores and parent characteristics for the community group in Part 1 of the study and the caregiver characteristics for the residential facility group in Part 2 of the study. The length of stay and age of admission in the case of the child care participants was also determined in Part 2 of the study.

Developmental status of the community group was determined using the Beery VMI. The association between the HOME inventory and BMI scores, and the outcome of VMI in terms of developmental status for this group was established to determine a standard against which the group living in a residential child care facility could be assessed for developmental delay, and their risk for developmental delay determined in Part 2 of the study.

Due to the cross-sectional nature of the study, the children and their caregivers and or parents were assessed once, often at the same visit, so there was no loss of participants from the study.

4.2 PART 1: Assessment of children in the community in Mauritius

4.2.1 Factors associated with development in children

Certain demographic information such as family ethnicity, gestational age at birth, weight at birth and medical history was excluded from the results, as there was either insufficient information or the data wasn't available when collected by the research assistant.

4.2.1.1 Demographics of the participants and their parents

The first objective was to determine the factors associated with development in children living in the community in Mauritius. The factors measured included demographics such as BMI (as an indication of nutritional status), and caregiver characteristics, as well as environmental supportiveness, assessed using the HOME inventory.

There were an equal number of males and females in the community group, and their ages ranged from six years and three months to 15 years and eight months. For the administration and analysis of the HOME inventory the total sample was divided into ages six to ten years or a Middle Childhood group, and 10 years to 16 years or an Early Adolescent group. The age and gender distribution for these groups is presented in Table 4.1.

Table 4.1 Demographics of the participants and their parents in the community group

	Community- Total group (n=50) **Range – Mean (SD)**	
Age	6 years 3 months - 15 years 8 months10.87 (2.83)	
	Community group **Middle Childhood (MC) (n=20)**	**Community group** **Early Adolescence (EA) (n=30)**
	6 years 3 months –9 years 8 months7.92 years (1.08)	10 years 2 months – 15 years 8 months12.85yrs (1.79)
Gender	**Total sample, Community group Middle Childhood (MC) (n=20) and Community group Early Adolescence (EA) (n=30)**	
		n(%)
	Male	25 (50%)
	Female	25 (50%)
	Parents (n=43) **Mean (SD)**	
Age	39.26 years (4.78)	
Income (MUR)	11,329.60 (5468.46) of one parent per household	
Years of education	**Range – Mean (SD)**	
	6 to 18 years - 9.28 (2.98)	

The community group participants were recruited through a private after school tutoring programme, where children received extra tuition, as well as through families known to the research assistant. They represented typical children in Mauritius in that after school private tuition is common practice in Mauritius, in both primary and secondary schools, where approximately 85% of children use the services of a tutor (126).

All, except two, of the participants in the community group lived with both their parents, with an average of two children in each family, which is the norm for Mauritius (94), and attended different schools in the community.

Since some of the community participants were siblings, they had the same parents, so there were parents from 43 households in the sample (Table 4.1). All community group participants lived within 45 km's of the child care facility.

As SES has often been measured by income and education (97) these were both recorded. Each parent of the community group who was interviewed, had an average of 9.28 years of school education (Table 4.1).

None of the parents were over the age of 50 years with an average age of 39,26 years. Only 36% of the parents had completed secondary school; and had higher or tertiary education, while 34% had only completed primary school (Table 4.1).

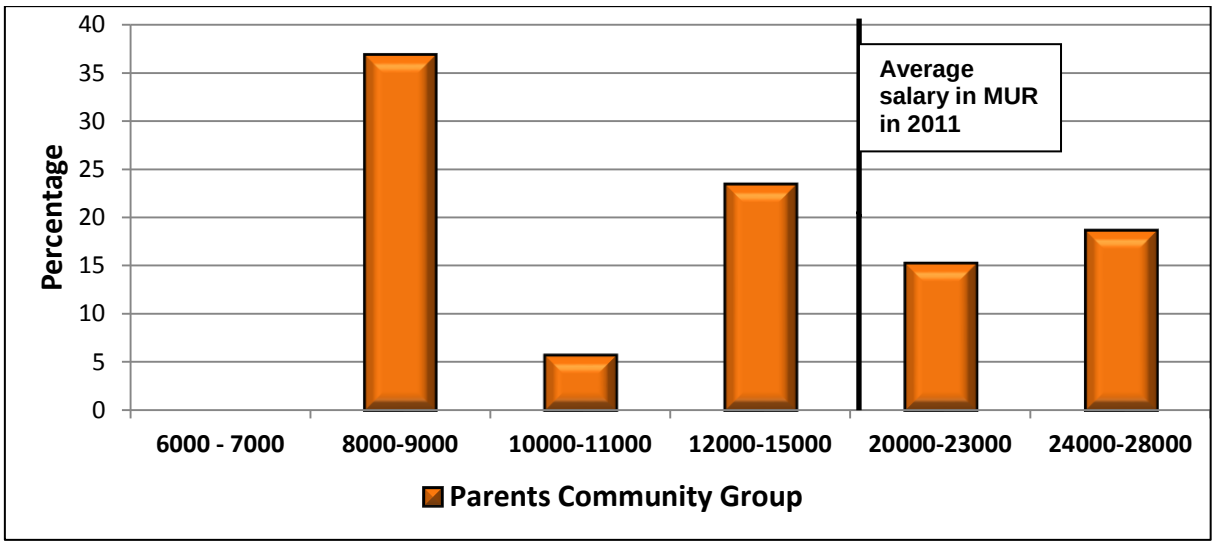


Figure 4.1 Income of one parent of participants in the community group

The parent who was interviewed with the participant in the community group provided information about their salary, which was an average 11, 329.60 MUR (Table and Figure 4.1)

4.2.1.2 Nutritional Status

In order to establish the nutritional status of the children, their height and weight measurements were recorded and converted to their body mass index for their age, for which a z score was then determined.

The mean BMI for the community group was just above -1 SD below the norm for their ages (Table 4.2).

Table 4.2 Body mass Index for the community group

	BMI Mean (SD)	**z score Mean (SD)**
Total sample (n= 50)	16.17(3.25)	-0.97(1.48)
Middle Childhood (n= 20)	15.01(7.89)	-0.95 (1.78)
Early Adolescence (n= 30)	16.94(3.06)	-0.98(1.28)
p value	0.96	

Figure 4.2 shows that while the community group may be slightly undernourished the majority fell within an acceptable level between -1 and +1 SD for their BMI. While 8% of this group fell into the overweight group and 2% into the obese group, 24% fell into the thinness group and only 2% into the severe thinness group.

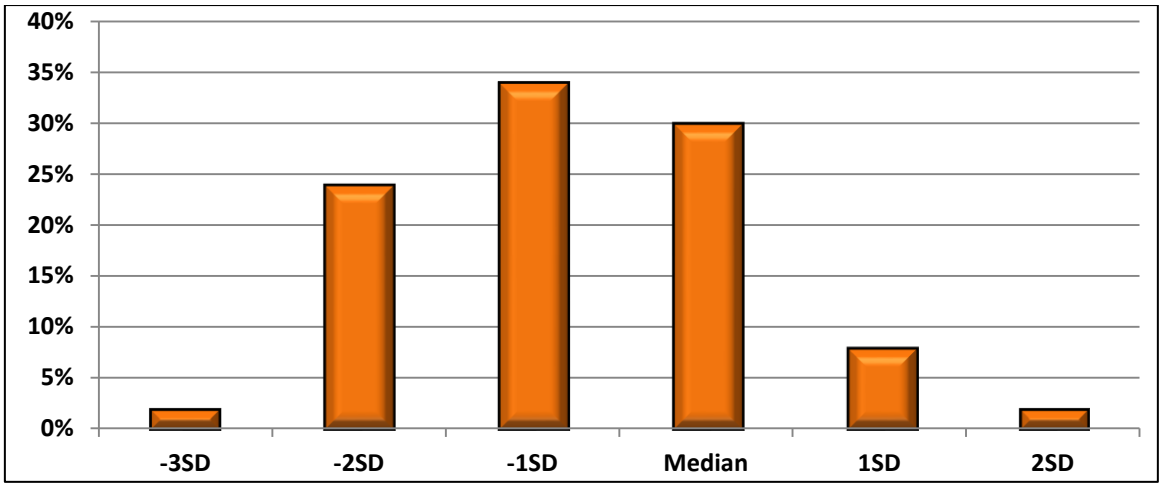


Figure 4.2 Percentage body mass index according to z scores for the community group

Key Cut offs for BMI

Overweight: >+1SD (equivalent to BMI 25 kg/m^2 at 19 years)
Obesity: >+2SD (equivalent to BMI 30 kg/m^2 at 19 years)
Thinness: <-2SD
Severe thinness: <-3SD (WHO Growth Reference 5-19 years)

Figure 4.3 Key cut offs for BMI

4.2.1.3 Environmental supportiveness

The second factor assessed in relation to risk for developmental delay, was the supportiveness of the environment as measured by the HOME inventory. Table 4.3

indicates that children in the community group experienced environments that were supportive with a median of 56, which is what the HOME inventory is evaluated on.

Table 4.3 Mean Standard Scores on the HOME Inventory for community groups

Home Inventory			
	Maximum score obtainable (median)	**Mean (SD)**	**Median**
Total group (n=50)	-	55.26 (4.00)	56
Middle childhood group (n=20)	59 (46)	55.85 (3.49)	57
Early adolescence group (n=30)	60 (44)	54.70 (4.42)	55
p value		**0.33**	

The MC HOME inventory and the EA HOME inventory were completed for the two age groups in the study. The subscale scores were all within the median for the community group, and the mean total HOME score was within seven points of the scores provided for comparison, indicating that the environment was supportive for these participants (Table 4.3). There was no significant difference between the Middle Childhood and Early Adolescence groups (p=0.33).

Table 4.4 Mean Standard Scores on the components of the HOME Inventory for Middle Childhood community group

The Middle Childhood	**Maximum score obtainable (median)**	**Community group n=20**	
		Mean (SD)	**Median**
Responsivity	10 (9)	9.90 (0.44)	10
Encouragement of maturity	7 (5)	6.70 (0.47)	7
Emotional climate	8 (7)	7.75 (0.63)	8
Learning materials and opportunities	8 (4)	6.35 (1.34)	6.5
Enrichment	8 (6)	7.65 (0.58)	8
Family companionship	6 (5)	5.95 (0.22)	6
Family integration	4 (3)	3.80 (0.61)	4
Physical environment	8 (7)	7.70 (0.92)	8

While none of the subscale scores for the Middle Childhood and Early Adolescence groups of children living in the community were concerning, falling no less than the seven points below the scores considered adequate for the HOME (Table 4,4 and 4,5), all the

subscale median scores were in fact equal to or greater than the scores provided in the HOME administration manual.

Table 4.5 Mean Standard Scores on the components of the HOME Inventory for early adolescent, community group

Early Adolescence	**Maximum score obtainable (median)**	**Community Group n= 30**	
		Mean (SD)	**Median**
Physical environment	7 (7)	6.73(0.45)	7
Learning materials	10 (7)	8.30(1.78)	9
Modelling	10 (7)	7.90(1.47)	8
Fostering self sufficiency	6 (4)	5.97(0.49)	6
Regulatory activities	10 (9)	9.30(0.59)	9
Family companionship	8 (5)	7.70(0.87)	8
Acceptance	9 (9)	8.53(1.65)	9

The second objective was to determine the Beery VMI as measure of developmental delay in children between 6 and 16 years living in a community and those living in a residential child care facility in Mauritius. The Beery VMI test was used with the participants living in the community and the residential child care facility to confirm if developmental delay in relation to VMI was present. According to the Beery VMI scoring criteria, developmental delay in VMI occurs when children fall at -2SD or below the norm with those in the -1SD to -2SD range being at risk of delay in VMI.

4.2.1.4 The Beery-Buktenica Developmental Test of Visual Motor Integration

The mean standard scores for the three subtests of the Beery VMI for the community group all fell into the average group, listed as between 108-89 for the Beery VMI (Table 4.6)(51).

The lowest mean score for the total community group was for the motor co-ordination sub test. See standard score interpretation (Appendix E1). There was no significant difference in the VMI scores for the Middle Childhood and Early Adolescent groups although overall the Middle Childhood group performed better, with their scores above the means published for this test (Table 4.6).

Table 4.6 Mean Standard Scores on the Beery-Buktenica Developmental Test of Visual Motor Integration for the community group

	Total group n=50	Middle childhood (n=20)		Early adolescence (n=30)		
Standard Scores	**Mean (SD)**	**Standard Scores Mean (SD)**	**z scores Mean (SD)**	**Standard Scores Mean (SD)**	**z scores Mean (SD)**	**p value**
Visual Motor Integration	97.28 (13.16)	101.10 (12.13)	0.07 (0.86)	94.73 (12.83)	-0.35 (0.86)	0.09
Visual Perception	99.24 (17.23)	103.45 (19.30)	0.23 (1.15)	96.43 (16.34)	-0.24 (1.12)	0.16
Motor Co-ordination	95.04 (17.61)	94.20 (19.30)	-0.39 (1.69)	95.60 (13.54)	-0.29 (0.86)	0.79

Significance p≤ 0.05*
Significance p≤ 0.01**

Visual Motor integration

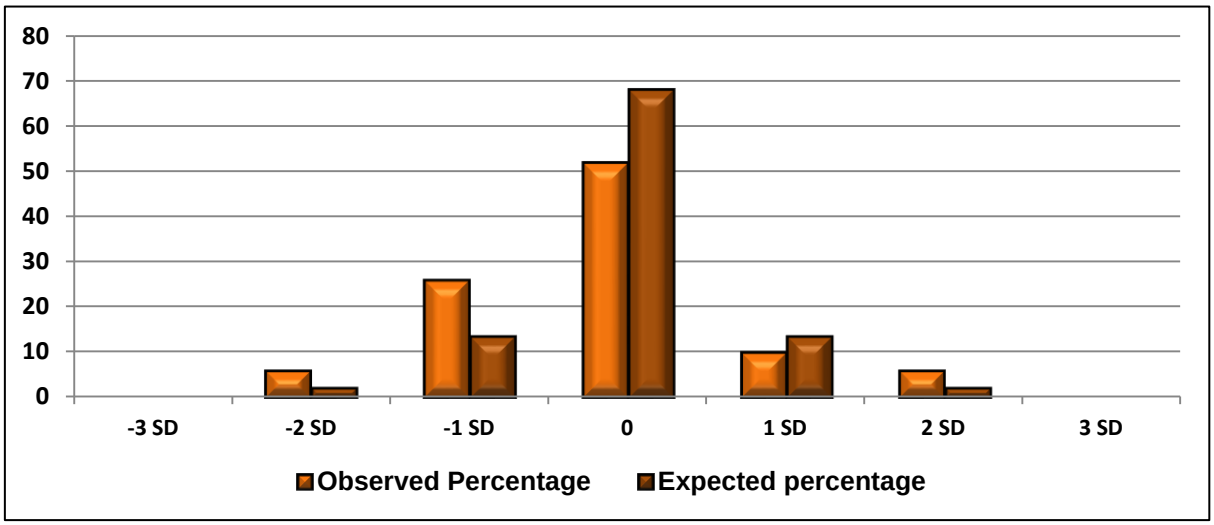


Figure 4.4 Expected and observed performance on visual motor integration standard scores for community group

The scores for the community group were normally distributed, their scores clustered around the average to at risk -1SD performance, more than those of the typical sample (Figure 4.4). Only 6% had a delayed performance, at -2 SD.

Visual Perception

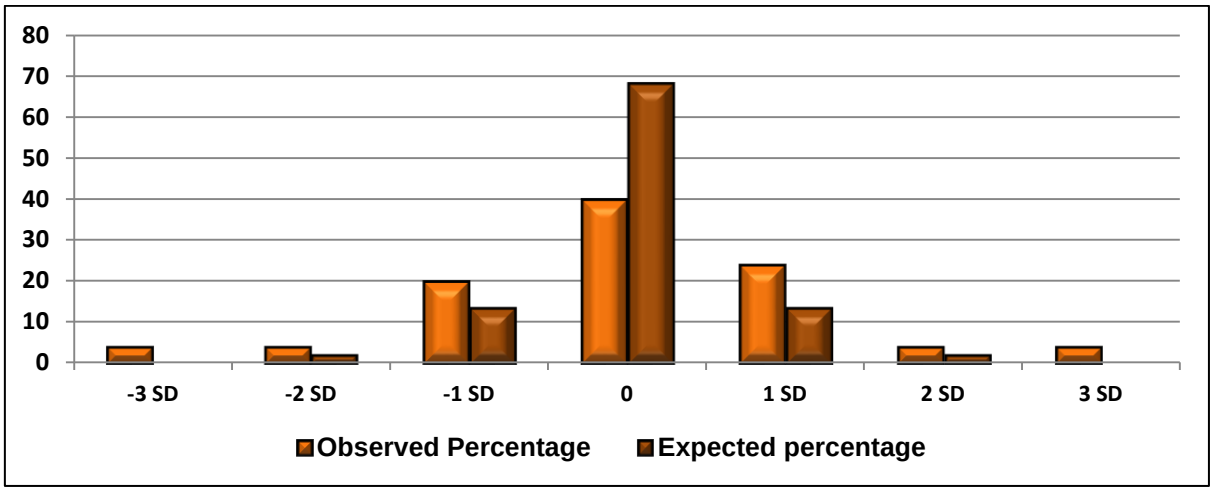


Figure 4.5 Expected and observed performance on visual perceptual standard scores for the community group

As for VMI, the visual perception scores for the community group were normally distributed, with 8% of the participants falling into the delayed category, at -2 SD and -3 SD (Figure 4.5). Although 20% were at risk of delay, the percentage of participants scoring 1 SD, 2SD and 3 SD were higher than expected of a typical sample.

Motor Co-ordination

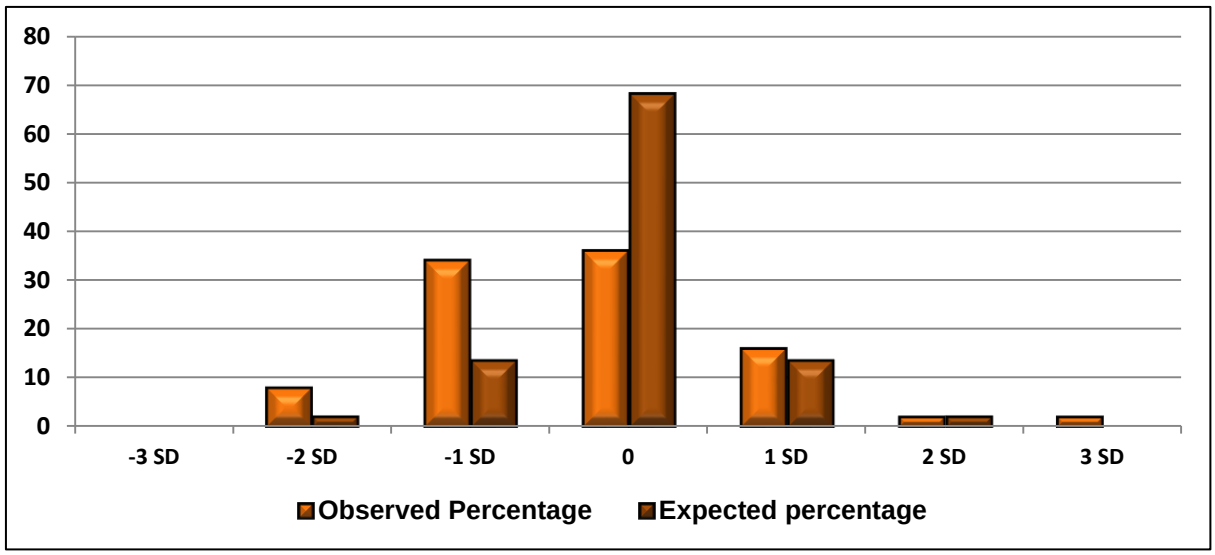


Figure 4.6 Expected and observed performance on motor co-ordination standard scores for typical, community group

Results for the motor co-ordination subtest showed the greatest deficits were in the motor coordination subtest, with 36% of the participants at risk for delay. Again only 8% of participants were at the -2 SD performance level indicating delay (Figure 4.6).

4.2.2 Association between the Beery-Buktenica Developmental Test of Visual Motor Integration scores, demographic Factors and the HOME Inventory

The third objective was to determine the association between demographic factors and environmental supportiveness and the Beery VMI for children between six and 16 years living in the community in Mauritius.

4.2.2.1 Association between the Beery-Buktenica Developmental Test of Visual Motor Integration Scores and Body Mass Index

The correlations between the demographic factors (age and BMI) and VMI for the community group, were all weak and below 0.3, indicating little to no association between these factors (Table 4.7).

Table 4.7 Correlation between the Standard Scores on the Beery-Buktenica Developmental Test of Visual Motor Integration and body mass index and age for the community group

	Community Group n= 50			
	BMI		**Age**	
Standard Scores	**r**	**p**	**r**	**p**
Visual Motor Integration	-0.07	ns	-0.27	0.05*
Visual Perception	-0.00	ns	-0.20	ns
Motor Co-ordination	0.14	ns	0.08	ns

Significance p≤ 0.05

4.2.2.2 Association between the Beery-Buktenica Developmental Test of Visual Motor Integration Scores and the HOME Inventory

The correlations between the HOME and Beery VMI for the community group were all weak, and below 0.04, indicating little to no association between these factors (Table 4.8).

Table 4.8 Correlation between the HOME Inventory and standard scores on the Beery-Buktenica Developmental Test of Visual Motor Integration for the community group

	HOME Inventory Community Group					
	Total Group n= 50		**Middle Childhood Group n= 20**		**Early Adolescence Group n= 30**	
Standard Scores	**r**	**p**	**r**	**p**	**r**	**p**
Visual Motor Integration	0.39	*0.05	0.26	ns	0.26	ns
Visual Perception	0.13	ns	0.27	ns	0.27	ns
Motor Co-ordination	0.05	ns	0.13	ns	0.13	ns

*Significance set at p≤ 0.05

4.3 PART 2 Assessment of children in a residential child care facility in Mauritius

4.3.1 Factors associated with development

The fourth objective was to determine the factors associated with development in children living in a child care facility in Mauritius. The demographic factors measured included care giver characteristics, BMI (as an indication of nutritional status), and environmental supportiveness, assessed using the HOME inventory. Length of stay in the facility and age of admission were also recorded for the residential child care group.

4.3.1.1 Demographics of the participants and caregivers

There were slightly more males than females in the child care group, and their ages ranged from six years to 15 years and 10 months. The greater number of males was in the Middle Childhood group where there were more younger males in the residential child care facility than females. The participants in the Early Adolescent group were evenly distributed for gender (Table 4.9).

There were 14 caregivers in the child care group, who were all female. They each lived in a house in the residential child care facility, and cared for between six and nine children, of mixed ages and sex (Table 4.9).

Table 4.9 Demographics of the participants and caregivers in the child care group

	Child care Total group (n=50) Range – Mean (SD)			
Age	6 years 0 months – 15 years 10 months -11.58 (2.81)			
	Child care group Middle Childhood (MC) (n=15)		**Child care group Early Adolescence (EA) (n=35)**	
	6 years 0 months –9 years 8 months - 7.89 years (1.22)		10 years 6 months – 15 years 10 months - 13.16 yrs (1.46)	
Gender	**n (%)**			
	Total sample (n=50)		**Middle childhood (MC) (n=15)**	**Early adolescence (EA) (n=35)**
	Male	28 (66%)	11 (73%)	17 (48.6%)
	Female	22 (44%)	4 (27%)	18 (51.4%)
	Child care group - caregivers (n=14) Mean (SD)			
Age	52.80 years (7.17)			
Caregiver income (MUR)	8192.85 (1429.61)			
Budget per child	2576 MUR			
Years of education	**Range Mean (SD)**			
	6 to 12 years 8.71 (2.17)			

The caregivers at the residential child care facility were older with 50% over the age of 55 years, with an average age of 52.8 years.

While 28% of the caregivers had a only a primary school education, only 14% of them finished secondary school, with the majority having one or three years of secondary education. One caregiver has some higher education, but 92% of caregivers in the residential child care facility had received training in child care from the facility.

The caregivers' average salary was close to the lowest salaries paid in Mauritius and they earned less than half the average wage in Mauritius in 2011 (Figure 4.1).

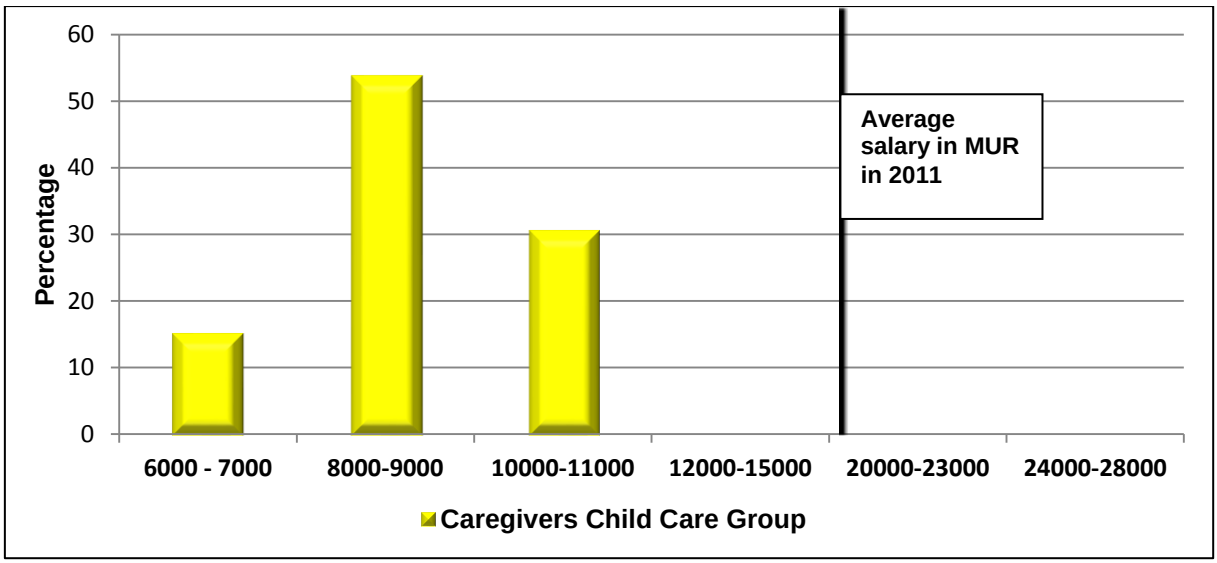


Figure 4.7 Income of caregivers of the participants in the Child care group

4.3.1.2 Care History of participants in the child care group

The length of stay of the child care participants at the residential child care facility, ranged from 14 months to 14 years. The mean length of stay in child care facilities was 5.94 years (SD=3.30), and the mean age of admission was 5.65 years (Table 4.10), with a significant difference found between the length of stay (p≤0.004) and age at admission (p≤0.001) of the Middle Childhood and Early Adolescent groups.

Table 4.10 Age of admission and length of stay in the residential child care facility

	Middle Childhood (MC) Child care Group (n= 15) Mean (SD)	**Early Adolescence (EA) Child care Group (n= 35) Mean (SD)**	**p**	**MC and EA group (Total sample) Mean**
Age at admission	76.09 months (35.16) 6.34 years	48.27 months (21.2) 4.02 years	0.001***	5.65 years
Length of Stay	**Range Mean (SD)**	**Range Mean (SD)**		
	15 months – 79 months (1 year 3 months - 6years 7 months) 3.70 years (1.59)	14 months -167 months (1 year 2 months -13 years 11 months) 6.99 years (3.39)	0.004**	5.94 years

Significance p≤ 0.05*
Significance p≤ 0.01**
Significance p≤ 0.001***

Therefore, the Early Adolescent group were admitted at a younger age and had stayed longer than the Middle Childhood child care group.

Due to confidentiality, the background information of the participants in residential child care was very limited.

It was not possible to record the children's circumstances prior to admission to the child care facility. The reason given for most of the children's admission was 'neglect' and it was not specified as to what form of neglect this was.

4.3.1.2 Nutritional status

Table 4.11 Body Mass Index for the child care group

	BMI **Mean (SD)**	**z score** **Mean (SD)**
Child care Group Total group (n= 50)	12.58(1.67)	-1.83(1.81)
Middle Childhood (n= 15)	12.58 (1.67)	-2.73 (1.64)
Early Adolescence (n= 35)	16.33 (3.66)	-1.44 (1.76)
p-value	0.02	

The mean BMI for the child care group was just below -1 SD for their ages for the total group, as well as the EA group (Table 4.11).

The Middle Childhood group's BMI however fell more than -2SD below the norm indicating that the Middle Childhood group participants were significantly more underweight than those in the Early Adolescent group (p≤ 0.02) (Table 4.11).

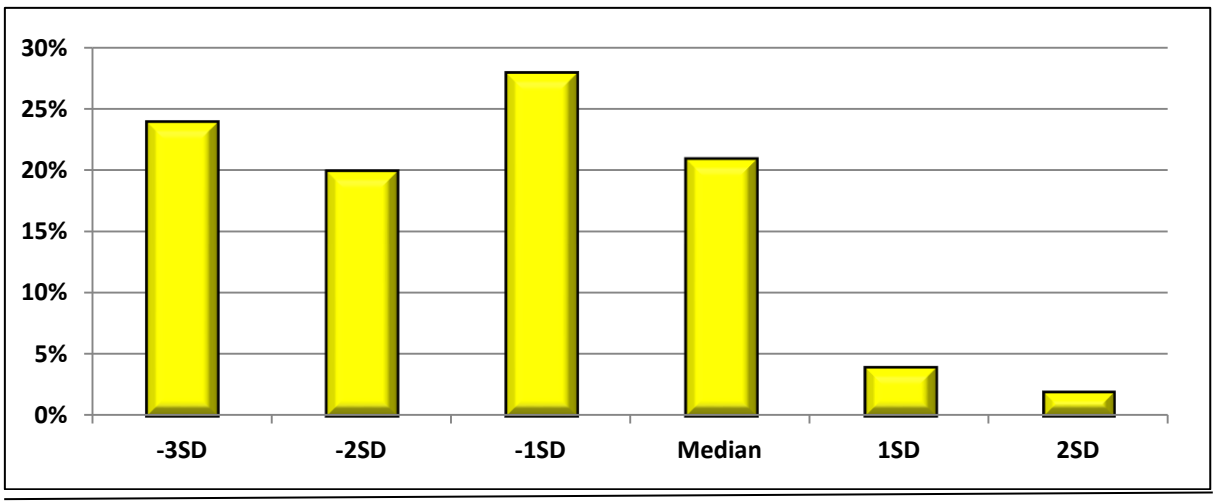


Figure 4.8 Percentage body mass index according to z scores for the child care group

Figure 4.8 shows that 24% of the children in residential child care fell into the -3SD category, and 20% into the -2SD category. They would be classified into the 'severe thinness' and 'thinness' categories of the WHO 5-19 years Growth Reference (60). Only 6% of the children in residential child care fell into the 'overweight' and 'obese' category, with only 50% of the participants considered to have a BMI that fell within acceptable limits.

4.3.1.3 Environmental supportiveness

The second factor assessed in relation to risk for developmental delay was the supportiveness of the environment.

Table 4.12 Mean Standard Scores on the HOME Inventory for the child care group

	Maximum score obtainable (median)	**Mean (SD)**	**Median**
Total group (n = 50)		34.56 (5.73)	32
Middle childhood group (n=15)	59 (46)	32.93 (5.86)	30
Early adolescence group (n=35)	60 (44)	35.26 (5.61)	37
p value		0.80	

The MC HOME assessment, and the EA HOME assessment were completed for each of the participants in the child care group (Table 4.12). The Middle Childhood group had a lower median score when compared to the Early Adolescence group.

Table 4.13 Mean Standard Scores on the components of the HOME Inventory for Middle Childhood child care group

The Middle Childhood	**Maximum score obtainable (median)**	**Child care group n=15**	
		Mean (SD)	**Median**
Responsivity	10 (9)	7.93 (2.28)	8
Encouragement of maturity	7 (5)	6.20 (0.41)	6
Emotional climate	8 (7)	5.37 (1.70)	6
***Learning materials and opportunities**	8 (4)	2.33 (1.58)	2
Enrichment	8 (6)	5.06 (1.43)	5
***Family companionship**	6 (5)	1.00 (1.06)	1
***Family integration**	4(3)	0.26 (0.45)	0
***Physical environment**	8 (7)	4.20 (1.01)	4

- subscales with scores 2 or more points below the median - indicating potential problems

Since the HOME is evaluated on the median scores this indicated a greater deficit in the Middle Childhood group child care environment. The Middle Childhood group also had median score with a deficit greater than seven points when compared to the median score obtainable, indicating an unsupportive environment. The deficit for the Early Adolescent group was just at seven points between the median scores, which indicates environmental deprivation. There was however no significant difference between the Middle Childhood group and the Early Adolescent group for the supportiveness of the environment (p = 0.80) (Table 4.12).

For the subscales for the Middle Childhood group, learning materials and opportunities, family companionship, family integration and physical environment, were all two or more points below the median for the child care group (124), indicating potential problems in these areas (Table 4.13). However the childcare group scored one point above the median for 'encouragement of maturity'.

Table 4.14 Mean Standard Scores on the components of the HOME Inventory for early adolescent child care group

Early Adolescence	**Maximum score obtainable (median)**	**Child care Group n= 35**	
		Mean (SD)	**Median**
***Physical environment**	7 (7)	4.85(0.94)	5
***Learning materials**	10 (7)	4.14(1.66)	4
Modelling	10 (7)	6.08(1.42)	6
Fostering self sufficiency	6 (4)	4.86(1.3.1)	5
Regulatory activities	10 (9)	8.11(0.93)	8
***Family companionship**	8 (5)	0	0
Acceptance	9 (9)	7.28(2.35)	8

* subscales with scores more than 2 points below the median - indicating potential problems

In the Early Adolescence group the category 'family companionship' may have been influenced by the absence of a father in the home, as it refers specifically to father involvement (Table 4.14). When comparing the HOME subscale scores, relative to the scores provided in the HOME inventory manual, it was found that three of the seven subscales had scores two or more points below the median for the residential child care facility, which should be considered problematic.

These categories included: physical environment, learning materials, and family companionship. However, 'fostering self-sufficiency' was a strength for the child care group, as the median was one point above the median provided.

4.3.1.4 Beery-Buktenica Developmental Test of Visual Motor Integration (Beery VMI)

The mean standard scores for the total child care group, for the three subtests of the Beery VMI all fell into the below average group, with motor coordination having the lowest mean standard score (Table 4.15).

When analysing the Middle Childhood and Early Adolescence groups separately, it is evident that the Early Adolescence group experienced the greatest delays, with the VMI and visual perception subtests having below average mean scores, and the motor coordination subtest having a mean score considered by the Beery VMI test to be low. For the middle childhood group only the motor coordination subtest is a concern. There was a significant difference in the scores of the Middle Childhood and Early Adolescence groups for VMI (p≤ 0.02) and Motor Co-ordination (p≤ 0,04) but not for Visual Perception on this test (0.32) (Table 4.15).

Table 4.15 Mean Standard Scores on the Beery-Buktenica Developmental Test of Visual Motor Integration for child care group

	Total group n=50	**Middle childhood (n=15)**		**Early adolescence (n=35)**		
Standard Scores	**Mean (SD)**	**Standard Scores Mean (SD)**	**z scores Mean (SD)**	**Standard Scores Mean (SD)**	**z scores Mean (SD)**	**p value**
Visual Motor Integration	88.38 (12.06)	94.13 (12.15)	-0.39 (0.81)	85.91 (11.31)	-0.94 (0.75)	0.02**
Visual Perception	88.12 (18.20)	92.07(19.3)	-0.53 (1.29)	86.43 (17.73)	-0.90 (1.18)	0.32
Motor Co-ordination	82.08 (11.76)	87.20(8.99)	-0.85 (0.60)	79.89 (12.23)	-1.34 (0.82)	0.04**

Significance p≤ 0.05*
Significance p≤ 0.01**

When the frequency of the scores were analysed however, it is clear that more than 50% of the participants are at risk for delay in VMI and especially for the subtests where between approximately 30%-40% show delay for visual perception and motor coordination (Figures 4.9-4.11).

Visual Motor Integration

The child care group scores were skewed towards the -1SD and -2 SD performance on the VMI (Figure 4.9), with 14% of the participants falling into the delayed category, at -2 SD.

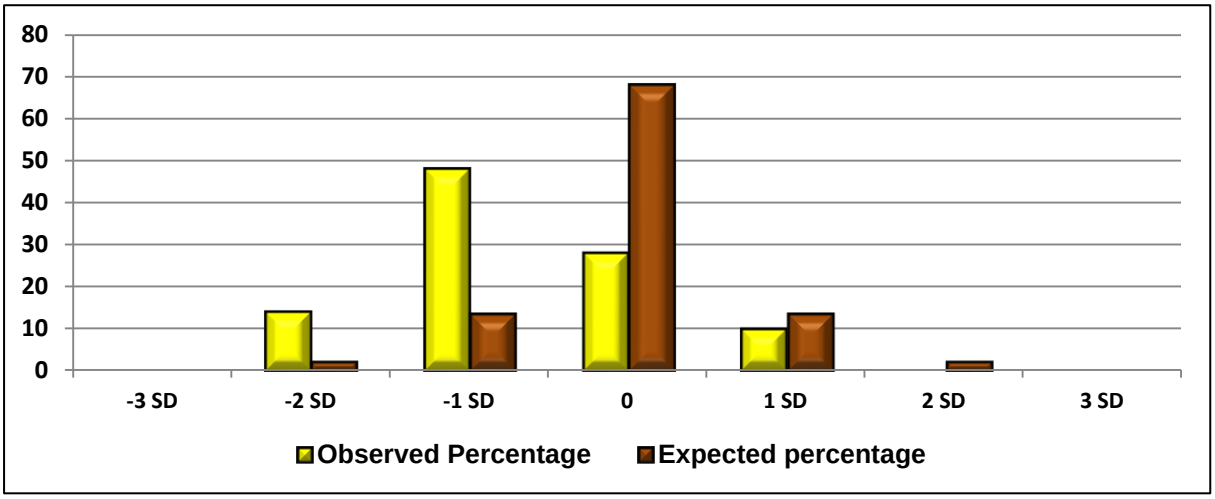


Figure 4.9 Expected and observed performance on visual motor integration standard scores for child care group

Visual Perception

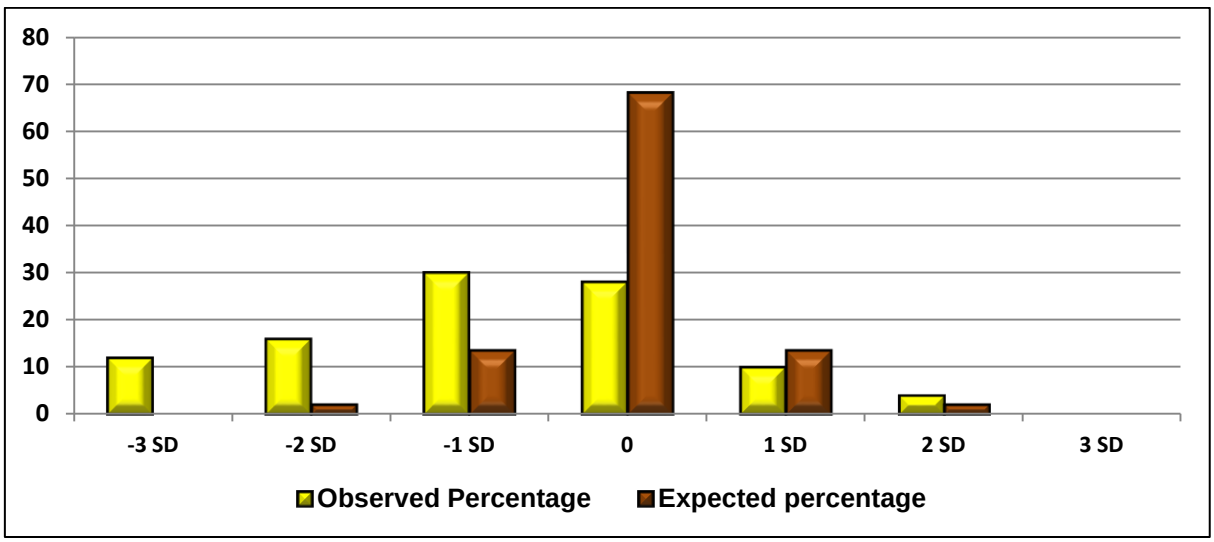


Figure 4.10 Expected and observed performance on visual perceptual standard scores for the child care group

The visual perception scores showed greater delays with 28% of the participants falling into the -2 SD and -3 SD categories. A further 30 % of the participants were at risk for delay and 58 % of participants scored below the average level (Figure 4.10).

Motor Co-ordination

Results for the motor co-ordination subtest indicated more delay in performance, as 42% of the participants fell into the -2 SD and -3 SD categories. There is an absence of scores in the 2SD and 3 SD ranges for this group, with an obvious skewing towards an at risk performance of -1 SD, with 84% of the participants scoring below the average (Figure 4.11).

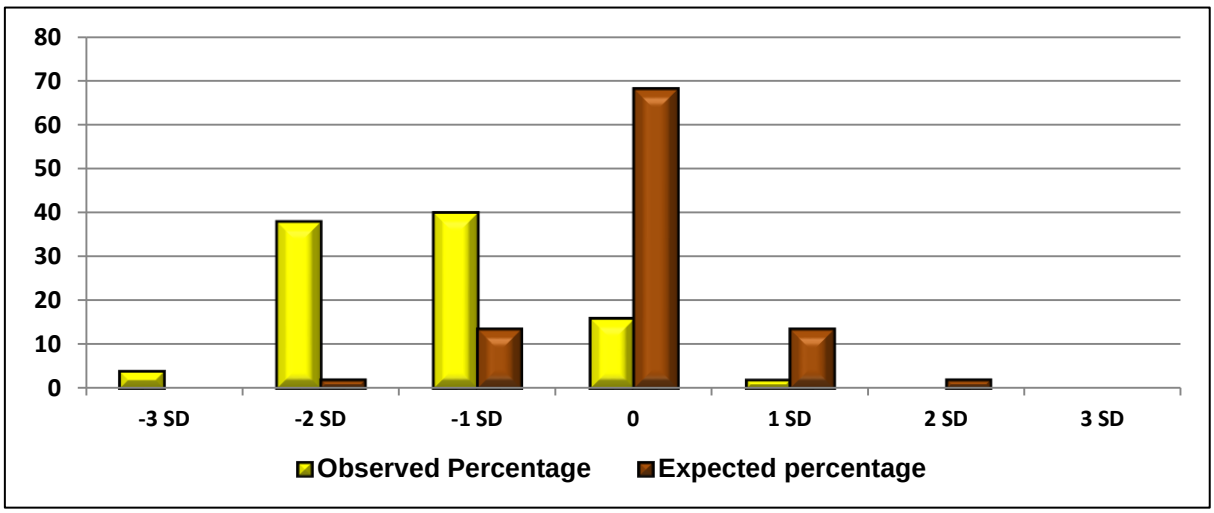


Figure 4.11 Expected and observed performance on motor co-ordination standard scores for child care group

4.3.2. Relative risk for developmental delay in visual motor integration for child care group

The results indicated there was no relative risk of the Middle Childhood participants in the residential child care group having a z score below -1 compared to the community group. The relative risk however, was 0.68 (68%) for visual perception and 0.56 (56%) for motor co-ordination, when the percentage of the residential child care participants with a z score of -1 were compared to the community group.

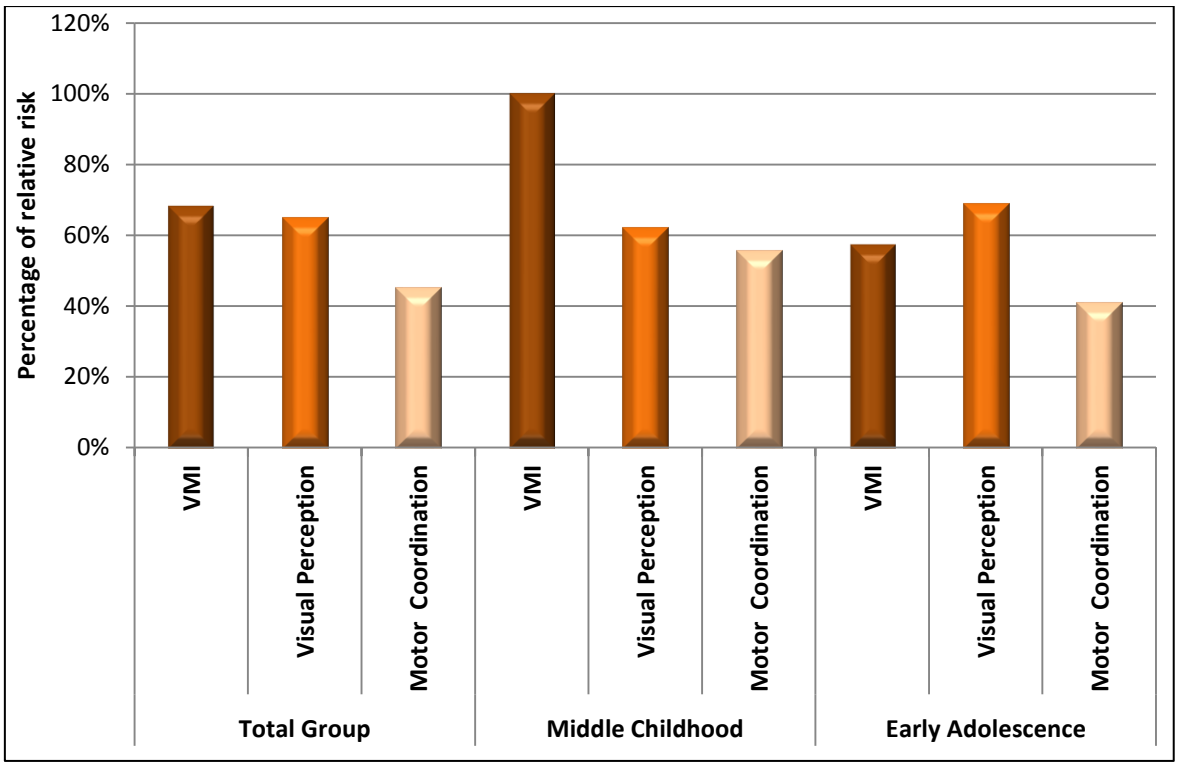


Figure 4.12 Percentage relative risk for the childcare group relative to the community group for dysfunction in visual motor integration, visual perception and motor coordination .

When the percentage of Early Adolescence participants with a z score below -1 in the child care group was compared to those in the community group, the greatest relative risk for dysfunction was also for visual perception at 0.68 (68%). The Early Adolescents in child care also had a 0.55 (55%) relative risk of having a z score below -1 for VMI, and a 0.40 (40%) relative risk for having a motor co-ordination z score below -1 when compared to the community group.

4.3.3 Association between the Beery-Buktenica Developmental Test of Visual Motor Integration Scores, demographic factors and the HOME Inventory

The sixth objective was to determine the association between demographic factors and environmental supportiveness and the Beery VMI for children between six and 16 years living in a residential child care facility in Mauritius.

4.3.3.1 Association between the Beery-Buktenica Developmental Test of Visual Motor Integration Scores and Body Mass Index and length of stay in the residential child care facility

A weak negative relationship was found between age and VMI scores for the childcare group (r = -0.31) (Table 4.16), indicating that the participants 'VMI scores may get lower

as they grow older. No association was found between length of stay in child care and the Beery VMI test but a weak positive relationship (r = 0.47) between age and BMI does indicate that the children's BMI increases as they get older, although this is not associated with their length of stay (Table 4.19).

Table 4.16 Correlation between the standard scores on the Beery-Buktenica Developmental Test of Visual Motor Integration and body mass index and age for the child care group

	Child care Group n= 50					
	BMI		**Length of Stay**		**Age**	
Standard Scores	**r**	**p**	**R**	**p**	**r**	**p**
Visual Motor Integration	-0.49	0.05*	-0.07	ns	-0.31	0.05*
Visual Perception	-0.33	0.05*	-0.04	ns	-0.11	ns
Motor Co-ordination	-0.15	Ns	-0.15	ns	-0.23	ns
BMI			0.03	ns	0.47	0.01*

Significance p≤ 0.05

Weak negative relationships (r=-0.33 and r=-0.49) between visual perception and BMI, and VMI and BMI indicate that those with lower BMI have higher scores on visual perception and VMI. A weak negative relationship between age and VMI indicates that the older the child or the longer he/she is in a residential child care facility, the lower the VMI scores but these variables only account for at most 15% of the variability in the VMI scores so cannot be considered important.

4.3.3.2 Association between the Beery-Buktenica Developmental Test of Visual Motor Integration scores and the HOME Inventory

When treated as a whole, there were no associations between the total HOME scores and VMI scores, or motor coordination scores, and only a weak positive relationship (r=0.25) between HOME scores and visual perception for the child care group (Table 4.17).

Table 4.17 Correlation between the HOME Inventory and standard scores on the Beery-Buktenica Developmental Test of Visual Motor Integration for the child care group

	HOME Inventory Child care Group n= 50					
	Total Group n= 50		**Middle Childhood Group n= 15**		**Early Adolescence Group n= 35**	
Standard Scores	**r**	**p**	**r**	**p**	**R**	**p**
Visual Motor Integration	0.14	ns	0.17	ns	-0.21	ns
Visual Perception	0.25	ns	0.83	0.01*	0.04	ns
Motor Co-ordination	0.02	ns	0.50	0.05*	-0.05	ns

*Significance set at p≤ 0.05

However when viewed separately, findings indicate a very strong positive relationship between visual perception standard scores (r = 0.83) and the HOME Inventory scores, and a strong positive relationship (r = 0.50) between motor co-ordination and the HOME scores for the Middle Childhood child care group (Table 4.17). Thus it would appear that lower scores for these subtests are associated with a less supportive environment in the middle childhood group. Findings indicated only a weak negative relationship (r=-0.21) between VMI scores and total HOME scores for the Early Adolescent child care group.

4.4 Summary

Part 1

The first objective was to determine the factors associated with development in children living in the community in Mauritius. This included the demographics: BMI (as an indication of nutritional status) and caregiver characteristics, as well as the environmental supportiveness, as determined by the HOME inventory. Demographic factors for the community group indicated that they lived in lower middle socioeconomic conditions and that their BMI scores indicated adequate nutrition. The ratio of children to caregiver was 2:1 or 1:1 in most homes where parents had various levels of education but only 36% had completed secondary school education, and on average parents were below 40 years of age. Results of the HOME inventory revealed the environment of the community group fell within the expected median scores on the HOME Inventory indicating normal supportiveness in their environment.

The second objective was to determine developmental status of the between 6 and 16 years living in a community using the Beery VMI. These children fell within the expected range although particularly their motor co=ordination was at risk for delay. The results indicate that as expected only 5-10% of children presented with developmental delay therefore indicating this is a valid test to determine development in this population. The Early Adolescence group showed slightly more delay than the Middle Childhood group. The third objective was to determine the association between the demographic factors. HOME and VMI for children in the community and weak to no associations were found.

Part 2

The fourth objective was to determine the factors associated with development in children living in a residential child care facility in Mauritius. The factors measured included the demographics: age of participants' care history (age of admission and length of stay), BMI (as an indication of nutritional status) and caregiver characteristics (age, education level and income), as well as the environmental supportiveness as determined by the HOME inventory. For the children living in a residential child care facility, their BMI, particularly for the Middle Childhood group, placed them at risk for malnutrition as 40% fell into the extremely thin group. The caregivers in the child care group were also older and had more children to care for, with a ratio of 6:1 to 9:1. The caregivers had a lower education level with only 14% having completed secondary school.

The environment of the child care group is less supportive with the median score of 34.56 falling seven points below the accepted median for this group (Table 4.12). Deficits were found for all the subtests of the residential child care facility groups on the HOME inventory, except 'modelling' in the Early Adolescence group. When HOME scores for the Middle Childhood child care group were compared to the Early Adolescence child care group, differences were also seen, indicating the highest percentage of low scoring items was for the Middle Childhood childcare group. This suggested that the Middle Childhood child care group in the residential child care facility had the least supportive environment.

The fifth objective was to determine developmental status using the Beery VMI in children between 6 and 16 years living a residential child care facility in Mauritius.
Delay was found for these participants as14% - 42% of participants scored below -2SD on the Beery VMI test, particularly for motor co-ordination delay. When the Middle Childhood and Early Adolescence group were examined separately, it was evident that the greatest deficits were amongst the Early Adolescent child care population and the Early Adolescent childcare group were most at risk for delay.

The sixth objective was to determine the association between demographic factors and environmental supportiveness, and the Beery VMI for children between six and 16 years living in a residential child care facility in Mauritius. There was a strong positive association between the demographic factors age and BMI in the child care group (r=0.47) (table 4.16). When the Beery VMI scores were correlated with the HOME scores, a very strong correlation between the child care Middle Childhood group for visual perception subtest (r=0.83), as well as the motor co-ordination sub test scores (r=0.50) (Table 4.17) was found.

Table 4.18 Interpretation of the strength of correlation results (136,137).

Correlation coefficient range	**Strength of correlation**
0.00-0.30	Weak
0.31-0.50	Moderate
0.51-0.80	Strong
0.81-1.00	Very strong

CHAPTER 5
DISCUSSION

5.1 Introduction

This chapter will first briefly discuss the demographics, environmental supportiveness (as measured by the HOME inventory), associated with development of children living in the community in Mauritius, as well as their developmental status (as measured by the Beery VMI). These assessments provide a base line or standard for demographic factors and validate the use of the HOME and Beery VMI for children in Mauritius, against which the development of children living in a residential child care facility in the same country can be evaluated, in terms of their developmental delay.

The first three objectives of the study concerned determining the factors associated with development in children living in the community in Mauritius. The factors measured included the demographics: BMI (as an indication of nutritional status) and caregiver characteristics, as well as the environmental supportiveness as determined by the HOME inventory. The second objective was similar except that investigated the child care group.

5.2 PART 1: Factors associated with development for children living in the community in Mauritius

5.2.1 Demographic factors

The first objective for Part 1 of the study was to determine the factors associated with development in children living in the community in Mauritius. The factors measured included the demographics: (as an indication of nutritional status) and caregiver characteristics, as well as the environmental supportiveness as determined by the HOME inventory.

The study involved 50 children living in the community in Mauritius between the ages of six and 16 years the group was divided into a Middle Childhood group with ages six to 10 years and Early Adolescence with ages 11 to 16 years to accommodate the HOME assessments.

The demographic information showed the care received by the community indicated that most children lived with two parents with an average of two children household. Therefore there was a high caregiver ratio of 1:1 or 1:2. Research shows links between father's presence in the home and youth mental health, as well as increasing the family's ability to generate income, and that better academic results are achieved when fathers are more

involved in their child's school. In the NICHD (2000) study, they found that fathers and grandparents were more likely to exhibit more positive care giving than providers. The parents were at the average age in their late thirties as is expected of parents with young and teenage children (69).

The parents of the children did, on average have 9.28 years of school education with 34% having only a primary school education (Table 4.1). This is congruent with the pass rate at primary school being 70% in Mauritius (94). The education range with some parents having post school qualification reflects the heterogeneous spread expected in any community.

The recorded income given in the interview was for the parent being interviewed and at an average of 11,000 MUR this which was slightly higher than the average monthly income of women in 2011, at 11000 MUR, but lower than the average salary of 20,050 MUR in Mauritius and which places the parents in the middle to lower socioeconomic group (94).

In the community the participants' nutritional status, which was determined by BMI for age indicates that the group may be considered slightly undernourished (Table 4.2). However, since the child BMI is not normed on the Mauritian population the results were also compared to those from a Mauritian study by Caleyachetty, Rudnicka, Echouffo-Tcheu, Siegel, Richards and Whincup, published in 2012. The incidence of underweight was higher for the control (26%) and child care (46%) participants, than for the participants of the previous study, which was 12.7%. The incidence of overweight and obesity is lower for control (10%) and, child care (6%) participants, when compared to the previous study, which found a prevalence of 25%. In the previous study the Indian children had a mean BMI of 16.6 and the Creole children had a mean BMI of 16.8. This is comparable to the results of the control group in the current study, which had a mean BMI of 16.17 (100). This highlights the problem in the child care group, which had a mean BMI of 12.58.

5.2.2 The Supportiveness of the Environment

The first objective also considered the supportiveness of the environment for the children between six and 16 years, in the community in Mauritius using age appropriate HOME inventories. This assessment was chosen as it provides information about both the physical and emotional/social environments of the children and adolescents. As occupational therapists, both these contexts are of concern if the individual is to be viewed in totality, in relation to their development (138). The median scores for all categories of the HOME inventory suggest that the community children and adolescents lived in physical and social environments that were conducive to normal development. No median

scores more than 2 points below those recorded as acceptable in the HOME administration manual were found for this group, indicating their environment was supportive (Table 4.5). This was true for both the Middle Childhood and Early Adolescence groups.

The assessment and remediation of client factors and performance skills required for academic tasks fall into the scope of the occupational therapist and are used to determine the developmental status of a child in the educational occupational performance area (2). Thus VMI was assessed in the participants in the community to establish if validity of this assessment in determining the developmental status of this group of children as there is no reported studies on the use of this assessment in Mauritius

5.2.3 Visual Motor Integration

The second objective was therefore to determine the VMI of the children between six and 16 years, in the community in Mauritius, using the Beery VMI, and the third objective was to establish if any association between the supportiveness of the environment, demographic factors and VMI scores for these participants.

The mean and standard scores on the Beery VMI, as well as the two subtests, fell within acceptable norms for the community group (Table 4.6), with slightly lower scores for the motor co-ordination subtest. The results showed an essentially normal distribution with the incidence of developmental delay below -2 SD being in the accepted range of 5-10% (Figure 4.4). The slightly lower scores can be attributed to the use of a test normed in the USA in Mauritius as it is unlikely that the population will represent exactly the same VMI profile.

The children in the Middle Childhood group had slightly better scores than those in the Early Adolescence group. This indicates that the VMI ability seems to decline slightly in this group for children older than 10 years of age except for motor co-ordination. As explained by Stromswold et al (2012)(113) VMI is strongly related to genetic component however, because schools explicitly teach copying as children get older, the impact of environmental factors of instruction at school also affects the level of VMI ability eventually obtained. Thus for the older participants other environmental factors like the quality of their schooling, should be researched to account for significantly lower level of their VMI scores, which did not keep up with their age. An additional explanation could be the lack of physical activity related to the amount of time children spend in private tuition, which was highlighted in a government publication in Mauritius in 2011. This limits the time that children have to engage in physical activities (126).

5.2.4 Association between the factors associated with development, the environment and Visual Motor Integration

The finding mentioned above in relation to age and VMI was confirmed by the weak negative correlations between age and the VMI and visual perceptual Beery VMI scores (table 4.7). This could be due to increased academic demands, with children spending more time studying than engaging in physical activity.

A weak correlation between total HOME scores and Beery VMI scores (r = 0.39) for the community group (Table 4.8) confirms that the supportiveness of the environment (as measured by the HOME) does have a low association with VMI, and that better resourced and supportive homes may result in children having higher VMI ability. These only account for less than 20 % of the variance however, indicating that other factors are more important in influencing VMI scores for this group. This only supports the research which shows that HOME scores are related to cognitive development to a small degree (17,73).

Nutritional status was also shown to have little to no impact on Beery VMI scores for the community group and the scores for both aspects were normally distributed (Table 4.7).

The demographic factors determined for the children living in the community in Mauritius indicated they came from supportive environments in middle to low socioeconomic circumstance and that their developmental status as measured on the Beery VMI could be considered to fall into the mean average range. It was therefore assumed that the same assessments and determination of demographic factors could be used to ascertain the developmental status of a group of children living in a residential child care facility in Mauritius.

5.3 PART 2: Factors associated with development for children living in a residential child care facility in Mauritius

5.3.1 Demographic factors

The fourth objective of the study was to determine the factors associated with development in children living in a residential child care facility in Mauritius. Due to the lack of background information on the residential child care facility group, the complexity of environmental circumstances, and differences between individual children in general, only a limited number of variables were considered, when exploring the factors influencing development. The factors measured included the length of stay and age of admission of the children to the residential facility, as well as their BMI (as an indication of nutritional status) and caregiver characteristics.

This part of the study involved 50 children between the ages of six and 16 years living in a residential child care facility, providing long term care for children who could no longer be accommodated in the community. As with the community group the group was divided into a Middle Childhood group with ages six to 10 years and Early Adolescence with ages 10 to 16 years, to accommodate the HOME assessments.

The early years of the child care facility children's lives are unaccounted for, due to limited access to the participants' records. According to Little et al. (2005)(37) most often children in residential care in the USA are from low socioeconomic backgrounds, which is quite likely to be the case in Mauritius, and for this study. Most had been placed in residential care in early childhood, and not as infants, with reports of family neglect as the reason for admission, which is internationally associated with poverty and low SES (15). It is possible that it is these unknown factors that influenced the majority of children who may have spent their early formative years in adverse environments that were not optimal for their development, and an assumption that the children were from low socioeconomic circumstances prior to their admission to the child care facility was made. This means they were probably exposed to these situations prior to their admission to the residential child care facility, which may have contributed to developmental delay. The effects of living in these environments may be reflected in the results for BMI and developmental delay discussed later.

The age of admission and length of stay in the residential child care facility, were compared between the Middle Childhood and Early Adolescence groups. The Early Adolescence group were admitted on average two years younger than those in the Middle Childhood group, a significantly younger age, and had stayed for a significantly longer period in the residential child care facility than those in the Middle Childhood group (Table 4.10). The participants had been in the facility between 14 months and 14 years (mean = 5.94 years) where they received care in a family-type setting. Although the residential child care facility participants were cared for in a family-type environment, which has been shown by previous research to be less detrimental to development than traditional institutional care (36,79,82), the demographic information showed that the children were exposed to factors that have been associated with developmental delay. This includes the age and number of the caregivers as well as the caregiver's income and education level (Table 4.9). It is possible that these factors played a role in influencing the environment the children lived in.

Child to caregiver ratios at the residential facility ranged from 6:1 and 9:1 which is high and has been shown by previous research to affect developmental outcomes

(19,30,33,76,77,81). This would limit the amount of time the caregivers have to spend with each child. The residential child care facility caregivers were also older, on average 13.2 years older than parents of children of a similar age living in the community (Table 4.9) with a mean age of 52.8 years. This has also been shown to impact development (18,58) as age will no doubt influence the amount of help and attention a caregiver can provide. An older, single caregiver, will no doubt have less energy and time to fulfil a parenting role, compared to a younger parent, with a spouse, higher income and fewer children (27).

The caregivers in the residential child care facility were all female which resulted in a lack of male parent figures in the child care facility. Fathers have been considered very important for the well-being of children (84). It has been postulated that the lack of male role models could, later in life, have detrimental effects on male orphans as they seek to develop healthy cross-gender relationships. The lack of a positive male influence in the lives of young girls could also be detrimental in their development. To prevent these problems, it is essential that male role models be introduced into the lives of children (139).

The average level of education of the caregivers was lower than that for parents in the community groups (Table 4.9), but the majority of the caregivers had received some form of training, usually in-house, in child care (Table 4.9). However, the caregivers' income indicated that the caregivers received amongst the lowest salaries paid in Mauritius in 2011 (96) placing them in a low SES. While this does not necessarily reflect the SES of the residential facility, the low salaries may be indicative of limited funding at the facility. More importantly, children are being cared for by caregivers from a low SES and with limited education, factors which have been shown to affect optimal development in children (25,26).

The last demographic factor affecting development that was considered was the participants' nutritional status measured by their BMI for age. Research has demonstrated the impact of nutrition on motor, psychosocial, academic and mental development (101,102), so when considering developmental delay, nutritional status of the participants must be considered as a contributing factor.

A comparison of z scores demonstrated that the child care group had a high percentage (44%) of children who could be considered underweight. The average BMI of 12,58 compared to the average 16,6 reported by Caleyachetty et al for Mauritian children (100), illustrates that the children in child care are less well nourished than those in the community.

In the case of the child care group, it is possible that preadmission diet (and related BMI) played a role in their nutritional status at the time of assessment. This is supported by the finding from this study, that the Middle Childhood participants had the lowest BMI scores, with an average z score of -2.73SD below the mean for their ages (Table 4.11), placing them in the 'thinness' category of the WHO growth reference (10).

The finding for the Early Adolescence group showed that the same problem did not exist in relation to their BMI of 16.3 which is close to the norm reported by Caleyachetty et al. (2012) (100). The moderate association (r =0.47) between age and BMI (Table 4.16), for this group of participants indicates that the BMI increases as they get older, or the longer they remain in child care. This suggests that the child care facility supports the improvement of the children's nutritional status or that due to their earlier age of admission they suffered less from the effects of a low SES in the preadmission environment. These BMI results indicate that the child care environment may not provide an adequate diet.

5.3.2 The Supportiveness of the Environment

The fourth objective also considered the supportiveness of the environment for the children between six and 16 years, in residential child care facility using the age appropriate HOME inventories. The HOME allows for an assessment of the physical and emotional environment which is important in a residential facility where any assessment of deficits should address all aspects of the environment and not only the physical aspects, which are often seen in residential care of young children as more important (69).

The difference for the child care participants in the HOME median scores were more than seven points lower than the median indicating an unsupportive environment (Table 4.12). The total score for the Middle Childhood group showed a greater deficit than that of the Early Adolescence group. This shows that the environment of the eight Middle Childhood homes at the child care facility was less suited to the children's needs than for the 11 Early Adolescence homes. However, some of the homes housed children from both the Middle Childhood and Early Adolescence groups. This finding may indicate the need of the younger children for more support and assistance to develop in their environment. Thus even if the environments for both groups are similar, the lack of support and resources may affect the development of the younger children more.

An examination of the HOME subscales, according to the HOME manual scoring, for the child care Early Adolescence group, shows problems in the following areas: 'learning materials', 'physical environment', and 'family companionship' (Table 4.14). The problems

in the areas of ‘learning materials’ and ‘physical environment’ are possibly linked to the child care facility being of a lower SES with limited funding.

Research supporting the important role of the physical environment in child development is prolific (14,17,31,32,69). A closer view of the HOME inventory responses showed that none of the adolescents had access to a computer, only one house provided access to a musical instrument, only four houses provided access to materials for arts and crafts and/or collections, and had board games available, and only two houses had a full shelf of books visible, although seven of the eleven houses did provide access to at least 20 developmentally appropriate books, and every child had either a library card or their name on a library list.

In addition, the environment was considered too noisy in ten of the houses. Nine of the houses didn’t have sufficient suitable pictures, and all the homes had less than 100 square feet of living space. Although the space in the homes of the children in the residential child care facility was limited, they had additional facilities, such as a large dining area and communal grounds, which all the participants had access to, which could be said to make up for the small living space.

An examination of the scores for ‘family companionship’ shows zero for all items. This implies a general lack of outings, highlights the lack of a father figure, and a lack of visits from relatives or friends. An examination of the ‘family integration’ category (median = 0) demonstrates how the absence of a father or father figure, influences family integration, as all the items refer to time spent with a father (or father substitute), and time spent with the mother and father together. The role of mother and father is therefore placed on the shoulders of the caregiver. Ball and Moselle (2007)(84) reviewed the literature on the effects of absent fathers on child well-being and the positive care that fathers give when compared to care providers (who were not related) in residential care facilities (69). Research linking father involvement and child development is limited, although this aspect should be examined further in relation to residential child care.

An examination of the eight HOME subscales for the child care Middle Childhood group highlighted problems in more areas (Table 4.13), although those that were problematic were similar to the Early Adolescence group. These were ‘learning materials and opportunities’, ‘family companionship’, ‘family integration’ and ‘physical environment’. None of the caregivers were recorded to buy and read a newspaper on a daily basis. It is however possible that they stayed informed of current events by listening to the radio, or from the television. Only one of the houses in the residential child care facility had a dictionary, only two houses provided free access to tapes, CDs or radio. In terms of

access to other resources only one house provided access to a musical instrument and only two houses provided free access to at least ten appropriate books.

The category ‘family companionship’ was affected by low scores for most items. None of the houses visited or received visits from friends or relatives at least twice a month, only one house had a child/ren accompanying the caregiver on a family business venture three to four times within the past year and only one house had taken a child on a trip more than 50 miles from home. Two of the houses recorded that the children had been visited by a friend in the past week indicating a possible lack of integration of the participants into the community in which they live. The lack of visits and visitors could result in the children feeling isolated from the outside community. It appears that the participants were dependent on other children in the facility for companionship and friendship.

One caregiver had assisted the children to achieve advanced motor skills, such as bike riding, skating, ball playing etc. The lack of involvement by the other caregivers in aiding the children with motor skills is most likely due to a lack of time, and possibly due to their more advanced age. It is possible that in the context of a residential child care facility such as this, that the older children (from the Early Adolescence group) would play this role and/or the management of the facility. This emphasises that even within the family-type residential child care environment, there are factors related to individual caregivers that affect the amount of stimulation provided to the children in their care. While this is also true in any family, caregivers in residential child care facilities need to be aware of the greater risk of delay in the children they care for, so an effort can be made to address some aspects like motor skills.

It was found that HOME subscale scores were higher for the categories, ‘encouragement of maturity’, ‘emotional climate’, and ‘enrichment’, relative to scores for the other categories for the participants in residential child care, even though they were still significantly lower than the expected medians for the HOME indicating a support environment.

The lack of emotion and social supportiveness in residential care is supported by Frank et al (1996)(74), who stated that children growing up in a child care facility were more likely to be psychiatrically impaired and Vorria et al (1998)(70) who evaluated only boys, found that the boys in institutions were more likely to have emotional and behavioural problems than family reared boys. Sigal, Perry, Rossignol and Ouimet (2003)(32) showed that a randomly selected group of middle aged people who had been in a residential child care facility since birth, had higher rates of psychosocial dysfunction and chronic stress-related illness, compared to matched people in the community. Therefore, when it comes to

socio-emotional development (70), the residential child care facility environment is often described as having a poorer quality, which does not promote development (33,72,73,83). In this study the social environment was reported as being more adequate than the physical environment. This is possibly due to the family-style care practiced and access to psychological counselling. It is clear however that the participants, although they attend school in the community, are not integrated into the wider community.

Literature has indicated that the lack of a supportive physical environment, linked to low SES (109), as well as inadequate diet (101,102), as found for the participants in child care in this study, can be associated with deficits in children's academic performance. The assessment and remediation of performance skills required for academic tasks fall into the scope of the occupational therapist and are used to determine if there is developmental delay, which may affect the educational occupational performance area (4). Thus VMI was assessed in these participants to determine the association of this skill with the results described above relating to objective four.

5.3.3 Visual Motor Integration

The fifth objective was therefore to first compare the VMI of the children between six and 16 years, in the child care group using the Beery VMI, and the sixth objective was to establish if any association between the supportiveness of the environment, demographic factors and VMI scores could be demonstrated

The child care group had between 13% to 40% of participants whose scores fell below -2SD indicating developmental delay in VMI and the two subtests. The mean scores fell within the 'below average' range, with the lowest scores being for the motor co-ordination subtest (mean standard score 82.08), the VMI mean standard score being 88.38, and the visual perception being 88.12 (Table 4.15).

This differs from the findings of the South African study by Van Heerden et al (2011)(45) who investigated the VMI of children in residential care facilities, and found children in these facilities to have more problems with the visual perception subtest (mean standard score 84.38) than motor co-ordination (mean standard score 92.78). They however also found below average standard scores for VMI. However, comparing children between nations (with multiple environmental and possibly even genetic differences) is less helpful than comparing results typical children in the same country living in a community which supports development.

The relative risk for delay in the Beery VMI scores of the participants living in the residential child care facility was for visual perception at 68%. This Middle Childhood

group was more at risk for motor co-ordination delay relative to norms for the Beery VMI at 56% with the Early Adolescence group only having a 40% risk. The Early Adolescence group also had a 0,55 (55%) relative risk of having a z score below -1 for VMI. This indicates a difference between the Middle Childhood group and the Early Adolescence groups on the VMI scores.

The mean VMI and subtest scores for the Middle Childhood group fell into the – 1SD range (Table 4.15). There was a significant difference between the VMI scores of the Middle Childhood participants and the Early Adolescence participants while the mean VMI and subtest scores for the Early Adolescence group being lower (Table 4.15) indicating that the VMI deficit becomes bigger, and more of a concern, as children reach 10 years of age and older. This supports the findings for the community group in relation to genetics and school experience. Adolescents in the residential facility group however continued to demonstrate lower motor co-ordination scores. This may be related to the lack of exposure to physical activity in the facility.

Occupational therapists typically work with younger children when remediating VMI difficulties (112), due to early intervention being more effective (57,69). This is probably the area that should be addressed in the child care facility, so that children's VMI scores don't decrease as they grow older. Being aware of the deficits in VMI for the Early Adolescence group is still important in understanding and supporting them in the educational occupational performance area.

5.3.4 Association between the factors associated with development, the environment and Visual Motor Integration

The association between age and VMI was further confirmed by the low negative correlation (-0.31) between age and VMI scores for the child care group (Table 4.16). This was found in other studies in residential care (45) and may also indicate that the impact of institutional living on developmental delay will increase, the longer children are in care (40,42,43), despite no association being found between length of stay and VMI.

Deprivation and living in a child care facility have been shown to have an impact on child development (14,16,18,21,35,37). It was therefore anticipated that low HOME scores would be associated with the poor performance on the Beery VMI. However, no association between total HOME scores and Beery VMI for the Early Adolescence group in particular, were found (Table 4.17). It appears that the supportiveness of the

environment (as measured by the HOME) has little relationship to the Beery VMI scores for this age group, irrespective of whether they live at home or in a child care facility.

Therefore it appears that the developmental delay for VMI, for the Early Adolescence group as suggested above, are more related to the quality of their education, and the effects of a low SES situation before and after being admitted to residential care (15).

However, the results for the Middle Childhood group did show very high and high associations between the Beery VMI subtest scores and HOME scores for the Middle Childhood child care group only (Table 4.17), which was the smallest (n=15) of the two groups. This number is too small to draw conclusions from, but indicates that for this age group a more supportive living environment may have an effect on the visual perception and motor co-ordination of the participants.

There was no association found between VMI and other factors assessed in this study such as length of stay (Table 4.16) even though research has showed that length of stay in a residential child care facility is associated with developmental delay (78). However, it is expected that a child staying in an unsupportive environment will suffer increasing delays as they lag further behind in their development.

Nutritional status was also shown to have little to no impact on Beery VMI scores. Moderate negative correlations (r = -0.49) were found between the VMI test and BMI, and the visual perceptual subtest and BMI (r=-0.33) (Table 4.17), indicating that the better nourished children are, the lower their VP and VMI scores. This unexpected result can be explained only by the small sample size, as there is no literature that shows that undernourished children have better developmental outcomes than those who are better nourished, but countless studies show the opposite (12,38,103,104). With no records of preadmission environment it is possible that the pre-admission environment also played a role in influencing BMI and Beery VMI scores obtained (41).

5.4 Limitations of the study

5.4.1 Data collection

A small sample size (n=50 per group) limited the statistics applicable when the group was divided into Middle Childhood and Early Adolescence groups, as this reduced the sample size further, with the smallest group having only 15 participants. The parent income should have included family income in the community group, and not only the income of the parent interviewed. Household income would have given a clearer idea of the income available. Income for the community group was within a range and was not specific, as is

expected to maintain some confidentiality. In addition the lack of background information on the children in child care made it impossible to rule out pre-admission circumstances as possible contributors to the Beery VMI results. When considering income affecting child development for the child care facility, this was difficult to ascertain. Although the budget per child was 2576MUR it is not clear how this money is spent and then how this would compare to what is spent on a child in the community. It is possible that when comparing community and child care facilities that more is spent on the children in the child care facilities. The community group income may need to cover items or services which in the child care facility may fall under the budget of the facility and not the child's budget.

The community and child care group had unequal sampling ages due to the random selection used to select participants in the child care facility. Due to the lower number of younger children more early adolescence participants were selected. This does reflect the age distribution of children in the child care facility….

5.4.2 Test administration

5.4.2.1 Administration of the assessments

The administration of both assessment tools was done by the research assistant, who was a newly qualified occupational therapist, with no post-graduation work experience. . The services of a research assistant were used to complete the assessments as he was able to interview the caregivers in their home language. Although the research assistant practiced the assessments and followed standard administration procedures, he did not receive formal training in test administration. These factors may have affected his observation skills and efficiency in test administration, which may have affected the results. As he conducted 100 Beery VMI assessments and HOME assessments he would have become more proficient toward the end – possibly jeopardising the scores of the children and families assessed at the beginning.

5.4.2.2 Beery VMI

When administering the Beery VMI, some of the Beery VMI subtest assessments were conducted in groups of 2 or 3 children, which resulted in some lack of consistency in administration.

As Beery VMI assessments were analysed and scored by the researcher (who did not know the children), and HOME scores were calculated by the researcher. This will have made up somewhat for the lack of formal training in test administration.

5.4.2.3 HOME Inventory

The administration of the HOME requires more skill. The research assistant was required to complete this assessment as he was able to interview the caregivers in their home language. He may however not have identified some observable indicators in body language and the environment as he was inexperienced. For the Middle Childhood and Early Adolescence assessments, interview information is required for almost two-thirds of the items. Thus good interviewing techniques are deemed essential for the administration of the HOME. Of the 59 items contained in the Middle Childhood scale, only 19 are clearly observation items; with the remaining 40 most often requiring interview. For the EA HOME approximately one third of the items are scored by observation (126). This brings to the fore one of the problems of using a self-report assessment tool like the HOME. It is possible that when interviewed, the caregivers provided more positive answers for certain aspects of care that could reflect on their competence or caring, and thus gave the answer they thought was expected of them. For the Middle Childhood HOME, item 3, only three (of the 11) caregivers said they did not praise the children at least twice during past week for doing something, and only three caregivers admitted to losing their tempers more than once during the past week (item 18). Only one caregiver admitted to more than one incidence of physical punishment during the past month (item 19). These answers may very well be true, although should also be interpreted with caution.

For the EA HOME caregivers may not have been honest about item 24, which indicates if a caregiver has lost her temper with the adolescent more than once during the past week, as it could reflect badly on their caregiving abilities. Only 9 of the 21 HOME assessments indicated a negative response to this answer.

However, the HOME inventory was administered by the same person for all the participants, so there was consistency. When administering the HOME inventory to the child care children, the same caregiver was often responsible for more than one child in the study. She was therefore interviewed with the children present who fell within the age group for the HOME inventory being administered. With more than one child being present this may have affected her responses, which may not have been the same for all the children, and may therefore not have been entirely reflective of her relationship with the child/children. With some of the caregivers being interviewed up to three times this may have resulted in not sure if this would have had any effect.

It is important however to interpret these findings with the knowledge that the HOME inventory is not designed for assessing children in child care facilities, and that some of the areas could be altered to better assess the environment in a such a facility.

In addition, the median scores provided in the HOME inventory manual, for the Middle Childhood and Early Adolescence groups was based on small sample sizes. The Middle Childhood group, used for comparison purposes in the HOME inventory manual was based on data collected from 124 children in Little Rock, Arkansas, in 1982-1983. Approximately 50% of the sample was European American, while 50 % were African American. The data collected for the norming of the EA group was collected in 1995-1996, in Little Rock, Arkansas, San Antonio, Texas, New York, New York, and Los Angeles, California. At 331 this sample was larger and more diverse than that of the Middle Childhood group. Approximately 23% of sample were African American, 30% European American, 17% Chinese American, 15% Dominican American, and 15% Mexican American (126). These populations are both very different to the one in Mauritius.

The HOME was administered while the children involved in the study were present, which in all cases was more than one child. This will have affected items that demanded a judgement on caregivers interaction to an individual child, and was assumed that the caregiver responded in a similar way to all the children, for example the item, 'Parent has not lost temper with child more than once during previous week', demands a response that may be different for all the children (126, p. 60).

The binary scale of the HOME limited the depth of information obtained, and so couldn't be used to make well informed judgments or decisions (131).

5.2.4.4. Body Mass Index

BMI was the only measure of nutritional status used, which is not as conclusive as using multiple methods such as head circumference (134,140) and arm circumference (134). Bhurosy and Jeewon (2013)(101) also used hip circumference in addition to BMI to measure nutritional status of women.

5.5 Bias

The results may have been somewhat biased as some of the children in the community group were friends and family of the research assistant. Other children were from an after school tutoring programme which was attended mainly by Hindu children. These factors were not considered when reviewing the results as were thought to play less of a role in influencing child development than the environment as a whole (as assessed by the HOME).

5.6 Summary

Part 1

The demographic factors assessed for the typical children in the community indicated that the parent characteristics were congruent with supportive environments which meant on average the children fell into a normal range for their developmental status. This was confirmed by the demographics of the parents as well as the physical and emotional environments found in their homes.

There developmental status was confirmed by the results on the Beery VMI with “average “ results for both the Middle Childhood and Early Adolescence groups confirming that this test could be used to assess development of VMI in this sample. There was very little association between the environmental supportiveness measured by the HOME and the VMI scores for this group indicating that other factors influenced their development in this area including genetics and their schooling. A weak negative association between age and VMI scores was found indicating some decrease in VMI and visual perception in the Early Adolescence group although this was not true for the motor co-ordination subtest.

Part 2

The children living in the residential child care facility were exposed to a greater number of demographic factors associated with risk for developmental delay, than typical children in Mauritius. Factors were related to caregiver and child demographics including inadequate nutritional status for the Middle Childcare group.

The environmental supportiveness in the facility was found to be deficient in terms of ‘learning materials’, ‘physical environment’, which is related to a lack of physical resources in the facility and is probably indicative of low socioeconomic circumstances. The ‘family companionship’ and ‘family integration scores’ indicated a problem with lack of father figures and integration in the community surrounding the residential facility. Support from caregivers and other children seem to provide emotional supportiveness with scores for ‘encouragement of maturity’, ‘emotional climate’, and ‘enrichment’, being less deficient. The environment of the younger children was more deficient probably because they are more dependent on their home environment than adolescents for stimulation and input to develop.

In conjunction with exposure to these demographic factors and lack of a supportive environment delays in VMI and the subtests were found for the participants. However although a strong association was found for the Middle Childcare group between the supportiveness of the environment and the Beery VMI scores it must be remembered that

a combination of factors can affect development. Further investigation of these factors is needed, as the Middle Childcare group was a very small sample.

CHAPTER 6
CONCLUSION

With occupational therapy being a relatively new profession in Mauritius, and an absence of published research on the impact of residential child care facilities in Mauritius, the information needed to guide interventions is limited. This study hoped to highlight the developmental status and the assessment of this for typical children living in the community in Mauritius and to determine the effects of living in a residential child care facility of development in the same country. This would assist to identify areas in need of attention in terms of development in children living in residential child care facilities in Mauritius.

The study investigated demographic factors associated with development, environments and visual motor integration of children in Mauritius, and found:

- That for typical children between six and 16 years living in the community presented with a normal range of development, with little association between demographic factors associated with development, the supportiveness of their environments measured by the HOME and their VMI measured using the Beery VMI.
- That children between six and 16 years living in a residential child care facility presented were exposed to greater numbers of demographic factors associated with developmental delay and deficits in the supportiveness of their environments. In conjunction with this they were found to have developmental delay in their VMI scores. There was a strong association between demographic factors as well as association between the supportiveness of their environments and their VMI scores for the younger children, although these need to be interpreted with care.

6.1 Recommendations from the research

Delays in VMI, and inadequate environmental support for development and low BMI were all factors that were found for the child care participants in this study. Targeting these areas, as well as those identified through the HOME inventory will provide increased support for the children in the residential child care facility. Occupational therapy intervention has been shown to have positive effects on the VMI of pre-school children (8), as well as the motor and visual performance of children with fine-motor delays (57). This is supported by certain USA studies which show improvement in self-concept, self-control, behaviour problems, and psychiatric disorders, showing that if the setting is ‘right’ then

placement can be beneficial (39), and Thompson and Smith (1996)(114), who found that the academic achievement of children living in institutions improved when they participated in a specialised programme.

Based on this it would be worth examining the services offered to the children in the child care facility studied, as improvements in their day-to-day programme may help. It may also be worth examining the prevalence and effectiveness of current child development programmes in Mauritius, as child development programmes targeting young children, in low SES groups have been effective in facilitating and promoting childrens' and adolescents' development (22). Walker et al (2007)(103), show strong evidence for early cognitive stimulation to improve cognitive abilities, therefore the earlier any programme is implemented the better.

Although this study did not support the link between environmental supportiveness and VMI, it remains necessary for the environmental inadequacies to be addressed. Research has shown that an environment can be more stimulating if a home is spacious, well equipped, has well organised space, and varied materials for children to engage in their daily occupations (71). With low scores for the HOME categories - physical environment, learning materials and opportunities, learning materials, family companionship and family integration, it may be worth targeting these areas, to increase the supportiveness of the environment for child development. Facilitating visits from children or families from outside the child care facility, as well as visits to friends, relatives and places of interest can only be beneficial.

The lack of physical educational resources such as computers needs to be addressed, as well as the inadequate availability of books. With regards to the level of noise it is possible that this varies according to the time of day and is no doubt difficult to control. However, if not already in place, it is recommended that a fixed period of time be allocated to homework or quiet time, when the child care facility management limits the noise levels, allowing the children to concentrate on their homework. Increasing the availability of media, such as CD players and radios may help the children develop an appreciation for music, current affairs and develop language skills.

Research supports parental involvement in aiding the development of their children (93,141). Groups for support and obtaining information, within the residential child care facility or externally, may assist the caregivers in improving the care provided for the children, through an increased awareness of the difficulties the children face, an ability to share ideas and gain knowledge, as well as a way for the caregivers to feel valued. With the caregivers being older and having many children to care for, the careful use of

community volunteers could offer a practical solution, especially in the area of the physical development of the children. Volunteers could help with the more advanced skills, such as ball skills, skating and bike riding. Literature has however cautioned the use of volunteers, to ensure that volunteers are committed to remain 'stable figures' in children's lives' (59, p. 969). However, it can be argued that it would depend on what they are doing. A few visits from a football professional would not have a negative effect, whilst someone who engages on a personal level with the children would cause a greater impact when he/she left. It would be necessary to check references of all volunteers, establish their availability and skills, and agree on the hours they would be willing to commit.

The development of VMI can be targeted through an increase in physical activities and sports offered to the children, as well as increased participation in fine motor activities. The child care facility did not appear to have sporting facilities, so it may be necessary to use facilities available in the community. The space available however may allow for sports such as basketball (where a ball, board, hoop and net are the only essentials), netball (using this same net) and ping pong. There is a large park nearby which the children could visit, where there are apparatus to climb, as well as space to kick balls and ride bicycles. There are many games involving jumping and running, which could also be encouraged if the setting is right. Fine motor activities such as knitting, sewing, arts and crafts can be facilitated and encouraged.

With a programme targeting the physical development of the participants, improvements in VMI would be anticipated. The Beery VMI administration, scoring and teaching manual, suggests their booklets aimed at developing VMI. These however only cover the zero-to-six age group. Early intervention is best (64), but not possible for most of the participants, especially the EA group.

It is recommended that the children with 'low' and 'very low' scores for any of the subtests receive further assessment and intervention by an occupational therapist. This could be done through the child care facility or the schools. Whalen (2003)(2, no p.) cites various research papers which support the role of occupational therapy in schools. This is yet another route through which the participants could be assisted. The author also supported consulting and educating the adults in the children's home and school environment, 'to ensure an understanding of and match between the child's skills and abilities and the expectations placed on them in the school setting', as well as recommending task modifications, and assistive devices 'to optimize the child's performance in the school setting'.

Results indicated that the participants' BMI improved as they grew older, or the longer they were in child care, indicating that their nutritional status improved while in care. However, with the nutritional status of the children in child care still being significantly lower than the community group, it is worth examining the diets of the participants, as literature supports the link between child cognitive and general development, and nutritional status (103). It should also be considered that the Mauritian population may have a different body build which may impact BMI, although the WHO growth standards confirm that ethnic differences among groups, as well as genetic differences between individuals, are not considered large enough to invalidate the WHO growth standards being used as a standard in any population (137). It would therefore be best to involve a nutritional expert and keep records of the children's weight to monitor changes in weight.

5.8 Recommendations for further research

In order to establish if the environment prior to admission to the child care facility played a role in the Beery VMI scores it would be worth conducting a longitudinal study, comparing VMI on admission, versus VMI a few years later. Establishing if length of stay impacts VMI could be done by repeating the Beery VMI assessments, with the same group of participants. An experimental design could be used to determine the impact of fine and gross motor activities on the development of VMI, especially amongst older children.

As SES has been shown to impact child development in such a tremendous way, it would be worth measuring this more accurately to determine the role it plays in the lives of the children in the residential child care in Mauritius. Research aimed at improving their skill or home environment would also be beneficial.

As the HOME inventory specifically mentions a 'father' or 'father figure' it would be worth examining the impact of a single female caregiver versus a two parent (male and female) family.

A larger study would allow for a factorial analysis of all HOME subscales relative to Beery VMI.

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APPENDIX A: Permission to involve the specific children in the residential child care facility

Research Study - Determination of the development levels of children living in residential child care facilities

JanyBalmano <jany.balmano@soscvmauritius.org> 03/08/2010

to Rajen, me, amedee.dabeech.

Dear Rajen,

Kindly note that I have talked to Mrs Anne Tait who wishes to carry out research on children of SOS Villages based on the subject above.

She will need **at least 35 children** aged 6 to 15 for this research. The latter will have to participate in a 20 min assessment called the Developmental Test of Visual Motor Integration. She will also need to interview some primary care givers (5 -10 sos mothers/ aunties). Mrs Tait will send us a copy of this assessment and questionnaire by email for information and acknowledgement.

Further to our internal regulations regarding confidentiality of information and the Data protection policy of our organisation, I recommend that you assist Mrs Tait in answering a few questions regarding children instead of giving access to children's records.

Please liaise with Mrs Tait for scheduling visits in the village. I suggest that you agree on a plan where assessment is done, for example, for 5 children and 1 caregiver on one visit.

This research I believe can be interesting and will help us understand many things about our children to improve our work with them. We rely on the collaboration of Mrs Tait to submit a copy of her study when it is finished.

Mrs Tait can be contacted on the following number: 762 8656 / 288 3103 or by email:

Best regards,

JANYBALMANO
Assistant Operations Manager

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APPENDIX B: Verbal assent from child participants

VERBAL ASSENT

Hi, my name is _____. What is your name?

Do you want to come with me to draw some pictures in this (show test booklet) book.

It will be fun and I hope you will enjoy it with me today. If you listen well and do your best, you can choose a sticker from my sticker box when we are done.

Are you ready to come with me?

APPENDIX C: Information letters and consent forms for parents and caregivers

APPENDIX C1: Information Sheet for Caregivers/Parents of Community Group

Hi,

I am an occupational therapist studying my Masters degree, and would like to conduct a research study to determine the levels of Visual-Motor Integration of young children living in residential child care facilities in Mauritius.

The aim of the study is to determine the extent of delay in Visual-Motor Integration of children between the ages of six and fifteen years, living in residential child care facilities in Mauritius, compared with their peers, and to note any associations between the different environments, and the levels of Visual-Motor Integration of the children.

I invite you to be part of the control group with whom we will compare the children living in residential child care facilities. Your child will be required to complete a 20 minute assessment involving copying simple geometric forms, and it will also be necessary for my research assistant to interview you (as the primary caregiver) of your child. It is necessary for the interview to be conducted at your home with your child present and awake.

.

The assessment and interview cannot cause harm to your child or to you, and you or your child may choose not to participate, or withdraw from the research at any time, and will not be compromised in any way for doing so.

Confidentiality in terms of yourself and your child will be maintained at all times, with only me, my research assistant (**name**) and my supervisor (Denise Franzsen) having access to the names of the participants. Feedback will be given on request.

Should any problems with your child's Visual-Motor Integration be found you will be provided with the assessment and the names of occupational therapists, should you wish to follow up on the problem.

If you have any questions, please do not hesitate to contact me.

INFORMED CONSENT CAREGIVER/PARENT OF CHILD IN CONTROL GROUP

I, as caregiver/parent/guardian of _____(name of child) hereby give my permission for him/her to participate in the research study, which will involve identifying and copying simple geometric forms. In addition, I agree to be interviewed at my home for the purposes of making associations between home environments and the environment of a residential child care facility.

_____ _____ _____

Signature (Guardian) Print name Date

APPENDIX C2: Information Given and Consent from Residential Child Care Caregivers

16 Sep. 10

Hi

I am an occupational therapist studying my Masters degree, and would like to conduct a research study to determine the development levels of young children living in residential child care facilities in Mauritius.

The aim of my study is to determine the extent of delay in development in children between the ages of six and 15 years, living in residential child care facilities in Mauritius, compared with their peers, and to note any associations between the different environments, and the developmental levels of the children.

I invite you to participate in the study. The research will involve my research assistant interviewing you using a structured interview format taking 45-90 minutes about the institutions environment.

You may choose not to participate, or withdraw from the research at any time, and you will not be compromised in any way for doing so.

Confidentiality will be maintained at all times, with only me and my supervisor having access to the names and background details of the children. Feedback will be given on request.

If you have any questions, please do not hesitate to contact me.

_____ _____

Anne Tait Denise Franzsen (supervisor)

762 8656 / 2883103

INFORMED CONSENT PRIMARY CARE GIVER OF CHILD

SOS Children's Village, Beau Bassin, Mauritius

I, hereby accept the invitation to participate in the research study investigating the development of children in residential child care facilities.

I understand that the purpose of the research is to determine the development of children and to ascertain if an association exists between the environment and developmental levels. I understand that it will be necessary for me to be interviewed for approximately 45 minutes and that all personal information obtained as a result of the research will be kept confidential.

I understand that I can withdraw from the research at any time, and that it will not compromise me or the children in any way.

_____ _____ _____

Name Signature Designation

_____

Date

APPENDIX D: Demographic questionnaire

Code _____Date _____Visitor_____Location _____

D.O.B: _____ Age _____ Sex _____

Date of admission to institution _____ Age at admission_____

Gestational age at birth_____ Weight at birth _____

Medical history

_____
_____
_____

Initials of primary caregiver_____

Socio-economic status (caregiver education and income) _____

Family composition _____
(persons living in household, including sex and age of children)

Family ethnicity_____ Language spoken Caregiver education _____ Caregiver education in child rearing_____

Is child in school? _____ Grade/Class/Standard_____

Current weight(in kg's)_____ Current height (in cm's)____

APPENDIX E: Beery-Buktenika Developmental Test of Visual-Motor Integration

The Beery-Buktenika
Developmental Test of Visual-Motor Integration

Beery™ VMI

Fifth Edition

Ages 2 through 18 (FULL FORM)

by Keith E. Beery, Norman A. Buktenica, and Natasha A. Beery

Name/Code _____ Last _____ First _____ Sex: ○ F ☐ M

School: _____ Grade: _____

Examiner: _____

Test Date: ____ year ____ month ____ day

Birth Date: ____ year ____ month ____ day

Chronological Age: ____ years ____ months

(Count more than 15 days as one month.)

SUMMARY

See the Beery VMI manual (fifth edition) for norms.

	Beery VMI	Visual Perception	Motor Coordination
Raw Scores:	____	____	____
Standard Scores:	____	____	____
Scaled Scores:	____	____	____
Percentiles:	____	____	____
Other Scaling:	____	____	____

Comments and Recommendations:

PROFILE

Standard Score	Beery VMI	Visual Perception	Motor Coordination	Percentile
145	-	-	-	99.7
140	-	-	-	99.2
135	-	-	-	99
130	-	-	-	98
125	-	-	-	95
120	-	-	-	91
115	-	-	-	84
110	-	-	-	75
105	-	-	-	63
100	-	-	-	50
95	-	-	-	37
90	-	-	-	25
85	-	-	-	16
80	-	-	-	9
75	-	-	-	5
70	-	-	-	2
65	-	-	-	1
60	-	-	-	.8
55	-	-	-	.3

Begin testing on page 1. Turn booklet over with bound edge toward the student. If subtests are used, always test in this order: VMI → Visual → Motor.

PEARSON

PsychCorp

Product Number 48222/46223

Page 24

APPENDIX E1: Standard Score Interpretation for Beery VMI

STANDARD SCORE INTERPRETATION OF BEERY VMI		
Standard score	**Performance**	**% of age group**
>129	Very high	2
120-129	High	7
110-119	Above average	16
90-109	Average	50
80-89	Below average	16
70-79	Low	7
< 70	Very Low	2

APPENDIX F: HOME Inventory

APPENDIX F1: Middle Childhood (6-10 years) HOME Record Form

Date:
Initials of caregiver/parent: Caregiver age: Caregiver education level:
Caregiver education in child rearing:
Initials of children present at interview:
Location:

Middle Childhood (6-10 years) HOME Record Form

Place a plus (+) or minus (-) in the box alongside each item depending on whether the behaviour is observed during the visit, or if the parent reports that the conditions or events are characteristic of the home environment. Enter the subtotals and the total on the Summary Sheet. **Observation (O), Either (E), or Interview (I) is indicated for each item.**

I. RESPONSIVITY		21. Parent has not cried or been visibly upset in child's presence more than once during past week. **I**	
1. Family has fairly regular & predictable daily schedule for child (meals, day care, bedtime hour, how much TV, homework, etc.). **I**		22. Child has a special place in which to keep his/her possessions. **E**	
2. Parent sometimes yields to child's fears or rituals (allows night light, accompanies child to new experiences, etc.). **I**		23. Parent talks to child during visit (beyond correction and introduction). **O**	
3. Child has been praised at least twice during past week for doing something. **I**		24. Parent uses some term of endearment or some diminutive for child's name when talking about child at least twice during visit. **O**	
4. Child is encouraged to read on his own. **I**		25. Parent does not express overt annoyance with or hostility toward child (complains, describes child as "bad," says child won't mind, etc.). **O**	
5. Parent encourages child to contribute to the conversation during visit. **O**		**IV. LEARNING MATERIALS & OPPORTUNITIES**	
6. Parent shows some positive emotional response to praise of child by Visitor. **O**		26. Parent buys and reads a newspaper daily. **I**	
7. Parent responds to child's questions during visit. **O**		27. Family has a dictionary and encourages child to use it. **I**	
8. Parent uses complete sentence structure and some long words in conversing. **O**		28. Child has visited a friend by him/herself in the past week. **I**	
9. When speaking of or to child, parent's voice conveys positive feelings. **O**		29. Child has free access to tapes, CD, or record player or radio. **I**	
10. Parent initiates verbal interchanges with Visitor, asks questions, makes spontaneous comments. **O**		30. Child has free access to musical instrument (piano, drum, ukulele, or guitar, etc.). **E**	
II. ENCOURAGEMENT OF MATURITY		31. Child has free access to at least ten appropriate books. E.	
11. Family requires child to carry out certain self-care routines, e.g., makes bed, cleans room, cleans up after spills, bathes self. I		32. Child has free access to desk or other suitable place for reading or studying. I	
12. Family requires child to keep living and play area reasonably clean and straight. I		33. House has at least two pictures or other type of art work on the walls. O	
13. Child puts own outdoor clothing, dirty clothes, night clothes in special place. I		V. ENRICHMENT	
14. Parents set limits for child and generally enforce them. I		34. Family has a TV, and it is used judiciously, not left on continuously. I	
15. Parent is consistent in establishing or applying family rules. I		35. Family encourages child to develop or sustain hobbies. I	

16. Parent introduces Visitor to child. **O**		36. Child is regularly included in family's recreational hobby. **I**	
17. Parent does not violate rules of common courtesy during visit. **O**		37. Family provides lessons or organizational membership to support child's talents (Y membership, gymnastic lessons, art center, etc.). **I**	
III. EMOTIONAL CLIMATE		38. Child has ready access to at least two pieces of playground equipment in the immediate vicinity. **I**	
18. Parent has not lost temper with child more than once during previous week. **I**		39. Child has access to a library card, and family arranges for child to go to library once a month. **I**	
19. Parent reports no more than one instance of physical punishment occurred during past month. **I**		40. Family member has taken child to (or arranged for child to visit) a scientific, historical or art museum within the past year. **I**	
20. Child can express negative feelings toward parents without harsh reprisals. **I**		41. Family member has taken child on (or arranged for child to take) a plane, train, or bus trip within the past year. **I**	
VI. FAMILY COMPANIONSHIP		51. Child has remained with this primary family group for all his life aside from 2-3 week vacations, illnesses of mother, visits to grandparents, etc. **I**	
42. Family visits or receives visits from relatives or friends at least twice a month. **I**		**VIII. PHYSICAL ENVIRONMENT**	
43. Child has accompanied parent on a family business venture 3-4 times within the past year (to garage, clothing shop, appliance repair shop, etc.). **I**		52. Child's room has a picture or wall decoration appealing to children. **E**	
44. Family member has taken child, (or arranged for child to attend) some type of live musical or theatre performance. **I**		53. The interior of the home or apartment is not dark or perceptually monotonous. **O**	
45. Family member has taken child on (or arranged for child to take) a trip of more than 50 miles from home (50-mile radial distance, not total distance). **I**		54. In terms of available floor space, the rooms are not overcrowded with furniture. **O**	
46. Parents discuss TV programs with child. **I**		55. All visible rooms of the house are reasonably clean and minimally cluttered. **O**	
47. Parent helps child to achieve advance motor skills—ride a two-wheel bicycle, roller skate, ice skate, play ball, etc. **I**		56. There is at least 100 square feet of living space per person in the house. **O**	
VII. FAMILY INTEGRATION		57. House is not overly noisy—TV, shouts of children, radio, etc. **O**	
48. Father (or father substitute) regularly engages in outdoor recreation with child. **I**		58. Building has no potentially dangerous structural or health defects (e.g., plaster coming down from ceiling, stairway boards missing, rodents, etc.). **O**	
49. Child sees and spends some time with father or father figure 4 days a week. **I**		59. Child's outside play environment appears safe and free of hazards. (No outside play area requires an automatic minus.) **O**	
50. Child eats at least 1 meal per day, on most days, with mother and father (or mother and father figures). **I**			
TOTALS I____ II_____ III____ IV____ V____ VI____ VII____ VIII____ TOTAL _____			

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APPENDIX F2: Early Adolescent (10-15 years) HOME Record Form

Date:
Initials of caregiver/parent: Caregiver age: Caregiver education level:
Caregiver education in child rearing:
Initials of children present at interview:
Location:

Early Adolescent (10-15 years) HOME Record Form

Place a plus (+) or minus (-) in the box alongside each item depending on whether the behavior is observed during the visit or if the parent reports that the conditions or events are characteristic of the home environment. Enter the subtotal and the total on the front side of the Summary Sheet.

I. PHYSICAL ENVIRONMENT		21.Parent participates in an adolescent-oriented organization. **I**	
1. Adolescent's room has at least two pictures or decorations appealing to an adolescent. **E**		22.Parent has friends with whom s/he regularly interacts outside of work. **I**	
2. House or apartment has no potentially dangerous structural or health hazards. **O**		23.Parent regularly engages in fitness activities at least 2 days a week. **I**	
3. Home has at least 100 square feet of living space per person. **O**		24.Parent has not lost temper with adolescent more than once during past week. **I**	
4. Home and immediate surroundings are not overly noisy. **O**		25.None of the adults in the home displays obvious signs of recent alcohol or non-prescriptive drug consumption. **O**	
5. House or apartment is clean. **O**		26.Parent uses complex sentence structure and some long words in conversing. **O**	
6. The interior of the house or apartment is not dark or perceptually monotonous. **O**		27.Parent does not violate rules of common courtesy (ignoring Visitor, derogatory comments, or hitting child) during the visit. **O**	
7. Immediate external environment is esthetically pleasing and contains no obvious health or safety hazards. **O**		**IV. FOSTERING SELF-SUFFICIENCY**	
II. LEARNING MATERIALS		28.Parent has discussed current events with adolescent during past 2 weeks. **I**	
8. Adolescent has access to materials for arts and crafts and/or collections. **E**		29.Parent teaches adolescent basic cooking or cleaning skills. **I**	
9. Adolescent has library card or name on library list. **I**		30.Parent has taught adolescent how to deal with health and safety emergencies. **I**	
10.Adolescent has access to at least 20 developmentally appropriate books. **E**		31.Parent has arranged for special instruction outside of school for adolescent. **I**	
11.Home has at least 2 types of reference materials (e.g., dictionary, encyclopedia, CD). **E**		32.Parent has assisted adolescent with homework and school assignments during past 2 weeks. **I**	
12.Adolescent has access to a musical instrument. **E**		33.Parent has established rules about homework and checks to see if homework is completed. **I**	
13.Adolescent has access to desk or other suitable place for reading or studying. **E**		**V. REGULATORY ACTIVITIES**	
14.Adolescent has access to home computer. **E**		34.Family has a TV, and it is used judiciously, not left on continuously. **I**	

15.Adolescent has access to at least 2 appropriate board games. **E**		35.Parent periodically discusses the hazards of alcohol and drug abuse with adolescent. **I**	
16.Adolescent has access to at least 2 pieces of appropriate equipment for physical development or organized sports activities. **E**		36.Parent has provided guidance or advice to adolescent during the past year concerning responsible sexuality and physical hygiene. **I**	
17.At least one full shelf of books is visible in the home. **O**		37.Adolescent has weekly routine household responsibilities. **I**	
III. MODELING		38.Family has a fairly regular and predictable daily schedule .**I**	
18.Parent has read at least four books during past year. **I**		39.Parent requires adolescent to sleep at home on school nights. **I**	
19.Parent obtains and reads a newspaper daily or a weekly news magazine. **I**		40.When parent is not available to adolescent at home, reasonable procedures have been established for check in with parents, or their designee, on weekends and after school. **I**	
20.Parent regularly participates in church activities. **I**		41.Parent establishes rules for adolescent's behaviour with peers and asks questions to determine whether the rules are being followed. **I**	
42.Parent has had contact with at least 2 of the adolescent's friends in the last month. I		**VII. ACCEPTANCE**	
43.Parent knows signs of drug usage and remains alert to possible experimentation or abuse. I		52.Parent mentions a particular skill, strength, or accomplishment of adolescent during interview. **O**	
VI. FAMILY COMPANIONSHIP		53.Parent shows some positive emotional response to praise of adolescent by visitor. **O**	
44.Family member has arranged for adolescent to go to a scientific, historical, or art museum during the past year. **I**		54.Parent does not ridicule or express hostility or refer to the adolescent in a derogatory manner during the visit. **O**	
45.Family member has arranged for adolescent to attend some type of live musical or theater performance during the past year. **I**		55.Parent talks to adolescent during the visit (beyond correction and introduction). **O**	
46. Family member has arranged for adolescent to go on a trip of more than 50 miles from home during the past year. **I**		56.During the visit, when speaking of or to the child, the parent's voice conveys positive feeling. **O**	
47.Father regularly engages in outdoor activity with the adolescent at least once every two weeks. I		57.Parent allows adolescent to have some privacy. **I**	
48.Adolescent spends some time with father (or father figure) 4 days a week. **I**		58.Parent encourages adolescent to contribute to the conversation during visit. **O**	
49.Adolescent eats at least one meal per day, on most days, with mother and father. **I**		59.Parent responds appropriately and positively to adolescent's questions or comments during the visit. **O**	
50.Family visits or receives visits from relatives or friends at least once a month. **I**		60.Adolescent can have a disagreement with parent without harsh reprisals. **I**	
51.Family member has taken adolescent to a live organized athletic or sporting event during the past year. **I**			

TOTALS

I_____ II_____ III_____ IV_____ V_____ VI_____ VII_____ TOTAL_____

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APPENDIX F3: Mean, Standard Deviation and Median for HOME Inventory – Middle Childhood

Middle Childhood HOME

N = 124

Scale	Number of Items	Mean	SD	Median
Responsivity	10	8.4	2.3	9
Encouragement of Maturity	7	4.8	1.6	5
Emotional Climate	8	6.0	1.6	7
Learning Materials & Opportunities	8	3.4	2.2	4
Enrichment	8	5.2	2.0	6
Family Companionship	6	4.1	1.4	5
Family Integration	4	2.4	1.2	3
Physical Environment	8	6.8	1.7	7
TOTAL	59	41.6	9.0	46

Data were collected in Little Rock, Arkansas, in 1982-1983. Approximately 50% of sample were African American, 50% European American. Publications using the measure include the following.

Bradley, R.H., Caldwell, B.M., Rock, S.L., Hamrick, H.M., & Harris, P. (1988). Home observation for measurement of the environment: Development of a HOME inventory for use with families having children 6 to 10 years old. Contemporary Educational Psychology, 13, 58-71.

Bradley, R.H., Caldwell, B.M., & Rock, S.L. (1988). Home environment and school performance: A ten-year follow-up and examination of three models of environmental action. Child Development, 59, 852-867.

Bradley, R.H., Rock, S.L., Caldwell, B.M., Harris, P., & Hamrick, H.M. (1987). Home environment and school performance among black elementary school children. Journal of Negro Education, 56, 499-509.

APPENDIX F4: Mean, Standard Deviation and Median for HOME Inventory – Early Adolescent

Early Adolescent HOME
N = 331

Scale	Number of Items	Mean	SD	Median
Physical Environment	7	5.9	1.5	7
Learning Materials	10	6.3	2.7	7
Modeling	10	6.7	2.1	7
Fostering Self-sufficiency	6	4.0	1.4	4
Regulatory Activities	10	8.3	1.8	9
Family Companionship	8	4.7	2.0	5
Acceptance	9	7.9	1.6	9
TOTAL	60	43.6	9.4	44

Data were collected in Little Rock, Arkansas, San Antonio, Texas, New York, New York, and Los Angeles, California, in 1995-1996. Approximately 23% of sample were African American, 30% European American, 17% Chinese American, 15% Dominican American, 15% Mexican American. Publications using the measure include the following.

Bradley, R. H., Corwyn, R. F., Caldwell, B. M., Whiteside-Mansell, L., Wasserman, G. A., & Mink, I. T. (2000). Measuring the home environments of children in early adolescence. Journal of Research on Adolescence, 10, 247-289.

Bradley, R. H., &Corwyn, R. (2000). The moderating effect of perceived amount of family conflict on the relation between home environmental processes and the well-being of adolescents. Journal of Family Psychology, 14, 349-364.

Bradley, R. H., &Corwyn, R. F. (2001). Home environment and behavioral development during adolescence: The mediating and moderating roles of self-efficacy beliefs. Merrill-Palmer Quarterly, 47, 165-187.

APPENDIX G: Letter of Permission and Ethical Approval from the Ministry of Health and Quality of Life in Mauritius

University
of the Witwatersrand,
Johannesburg

Department of Occupational Therapy

7 York Road, Parktown, 2193 South Africa • Telegrams 'Witsmed' • Tel: +27-11-717-3701 • Fax: +27-11-717-3709
E-mail: franzsend@therapy.wits.ac.za

LETTER OF PERMISSION, MINISTRY

Ministry of Health and Quality of Life

Port Louis, Mauritius Date:

To Whom It May Concern

I am an occupational therapist studying my Masters degree, and have recently received ethical clearance to conduct research in two of the residential child care facilities in Mauritius.

The aim of my study is to determine the extent of visual motor integration delay of children between the ages of six and 15 years, living in residential child care facilities in Mauritius, compared with age and sex matched peers, and to note any associations between the different environments, and the developmental levels of the children.

I request your permission to assess all the children in the above age group who are resident in the government owned residential child care facility in Albion. The research will involve the participation of each child in an 20 minute assessment using the Developmental Test of Visual Motor Integration which is a well known, standardised measure of visual perceptual and co-ordination skills. The assessment involves the child copying and matching shapes on paper. It will also be necessary for my research assistants to interview the primary caregivers of the children using a structured interview format taking 45-90 minutes about the home environment. It will be helpful if access to the children's records is permitted in order for demographic information to be obtained and measure their height and weight.

The tests cannot cause harm to the children or caregivers, and a child or caregiver may choose not to participate, or withdraw from the research at any time, and will not be compromised in any way for doing so. Names of occupational therapists in the area as well as the results of the assessments will be provided if developmental delay is found, so that this problem can be addressed by you.

Please can you complete the attached permission letter to grant permission for the children and caregivers to participate in my study.

Confidentiality of the subjects and the name of your facility will be maintained at all times, with only me and my supervisor having access to the names and background details of the children.

If you have any questions, please do not hesitate to contact me.

_____

Anne Tait

762 8656 / 2883103

Anisa Keshav (Secretary –Ethics Committee)

+27117171234

APPENDIX H: Ethical Approval
APPENDIX H1: Ethical Approval from Ministry of Health and Quality of Life, Mauritius

MINISTRY OF HEALTH AND QUALITY OF LIFE

The National Ethics Committee

Decision

Project Protocol:	MHC/CT/NETH/ TAI
Submitted in:	March 2010
Applicant:	Mrs Anne Tait
Project Title:	Research in Residential Child Care Facilities (RCF's) in Mauritius.

National Ethics Committee Meeting held on 16 June 2010 has

Awarded Ethical Clearance

to the above study.

You are also requested to:-

(a) submit a Progress Report every month;
(b) Notify the Ethical Committee of any amendment of recruitment of material or of consent form, or of information to be submitted to the research participants;
(c) Report to the Ethical Committee any serious or unexpected, unforeseen circumstances;
(d) Report to the Ethical Committee termination of the study;
(e) Provide relevant information to the Ethical Committee for ongoing review;
(f) Give a copy of the Final Summary on the Final Report to the Ethical Committee.

Ministry of Health & Quality of Life
Mauritius

(Dr N. Gopee)
Director-General Health Services
for Supervising Officer

APPENDIX H2: Ethical Approval from the Human Research Ethics Committee at the University of the Witwatersrand

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Ms Anne Tait

CLEARANCE CERTIFICATE	**M090530**
PROJECT	Visual Motor Integration of Children Residing in Residential Chil Care Facilities in Mauritius
INVESTIGATORS	Ms Anne Tait.
DEPARTMENT	Department of Occupational Therapy
DATE CONSIDERED	09.05.29
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 30/07/2010 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Mrs D Franzsen

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...