

**The effect of mHealth and conventional awareness campaigns on caregivers' developmental literacy.**

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In the end it was a truly humbling and satisfying endeavour that I shall never forget.

**UNIVERSITY OF PRETORIA**  
**FACULTY OF HUMANITIES**  
**DEPARTMENT SPEECH-LANGUAGE PATHOLOGY AND AUDIOLOGY**

**DECLARATION**

**Full name:** Courtney Brown

**Student Number:** u13028465

**Degree:** MA Speech-Language Pathology

I declare that this research report is my own original work. Where secondary material is used, this has been carefully acknowledged and referenced in accordance with university requirements.

I understand what plagiarism is and am aware of the University of Pretoria's policy in this regard.



**SIGNATURE**

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**DATE**

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### **List of Abbreviations**

CDC – Center for Disease Control

ECD - Early childhood development

ECI - Early childhood intervention

FTF- Face-to-face

KIDI – Knowledge of Infant Development Inventory

HIV/AIDS - Human immunodeficiency virus, acquired immunodeficiency syndrome

LMIC - Low-middle income countries

RTHB – Road to health book

SAHRC- South African Human Rights Commission

UNICEF- United Nations Children’s Fund

WHO – World Health Organization

### **Formatting**

The American Psychological Association (*6<sup>th</sup> edition*) referencing style was utilised in the current dissertation.



## **Abstract**

### *Introduction*

Early childhood development (ECD) should be monitored closely as unattained early milestones are one of the first signs of possible developmental delay. In low-middle income countries, children in impoverished households face a multitude of risk factors that may impact ECD. Compromised ECD can lead to negative outcomes, the continuation of the intergenerational cycle of poverty and reduced educational and vocational opportunities. Increased developmental monitoring from caregivers can counter the effects of risk factors. Developmental literacy is the knowledge and beliefs about child development that can aid in early recognition and support of children with developmental delays. Increased developmental literacy supports positive parenting thus improving ECD outcomes. This study aimed to determine the effect of mHealth and conventional awareness campaigns on caregivers' developmental literacy.

### *Method*

Caregivers were recruited from a primary health care facility in a low-resourced setting. Once participants consented, caregivers' developmental literacy was assessed using the Knowledge of Infant Development Inventory (KIDI), prior to their exposure to awareness campaigns. The participants were randomly divided into three groups; two intervention groups (mHealth and conventional awareness campaigns) and a control group. mHealth participants received SMS's once a week over a course of three months. The conventional awareness group participants received the same information but, in a pamphlet, given at the initial interview. Participants were reassessed after three months. The KIDI was performed again to evaluate possible changes in developmental literacy post exposure to the awareness campaigns.

### *Results and discussion*

Results showed that neither awareness campaign was more effective ( $p=.359$ ); as intervention groups' results were similar to those of the control group. There was a significant improvement ( $p=.000$ ), from pre-test to post-test, across the entire sample ( $n= 127$ ). Improvements may be due to pre-test face-to-face interviews with caregivers. This approach may be more effective than awareness campaigns in improving development literacy.

### *Conclusion*

It appears that in the current study, neither awareness campaign is more effective than the other. Due to the lack of statistical significance in the score between the mHealth and

conventional awareness campaigns. Further research is needed to evaluate the effectivity of face-to-face interviews in improving developmental literacy. The importance of ECD should not be underestimated and thus determining the most effective way of improving developmental literacy is vital to the future of children from LMIC.

**Keywords:** Developmental literacy; mHealth; awareness campaign; early childhood development

## Chapter 1: Introduction

**Chapter Aim:** Chapter 1 explores early childhood development and how environmental factors in lower-middle income countries can impact early childhood development. The primary focus being on how caregivers' developmental literacy levels can influence early childhood development. Awareness campaigns' effectivity in improving caregiver developmental literacy is discussed, particularly mHealth and conventional campaigns.

### 1.1 Early childhood development

Early childhood development (ECD) should be monitored closely as unattained early milestones are one of the first signs of possible developmental delay (Jeyaseelan & Sawyer, 2017). ECD includes four major areas of development that are established in the first nine years of life; namely speech and language acquisition, sensory and motor skills, cognitive skills and psychosocial wellbeing (Olusanya, 2011). By promoting ECD, the foundation for a lifetime of learning is built while preventing the possibility of developmental delays (World Health Organization [WHO] & United Nations Children's Fund [UNICEF], 2012). Facilitating ECD can occur in any setting and involves aspects from childcare to parent education (Corr, Santos, & Fowler, 2015).

Developmental delays are characterised by delayed function due to an immature central nervous system (Jeyaseelan & Sawyer, 2017). The first two years of children's lives are vital for development due to the high plasticity of the brain (Benzies, Magill-Evans, Hayden, & Ballantyne, 2013). The success of early childhood intervention (ECI), in reducing developmental delays, is underpinned by taking advantage of this highly malleable period (Jeyaseelan & Sawyer, 2017; English, Peer, Honikman, Tugendhaft, & Hofman, 2017; Gao, Lin, Grewen, & Gilmore, 2017). If children with developmental delays and their families do not receive appropriate services, their difficulties may worsen, which would affect their future (WHO & UNICEF, 2012). By monitoring vital milestones, ECI can be implemented to improve the developmental outcomes and reduce long-term consequences (Raspa, et al., 2015) such as diminished academic performance as well as psychological and social development (Eadie, et al., 2010).

Caregiver knowledge of typical child development is also known as developmental literacy, i.e. knowledge and beliefs about child development that can aid in early recognition and support of children with developmental delays (Jeyaseelan & Sawyer, 2017). Childhood developmental outcomes are therefore better supported with increased caregiver

developmental literacy levels (Burger, 2010; Nuttall, Valentino, & Borkowski, 2012; Zand, et al., 2015). Developmental literacy has also been linked to the ability to provide positive parenting (Dermott & Pomati, 2016). Positive parenting is defined as warm, consistent parenting accompanied by good relationships, non-violent forms of discipline and supervision over children that is developmentally appropriate (Gould & Ward, 2015). Increased developmental literacy facilitates the establishment of nurturing environments that allow for age-appropriate stimulation which in turn promotes learning and development (Britto, et al., 2017). Caregivers with adequate developmental literacy tend to engage in positive parenting more successfully (Cooper, et al., 2009; Nuttall et al., 2015; Valentino, & Borkowski, 2012), which encourages behavioural and physiological development (Bernard, Meade, & Dozier, 2013; Britto, et al., 2017).

Developmental literacy and positive parenting can improve the ECD outcomes of all children. Caregivers perform a critical role in promoting children's learning and development (Cprek, Williams, Asaolu, Alexander, & Vanderpool, 2015). In combination with the presence of a cognitively stimulating environment, positive parenting in early childhood can enhance many areas of children's developmental and possibly future academic success (Shah, Kennedy, Clark, Bauer, & Schwartz, 2016). Considering that many children in LMIC are exposed to a multitude of risk factors that already affect their academic performance, targeting positive parenting in LMIC, could assist in reducing the impact of the risk factors (Weisleder, et al., 2016). Targeting positive parenting in caregivers of children exposed to multiple biological and environmental risk factors, can be especially beneficial for this vulnerable population.

In contrast, reduced developmental literacy and positive parenting can result in developmental delays as caregivers struggle to accurately monitor developmental milestones. Often, due to a lack of awareness, intervention is sought too late and, the optimal period of neural plasticity is missed (Anderson, Spencer-Smith, & Wood, 2011). A study investigating caregivers' knowledge of ECD was performed in South Africa using a 21 item questionnaire that spanned the domains of gross motor; fine motor and visual development; cognitive; language and speech; and social and emotional development (Meintjies & van Belkum, 2013). Data extrapolated from the study indicates that caregivers' knowledge of ECD was approximately 35.2% (Meintjies & van Belkum, 2013). As a result, innovative approaches to improving knowledge of developmental milestones require investigation. In LMIC, the importance of early identification of developmental delays is recognised and efforts are being made to improve caregivers ability to do so (Richter, et al., 2017). Unfortunately, the quality and coordination of these efforts are inconsistent in resource constrained regions (Black, et al., 2017).

## **1.2 Early childhood development in LMIC**

Many children in LMIC are at risk of developmental delay due to repeated exposure to numerous and cumulative biological risks, including poor maternal prenatal health and infectious diseases, as well as environmental risk factors such as limited maternal education and poverty (Meintjies & van Belkum, 2013; Zand, et al., 2015). Research has shown that poverty and the associated risk factors potentially inhibit over 250 million young children in LMIC from reaching their developmental potential (Britto , Singh, Dua, Kaur, & Yousafzai, 2018). In 2016, 63% of children in South Africa were living below the upper-bound poverty line, which at the time equated to R965 or less per household per month (Delany, Jehoma, & Lake , 2016). Poverty experienced in underserved communities obstructs childrens' access to basic education and primary health care throughout their life (Mbarathi, Mthembu, & Diga, 2016). Children living in poverty often experience malnutrition which impacts their growth of the brain and central nervous system (Alamy & Bengelloun, 2012; Vorster, 2010), and in turn increases the likelihood of developmental delays (Mehta, et al., 2013). One of the most effective long-term methods in the reduction of poverty is the advancement of ECD (Hall, et al., 2016).

Protective factors decrease the impact of biological and environmental risk factors that can affect LMIC children's ECD (Walker, et al., 2011). Included in protective factors are adequate maternal education level, long-term exclusive breast-feeding and adequate developmental literacy (Jeyaseelan & Sawyer, 2017; Walker, et al., 2011). Maternal education level has been linked to developmental literacy and positive parenting (Cprek et al., 2015; Greenaway, Leon, & Baker, 2012; Martinez-Torteya, et al., 2018; Yue, et al., 2017). Low education levels can result in the caregiver struggling to monitor the child's developmental progress (Britto , Singh, Dua, Kaur, & Yousafzai, 2018). The intergenerational cycle of poverty affects access to education, resulting in caregivers with low education levels living in poverty (Metzler, Merrick, Klevens, Ports, & Ford, 2017). Studies have shown that in South Africa, 62% of caregivers leave school at Grade 10 or before (Meintjies & van Belkum, 2013; van der Linde, et al., 2016). Due to financial constraints, books and stimulating toys are often less available in poverty-stricken homes (Dermott & Pomati, 2016). With higher maternal educational levels, the child will have more educational and stimulating opportunities, which could reduce the impact of risk factors.

## **1.3 Intervention in South Africa**

The public health care sector serves 84% of the South African population (Naidoo, 2012). The South African government recognises the impact multiple risk factors can have on the human life and in response allocates resources to the public health care sector (Jobson, 2015). The

public health sector still experiences challenges, including, inadequate quality of care in facilities, limited number of healthcare professionals and, poor infrastructure and access to the facilities (Jobson, 2015; Samuels, Slemming & Balton, 2012). The government has acknowledged primary prevention as a vital component for decreasing the appearance of atypical development (Cicchetti & Toth, 2009; Sroufe, 2013). Despite their efforts, health and developmental outcomes of South African children remain poor (Jobson, 2015). In sub-Saharan Africa, 44% of young children were estimated to have low developmental scores (McCoy, et al., 2016). In addition to the exposure to risk factors, a contributing factor to poor outcomes, may be that one fifth of children experience poor access to clinics where developmental surveillance takes place (Hall, et al., 2016). Healthcare professionals are unable to sufficiently meet the needs of more rurally located mothers and young children due to geographical inequities (Ataguba, Day, & McIntyre, 2014). Furthermore, once at the clinic, medical staff may not be experienced with working in contexts that are cross-linguistically and culturally diverse (Latif, et al., 2017), which may contribute to the inadequate quality of care.

The well-baby clinics, provided by the primary health care sector, are a viable prevention platform from which caregivers' developmental literacy may be addressed (Sokhela, Sibiyi, & Gwele, 2018). Surveillance programmes are, however, lacking in South Africa and ECD screenings are predominately provided by overburdened health institutions and primary health care professionals (Samuels et al., 2012). These services exhibit a professional-led perspective that sees caregivers as mostly passive participants (Jeyaseelan & Sawyer, 2017). Programmes that educate caregivers with knowledge and the ability to monitor and support children are caregiver-led programmes (Jeyaseelan & Sawyer, 2017). Alternate service delivery models, such as caregiver-led programmes, should be considered to reduce the strain on the health care system and to meet the needs of this vulnerable population (Jeyaseelan & Sawyer, 2017). A number of fundamental objectives must be addressed in order to decrease the risk factors and increase developmental outcomes including improved positive and responsive caregiving and increased opportunities for high quality early education (McCoy, et al., 2016).

With increased developmental literacy, caregivers can actively monitor and support development through increased positive parenting and seek intervention for their child, when necessary (WHO, 2012). South Africa has recognised the importance of improving ECD through caregivers' involvement. The Nurturing Care Framework has been incorporated into South Africa's National Integrated Early Childhood Development Policy for 2030 (Lindland, Richter, Tomlinson, Mkwazazi, & Watt, 2016) along with, the Side-by-Side campaign. The Side-by-Side campaign includes the production and use of various resources such as, MomConnect as well as the Road to Health Book (RTHB) (Side-by-Side, n.d.). The resources

aim to improve caregivers' understanding of the child development and the caregivers' role in early childhood care and education (Side-by-Side, n.d.), thus making it an awareness campaign. Awareness campaigns, as the first level of ECI, are defined as using multiple components to reach a specific goal (Bloomfield, et al., 2015).

### **1.5 Awareness campaigns**

Conventional awareness campaigns, including non-digital resources such as pamphlets, have been used in multiple domains with varying degrees of success (Poorman, Gazmararian, Parker, Yang, & Elon, 2015). Knowledge outcomes increase steadily and are maintained for up to two years when participants are provided with written educational material (O'Mahony, et al., 2017; Teo, Ling, & Ng, 2018). Yet, in the resource constrained public health care sector of South Africa, this may prove challenging as conventional awareness campaigns are resource intensive (Bloomfield, et al., 2015). The time, labour and money required for the design, production, distribution and implementation of the resource may be a barrier to success (Bloomfield, et al., 2015).

Text messaging, a form of mHealth service delivery, has become an economical and effective means to communicate with large groups of people (WHO, 2011). This mode of service delivery is a potentially powerful means of communicating health messages to underserved populations such as the young, impoverished, and the less educated (Smith, 2011). Many countries worldwide have implemented mHealth as it provides instantaneous health services (Dwivedi, Shareef, Simintiras, Lal, & Weerakkody, 2016). In the South African context, poor literacy levels (Oldewage-Theron & Slabbert, 2010) in combination with poor information literacy skills (Kasparian, et al., 2017), may make implementation of any awareness campaign challenging. Despite these factors, there are some positive factors to consider.

Young people (aged eight – 25 years old) in South Africa show an interest in using mobile devices to acquire health related information (Hampshire, et al., 2015). Electronic health (mHealth literacy) is the ability to find, comprehend, evaluate and utilise health information gained from an electronic source (Kasparian, et al., 2017). A South African study indicated that mobile phone users who received informational or motivational text messages about HIV testing were more likely to seek HIV counselling and testing services (de Tolly, Skinner, Nembaware & Benjamin, 2012). A number of studies across different contexts have used text messaging to target family planning, sexually transmitted infections, and pregnancy education (Poorman et al., 2015). Despite widespread poverty within South Africa (David, et al., 2018; South African Human Rights Commission [SAHRC] & UNICEF, 2014), 99.5% of households own a cell phone (Hampshire, et al., 2015). The validity and efficacy of mHealth resources,

especially focused on caregiver education, are however undetermined as research cannot keep pace with the rapid progression of mHealth technologies (Nilsen, et al., 2012).

The prevention of developmental delays through improving caregiver developmental literacy and positive parenting is vital. Achieving this goal when a child is young enough to take advantage of the neural plasticity is highly beneficial. By implementing awareness campaigns, caregivers will have the greatest opportunity to positively influence ECD outcomes. The most efficient method of information distribution to accomplish the necessary improvements is undetermined. The effect of a conventional versus an mHealth awareness campaign on caregiver developmental literacy should be explored as it would contribute significantly to the field of ECI in vulnerable populations.



## Chapter 2: Methodology

**Chapter aim:** Chapter two aims to describe in detail the study objective, research design, setting, participants, assessment material and intervention materials. The ethical considerations, data collection process, data analysis, validity and reliability are also addressed.

### 2.1 Research aim

To determine the effect of conventional and mHealth awareness campaigns on caregiver developmental literacy.

### 2.2 Research design

An experimental, pre-test-post-test comparative design (Leedy & Ormrod, 2010) was utilised. Quantitative data regarding caregiver developmental literacy was collected with the use of a standardised tool, the Knowledge of Infant Development Inventory (KIDI) (MacPhee, 1981). Convenience sampling was used when recruiting participants and randomisation used when organising participants into groups.

### 2.3 Ethical considerations

Ethical clearance was attained from the Research Ethics Committee of the Faculty of Humanities of the University of Pretoria (Appendix A). Consent to perform the study was then obtained from the Tshwane Research Committee (Appendix B) and the facility manager of the primary health care (PHC) clinic (Appendix C). The moral principles which guide the behaviour of a person, are defined as ethics (Stevenson, 2010); which create borders to ensure that core ethical standards are followed (Health Professions Council of South Africa [HPCSA], 2008). Core values such as respect, beneficence, human rights, autonomy, integrity, confidentiality, which are crucial when working with human participants (HPCSA, 2016).

#### 2.3.1 Autonomy, dignity and informed consent

This principle refers to the respect given to a participant's dignity, well-being and safety. A full explanation was given to each participant about the study and their role in the study. Consent was obtained once the participants confirmed that they understood their role and choices. Participants should be permitted to deliberate, exercise self-determination and have their choices respected (HPCSA, 2016). Participants can decide to withdraw from the study at any

point without any repercussions. Participants will always be treated with the dignity and respect entitled to every human being.

### **2.3.2 Beneficence and non-maleficence**

Do no harm is the main basis of this principle. The researcher ensured that no harm was done to the participants and maximize the benefit of their experience. The pursuit of research should not outweigh the importance of participants' interests (HPCSA, 2016). The research was done with the aim to improve life without bringing harm to any participants.

### **2.3.3 Confidentiality and anonymity**

In order to ensure that participants' confidentiality was maintained, participants received a numeric code as a form of identification. No identifying information has been documented or disclosed within the article or this paper. This is done to maintain and protect each participant's constitutional right to privacy and confidentiality (HPCSA, 2016).

### **2.3.4 Plagiarism**

Plagiarism is to use another's ideas, processes, results or words without providing the appropriate recognition (HPCSA, 2016). A signed plagiarism declaration is included in this document to verify that this dissertation is the researchers original work. The American Psychological Association (6th ed.) referencing style was used to cite and accredit all sources used in this study. Data was collected, examined, interpreted, and reported without manufacturing, doctoring, misleading or misinterpreting. Thus, ensuring that scientific misconduct did not occur and upholding the principles of academic and scientific professionalism (HPCSA, 2008).

## **2.4 Setting**

Participants were recruited at a PHC baby-wellness clinic in Mamelodi, an urban township in the Tshwane municipality of Gauteng, South Africa. The population consists predominantly of Black Africans (98.89%) (Frith, 2011). Mamelodi is a poverty-stricken area where the average per household annual income is R30000 or less for 60% of the residents (Gauteng Department of Agriculture and Rural Development, 2010). In 2011, there were approximately one million people within the 25 km<sup>2</sup> of Mamelodi (Brinkhoff, 2011). Many members of this population make use of government run institutions such as the above-mentioned baby-wellness clinic as their first point of access (Schoeman, Swanepoel, & van der Linde, 2017). The provision of child immunisations at the clinic provided a consistent point at which to acquire participants that met the inclusion criteria.

## **2.5 Procedure**

As the participants joined the study, they were randomly allocated to a research group in the order of mHealth, conventional and control. The first group was exposed to a conventional awareness campaign whereas the second group was exposed to an mHealth awareness campaign. The third set, the control group, was not exposed to any awareness campaign.

## 2.6 Participant description

Participants were recruited using convenience sampling. The research project was described to the caregivers at the clinic and those that wanted to partake indicated their willingness to participate. In total, 150 primary caregivers of children aged three or six months were sought out, recruited and randomly divided into three groups of 50 participants each. Participants for the study were required to be 18 years or older and comfortable in English. The age of child criteria was chosen as such because there is a three-month period between both immunisation appointments. Originally the post-test data was to be collected at the PHC facility, however caregivers' visits were unpredictable and unreliable. As a result, the post-test interview was performed telephonically. Face-to-face post-test data collection was performed with an insignificant number of participants. The total number of participants after the post-test interview was 127 as some participants could not be contacted again.

The average age of the participants was 29 years old (SD= 6.72), with the youngest and oldest participants being 18 and 49 years old, respectively (Table 1). Approximately 76.0% (n= 96) of the participants were the child's mother, while 3.0% (n=4) were non-family members such as childminders. Approximately 42.0% (n=53) of the participants were first-time caregivers. The participants' level of education indicated that 12.6% (n=16) achieved Grade 10 or less; 72.4% (n=92) left school at Grade 11 or 12, and 8.7% (n=11) achieved a qualification (degree or diploma) after completing Grade 12. Approximately 69.3% (n=88) of the participants were unemployed.

**Table 1: Demographical characteristics of study sample (n=127)**

<b>Demographics</b>	<b>% (n)</b>
<b>Race</b>	
Black	100 (127)
<b>Age of caregiver</b>	
Minimum	18
Maximum	49
Mean	29
<b>Primary caregiver</b>	
Mother	75,6 (96)
Father	3,9 (5)
Both parents	7,1 (9)
Grandparents	8,7 (11)
Extended family members	1,6 (2)
Other	3,1 (4)
<b>Education level of primary caregiver</b>	

Grade 10 or less	12.6	(16)
Grade 11 -12	72.4	(92)
Post-matric qualification	8.7	(11)
No formal schooling and unknown	6.3	(8)
<b>Employment status of caregiver</b>		
Unemployed	69.3	(88)
Employed	30.7	(39)
<b>Home language</b>		
Setswana	5,5	(7)
Sepedi	55,1	(70)
isiZulu	10,2	(13)
Shangaan	0,8	(1)
English	0,8	(1)
Afrikaans	0,8	(1)
Venda	1,6	(2)
Ndebele	6,3	(8)
Xhosa	2,4	(3)
Southern Sotho	3,9	(5)
Siswati	0,8	(1)
Tsonga	8,7	(11)
Other	2,4	(3)

## 2.7 Material and apparatus

All materials were in English. A South African study found that participants preferred materials in English over their own home language (van der Merwe, Cilliers, Mare, van der Linde, & le Roux, 2017), which supports the use of English materials.

A researcher-developed case history collected information regarding family and participant biographical information.

Primary caregiver knowledge of ECD was collected using the abridged version of the KIDI due to time constraints in the setting (Huang, O'Brien Caughy, Genevro, & Miller, 2005). The KIDI has been widely used internationally since its release in 1981 and is considered as the gold standard for determining caregivers' knowledge of ECD (Al-Maadadi & Ikhlef, 2015; Bornstein et al, 2010; Donovan, Taylor, & Leavitt, 2007; Nuttall et al, 2015; Rowe, Denmark, Harden, & Stapleton, 2015; Zand, et al., 2015). The abridged version includes 30 of the original 75 items measuring caregiver knowledge of milestones and parenting practices. The abridged KIDI was used to examine the correlation between early maternal knowledge of child development and their quality of parenting at a later stage (Huang et al., 2005). The KIDI was designed to be understandable by participants with a Grade 7 literacy level (MacPhee, 2002).

## 3. Intervention

The content used in both awareness campaigns was the four, six and nine-month sections of the "Milestone Moments: Learn the signs. Act early." (Centre for Disease Control [CDC], 2016) booklet. The resource aims to increase developmental literacy, instil the importance of tracking

development, encourage communication between caregivers and healthcare professionals, and motivate early action when delays are identified. The booklet has been used in countries with diverse cultures and socioeconomic situations and has been translated into other languages including Haitian Creole, Russian, Turkish, French, Indonesian, Bengali, Urdu, Arabic, and Portuguese for high and low resourced settings (CDC, 2018).

The mHealth and conventional awareness campaign utilised identical content but differed in the manner of presentation. The conventional awareness campaign made use of traditional means of information delivery in the form of coloured pamphlets that were provided at the initial interview. The mHealth awareness campaign involved the distribution of a screenshot from the Milestone Moments booklet (Image 1) via the use of text messages sent weekly to participants' mobile telephones over the course of the three-month exposure period.



*Image 1: Screenshot of Milestone Moments (CDC, 2016)*

### **3.1 Procedures for data collection**

There were three phases of data collection in the study (Figure 1). The entire sample (n=127) proceeded through the three phases simultaneously, however each group experienced phase two differently.

**Phase 1:** Participants were identified from the three-month and six-month immunisation group at a PHC clinic. After obtaining informed consent, the case history was completed. The abridged KIDI was then completed by the caregivers.

**Phase 2:** The caregivers were randomly assigned to either the conventional, mHealth or control group. Caregivers in the conventional awareness campaign were given pamphlets on the typical development of their child (three and six months respectively) at four and six

months old. The conventional group did not formally receive additional information from the clinic or researcher. The caregivers in the mHealth group received weekly SMS's consisting of the same information provided in the pamphlets in the three months between phase one and phase three. The pamphlet was broken down into smaller extracts in order to ensure there was enough information to span the length of phase two. The control group did not receive any information between pre-test and post-test data collection.

**Phase 3:** Three months after the initial visit, the caregivers were contacted telephonically. The KIDI was completed again by the 127 participants.

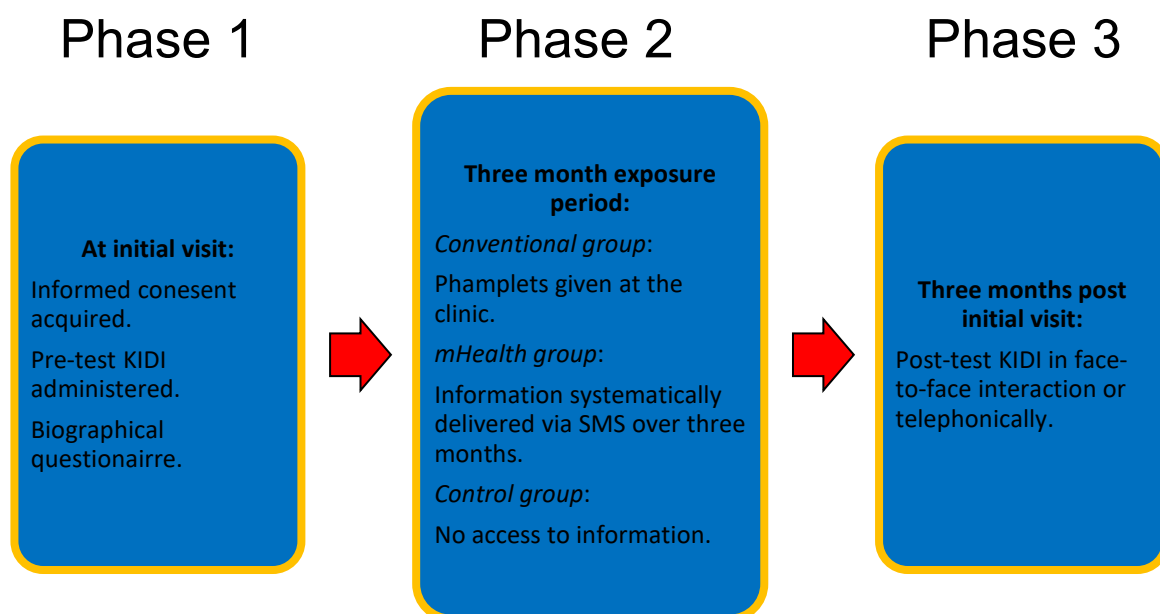


Figure 1 Representation of data collection process for participants (n=127)

#### 4.1 Data analysis

Descriptive and inferential statistics were utilised to determine if there was a statistically significant difference in developmental literacy in response to the mHealth or conventional awareness campaigns. The Wilcoxon signed-rank test was used to test differences between two related variables for continuous data (e.g. pre- and post-test scores). The 2-proportions z-test was also used to test for differences in proportions between two nominal variables (i.e. pre- and post-test proportion answered correctly). The Mann-Whitney test was used to test for differences between two independent groups (i.e. mHealth group and Control group). The

Kruskal-Wallis test was used to test differences between three or more independent groups (i.e. mHealth group, Conventional group and Control group). To probe the gaps in knowledge, the 2-proportions z-test was used to test for significant improvements in the number of incorrectly answered items between pre- and post-test scores

#### **4.2 Reliability and validity**

Reliability refers to the degree to which processes and procedures performed result in stable and consistent outcomes (Leedy & Ormrod, 2016). The KIDI has been determined to have an internal consistency that ranged from 0.5 to 0.82 for parents and the test-retest reliability coefficient ranges 0.80 to 0.92 (MacPhee, 1981). The researcher trained four Speech-Language Therapy students to assist with data collection for a brief period. Majority of the data collection was performed by the main researcher.

Validity refers to the degree to which the assessment measures the desired element (Leedy & Ormrod, 2016). Internal validity is the extent to which one can make inferences based on the data collected (Leedy & Ormrod, 2016). The post-test results showed similar to the normative sample score of the KIDI, which may indicate internal validity. External validity refers to the degree to which generalizations can be made from the data collected to other populations and/or context (Leedy & Ormrod, 2016). The participants were not put into an unfamiliar environment which may have caused stress or discomfort. Performing the study in a familiar context may further enhance external validity.

## **Chapter 3: The effect of mHealth and conventional awareness campaigns on caregivers' developmental literacy**

### **The effect of mHealth and conventional awareness campaigns on caregivers' developmental literacy**

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#### **Abstract**

**Introduction:** Children in impoverished households face a multitude of risk factors that may impact early childhood development (ECD). Poor ECD can lead to negative outcomes and the continuation of the intergenerational cycle of poverty. Early stimulation from caregivers can counter the effects of risk factors. Increased developmental literacy supports positive parenting, thus improving ECD outcomes. This study aimed to determine the effect of mHealth and conventional awareness campaigns on caregivers' developmental literacy.



**Method:** Caregivers were recruited from a primary health care facility in a low-resource setting. Participants were randomly divided into three groups; two intervention groups (mHealth and conventional awareness campaigns) and a control group. Caregivers' developmental literacy was assessed prior to their exposure to awareness campaigns. Participants were reassessed after three months, during which participants in the intervention groups received the same information.

**Results:** The results showed that neither of the awareness campaigns was effective ( $p = .359$ ); as the intervention groups' results were similar to those of the control group. There was a significant improvement ( $p = .000$ ), from pre-test to post-test across the entire sample. The improvements may be due to pre-test face-to-face interviews with caregivers. This approach may be more effective than awareness campaigns in improving development literacy.

## **Introduction**

Early childhood development (ECD) should be monitored closely as unattained early milestones are one of the first signs of possible developmental delay (Jeyaseelan & Sawyer, 2017). ECD relies on speech and language, sensory, motor, cognitive, and emotional processes that are necessary for children to grow and thrive in the first nine years of life (Bolajoko, 2011). The first two years of children's lives are particularly vital for development due to the high plasticity of the brain (English, Peer, Honikman, Tugendhaft, & Hofman, 2017; Gao, Lin, Grewen, & Gilmore, 2017).

Many young children in lower-middle-income countries (LMIC), such as South Africa, are at risk of developmental delay due to biological risks, including poor maternal health and infectious diseases, as well as environmental risk factors such as limited maternal education and poverty (Meintjies & van Belkum, 2013; Tomlinson, et al., 2014; Zand, et al., 2015). In 2014, 63% of children in South Africa were living below the upper-bound poverty line, which at the time equated to approximately \$50 or less per household per month (Hall et al., 2016).

The risk factors that impoverished children face can result in poor health outcomes, reduced academic preparedness and performance, later poor vocational outcomes and consequently the continuation of the intergenerational poverty cycle (Engle et al., 2007). Improvement of ECD is one of the most effective approaches for the reduction of poverty (Hall et al., 2016).

Adequate maternal education improves ECD outcomes by decreasing the impact of biological and environmental risks factors (van der Linde, Swanepoel, Glascoe, Louw, & Vinck 2015; Walker et al., 2011). Children's developmental outcomes have been directly linked to caregivers' developmental literacy level and their ability to use the information that developmental literacy is composed of (Burger, 2010; Zand et al., 2015). Developmental literacy entails caregiver knowledge of typical child development and allows for appropriate stimulation and early recognition of developmental disorders (Jeyaseelan & Sawyer, 2017). Informed caregivers tend to have sensitive and positive interactions with their children (Cooper et al., 2009) that encourage behavioural and physiological development (Bernard, Meade & Dozier, 2013; Britto et al., 2017). In contrast, children are at risk of delayed development when caregivers do not know when to expect skills to develop (Ertem, Peer, Honikman, Tugendhaft, & Hofman, 2007; Stith et al., 2009). Often, due to a lack of developmental knowledge, intervention is sought too late, and the optimal period of neural plasticity is missed (Anderson et al., 2011).

The lack of access to health services can further hinder timeous intervention. The South African government recognises the need to improve access to care as the public health sector experiences challenges with the inadequate quality of care in facilities, the limited number of healthcare professionals, and poor infrastructure and access to the facilities (Jobson, 2015; Samuels et al., 2012). One-fifth of the children in South Africa experience poor access to clinics where developmental surveillance takes place (Hall et al., 2016). Healthcare professionals are, often, not able to fulfil their role in meeting the needs of caregivers and young children due to these challenges. Alternate service delivery models, such as caregiver-

focused prevention programmes, have been considered as a means to reduce the strain on the health care system (Jeyaseelan & Sawyer, 2017) and respond to the needs of vulnerable and overlooked young populations (Vally, Murray, Tomlinson, & Cooper, 2015).

Caregiver-led awareness programmes targeting ECD hold potential as an alternative to professional-led awareness programmes. Providing caregivers with information will allow caregivers to monitor their children's development, thus forming a caregiver-led awareness campaign. Awareness campaigns, as the first level of early childhood intervention and stimulation, help establish developmental literacy and positive parenting (United Nations Children's Fund, 2017). Positive parenting is defined as warm, consistent parenting accompanied by good relationships, non-violent forms of discipline and supervision over children that is developmentally appropriate (Gould & Ward, 2015). Positive parenting is enhanced by improved developmental literacy (Dermott & Pomati, 2016). According to the World Health Organization (WHO), caregivers resultingly support development and seek intervention for their child when needed (WHO, UNICEF, Worldbank, 2012). WHO and other collaborators recognised positive parenting as vital for a child's development through the development of the Nurturing Care Framework (WHO, UNICEF, Worldbank, 2018). As a result, the Nurturing Care Framework has been incorporated into South Africa's National Integrated Early Childhood Development Policy for 2030 (Lindland et al., 2016). Positive parenting and developmental literacy can be targeted through awareness campaigns (WHO, UNICEF, World Bank, 2018).

Conventional awareness campaigns, such as paper-based pamphlets, have been used in multiple domains with varying degrees of success (Danaei, Faghihi, Golkari, & Saki, 2016; Khurana, et al., 2016). Paper-based awareness campaigns show promise as knowledge outcomes increase steadily and are maintained for up to two years when participants are provided with written educational material (O'Mahony et al., 2017; Teo, Ling, & Ng, 2018). The time, labour and money required for the design, production, and distribution of these resources may act as barriers to implementation (Bloomfield et al., 2015). In the resource-constrained

public health care sectors of LMIC, these barriers may prove challenging as conventional awareness campaigns are resource-intensive (Bloomfield et al., 2015).

Alternatively, text messaging, a form of mobile Health (mHealth) service delivery, is becoming an economical and effective means to communicate with a large group of people (WHO, 2011). This mode of service delivery is a potentially powerful means of communicating health messages to populations that struggle to access services (Smith, 2011). Young South Africans aged eight to 25 years old show an interest in using mobile devices to acquire health-related information (Hampshire et al., 2015). A South African study also indicated that mobile phone users who received informational or motivational text messages about HIV testing were more likely to seek counselling and testing services (de Tolly et al., 2012). Many South Africans experience financial constraints, although 99.5% of households own a cell phone (Hampshire et al., 2015). Several studies across different South African contexts have effectively used text messaging to target family planning, sexually-transmitted infections, and pregnancy education (Poorman et al., 2015); while limited research evaluated campaigns focused on ECD and developmental literacy (Nilsen et al., 2012).

It is vital to help prevent developmental delays in young, vulnerable populations, through increasing caregivers' developmental literacy and consequently, positive parenting. The most efficient method for distributing developmental information is, however, undetermined. The effect of a conventional versus an mHealth awareness campaign on caregiver developmental literacy should, therefore, be explored.

## **Materials and method**

### ***Research Objective***

The research objective is to determine the effect of mHealth and conventional awareness campaigns on developmental literacy.

### ***Participants and setting***

Participants were recruited from an immunisation clinic at a primary health care (PHC) facility in Mamelodi, South Africa. Mamelodi is a poverty-stricken area where the average annual income is \$2475 or less for 60% of households per month (Gauteng Department of Agriculture and Rural Development, 2010).

Participants were required to be 18 years or older and able to comprehend English. The participants needed to be at the PHC clinic to immunise a child that was either three or six months old. In South Africa, children are required to receive immunisation at three, six and nine months of age, resulting in three-month periods between clinic visits (Kibel, Saloojee, & Westwood, 2013). In total 150 primary caregivers of children aged three or six months consented to participate and were randomly divided into three groups of 50 participants each. The first group was exposed to a conventional awareness campaign, whereas the second group was exposed to an mHealth awareness campaign. The third set, the control group, was not exposed to any awareness campaign.

The average age of the participants was 29 years old (SD= 6.72), with the youngest and oldest participants being 18 and 49 years old, respectively. Approximately 76.0% (n= 96) of the participants were the child's mother, while 3.0% (n=4) were non-family members such as childminders. Approximately 42.0% (n=53) of the participants were first-time caregivers. The participants' level of education indicated that 12.6% (n=16) achieved 10<sup>th</sup> grade or less; 72.4% (n=92) achieved the 11<sup>th</sup> or 12<sup>th</sup> grade, and 8.7% (n=11) achieved a qualification (degree or diploma) after completing 12<sup>th</sup> grade. Approximately 69.0% (n=88) of the participants were unemployed.

### ***Material and apparatus***

Data was collected using the abridged version of the Knowledge of Infant Development Inventory (KIDI) (Huang et al., 2005). The KIDI is considered as the gold standard for determining caregivers' developmental literacy level and has been used in South Africa and other LMIC (Al-Maadadi & Ikhlef, 2015; Bornstein et al, 2010; Nuttall et al., 2015; Valentino,

Wang, Lefever, & Borkowski, 2015; Rowe, Denmark, Harden, & Stapleton, 2015; September, 2014; Zand, et al., 2015). The abridged version of the tool was utilised due to time constraints and included 30 of the original 75 items. The tool is made up of three categories, namely; caregiver knowledge of milestones and norms (section 1), parenting practices (section 2) and parenting principles (section 3). The KIDI was designed to be understandable by participants with a low literacy level (MacPhee, 2002). The case history collected information regarding family and participant biographical information.

### ***Intervention***

The content used in both awareness campaigns was the four, six and nine-month sections of the evidence-based “Milestone Moments: Learn the signs. Act early.” (Center for Disease Control [CDC], 2016). The resource aims to increase developmental literacy, instil the importance of tracking development, encourage communication between caregivers and healthcare professionals, and motivate early action when delays are identified. The booklet has been used in countries with diverse cultures and socioeconomic situations (CDC, 2018). Both awareness campaigns utilised identical content but differed in the manner of presentation. The conventional awareness campaign made use of coloured pamphlets. The mHealth awareness campaign involved the distribution of screenshots from the Milestone Moments booklet (Figure 1) via messages sent weekly to participants’ mobile telephones.



*Image 1: Screenshot of Milestone Moments (CDC, 2016)*

### ***Procedures for data collection***

Institutional review board clearance was obtained (GW20180104HS). After obtaining informed consent, the biographical questionnaire and abridged KIDI were completed.

The speech-language therapist and nurse working at the immunization clinic confirmed that the caregivers did not receive other official resources or training targeting infant development. Thus, the information provided during the study was the only source of formal information received regarding infant development.

The conventional awareness group were given paper-based versions of the intervention tool. mHealth group participants received weekly text messages for three months consisting of the same information provided in the pamphlets. The control group did not receive any information between pre-test and post-test data collection. The KIDI was re-administered telephonically after three months due to the unpredictability of clinic visits. The total number of participants after the post-test interview was 127, as some participants could not be contacted at follow-up.

### ***Data analysis***

Descriptive and inferential statistics were utilised to determine if there was a statistically significant difference in developmental literacy in response to the mHealth or conventional awareness campaigns. The Wilcoxon signed-rank test was used to test differences between two related variables for continuous data (e.g. pre- and post-test scores). The 2-proportions z-test was also used to test for differences in proportions between two nominal variables (e.g. pre- and post-test proportion answered correctly). The Mann-Whitney test was used to test for differences between two independent groups (e.g. mHealth group and Control group). The Kruskal-Wallis test was used to test differences between three or more independent groups (e.g. mHealth group, Conventional group and Control group). To probe the gaps in knowledge, the 2-proportions z-test was used to test for significant improvements in the number of incorrectly answered items between pre- and post-test scores (Table 3).

## Results

A large portion of participants (81.1%; n=103) achieved an education level of 11<sup>th</sup> grade and higher. For the pre-test, the participants' educational level did not correlate significantly with the performance on the KIDI ( $p=.548$ ). However, for the post-test, there was a significant positive correlation between participants' level of education and the performance on the KIDI ( $p= .004$ ). Since the correlation ( $r=.257$ ) was positive, participants with a higher education level performed significantly better than those with a lower education level.

The Kruskal-Wallis test was used to compare the three groups, showing that there was no significant difference between the groups ( $p=.359$ ). This result indicates that no awareness campaign was more effective than the others due to the similarity with the control group. In the pre-test performance, there was no significant difference between the three groups ( $p = .376$ ) as to the number of questions answered correctly on the abridged KIDI. Similarly, in the post-test performance, no significant difference between the three groups was noted ( $p= .497$ ). However, significant improvement (17.7%;  $p=.000$ ) was identified across all three groups when comparing pre and post-test outcomes (n=127) (Table 2). The resulting post-test normative score for the whole sample is 71% (n= 90). The approximate normative score of the KIDI is 72% according to the KIDI manual (MacPhee, 2002). The difference between the results from the current study and the KIDI normative score is only one percent.

*Table 2. Pre and post-test group comparisons of correct responses on the (KIDI)*

Participant		Mean	Standard deviation	Means represented as a percentage (%)	Difference pre- and post-test (%)	p-values of the Wilcoxon signed-rank tests
mHealth (n=44)	Pre-test total out of 30	15.59	3.97	51.8	17.73	0.000*
	Post-test total out of 30	20.91	3.22	69.7		
Conventional (n=39)	Pre-test total out of 30	15.85	3.18	52.8	19.15	0.000*
	Post-test total out of 30	21.59	2.41	80.0		
Control (n=44)	Pre-test total out of 30	16.55	3.29	55.2	15.98	0.000*



	Post-test total out of 30	21.34	2.26	71.1		
All participants (n=127)	Pre-test total out of 30	16.00	3.51	53.3	17.66	0.000*
	Post-test total out of 30	21.27	2.67	71.0		

\* p-value <0.05 thus indicating a statistically significant difference

When pre-test and post-test scores for the three sections of the abridged KIDI were compared across the sample, section one (milestones and norms;  $p=.000^1$ ), section two (parenting practices;  $p=.000$ ) and section three (parenting principles;  $p=.000$ ) showed significant improvement (Table 2). Section one improved the most (20.4%) between pre- and post-test and section two showed the least improvement (9.2%). Section two's pre-test scores were higher (62.3%) than both the other sections' pre-test scores. Overall, section three had the lowest percentage of correct responses at pre- (50.4%) and post-test (64.8%).

Table 1. Across group (n=127) pre- and -post-test comparisons between three sections of the KIDI

	Percentage (%) obtained for a specific section	Difference between pre- and post-test percentage (%)	p-values of the Wilcoxon signed-rank tests
Section 1			
Pre-test Percentage	51.2	20.4	0.000*
Post-test Percentage	71.6		
Section 2			
Pre-test Percentage	62.3	9.2	0.000*
Post-test Percentage	71.5		
Section 3			
Pre-test Percentage	50.4	14.4	0.000*
Post-test Percentage	64.8		

\* p-value <0.05 thus indicating a statistically significant difference

Of the 21 items in section one (norms and milestones), 16 items showed significant differences in pre- and post-test comparison (76.2%). In section two (parenting practices), of the six items, three items (50.0%) showed significant improvement from pre- to post-test. Of the three items

<sup>1</sup> Theoretically, a p-value can't equal zero. Thus,  $p=.000$  means that the p-value is smaller than 0.001.

in section three (parenting principles), two of the items (66.7%) had significant improvement from pre- to post-test.

*Table 2 Items from the KIDI that demonstrated a significant difference from pre-test to post-test across groups (n=127)*

		Correct response	Percentage (%) and number answered incorrectly pre-test	Percentage (%) and number answered incorrectly post-test	Difference between pre and post-test (%)	p-values of 2-proportions z-test
<b>Item</b>	<b>Sections one (norms and milestones)</b>					
21	Babies do some things just to make trouble for their parents, like crying or soiling their diapers	Disagree	46.5 (n=59)	15.7 (n=20)	30.8	0.000*
25	The new-born can see a face six feet away as well as an adult can	Disagree	32.3 (n=41)	3.1 (n=4)	29.2	0.000*
27	A two-year-olds sense of time is different from an adult's	Agree	29.9 (n=38)	9.4 (n=12)	20.5	0.000*
34	Most two-year-olds can tell the difference between a make-believe story on TV and a true one	Disagree, Older	54.3 (n=69)	15.7 (n=20)	38.6	0.000*
35	Infants usually are walking by about 12 months of age	Agree	29.1 (n=37)	15.7 (n=20)	13.4	0.016*
36	An eight-month-old acts differently with a familiar person than with someone not seen before	Agree	23.6 (n=30)	42.5 (n=54)	-18.9	0.000*
37	A baby is about seven months old before he or she can reach for and grab things	Disagree, Younger	65.4 (n=83)	32.2 (n=41)	33.2	0.000*
38	A two-year-old is able to reason logically, much as an adult would	Disagree, Older	52.0 (n=66)	18.9 (n=24)	33.1	0.000*

39	A one-year-old knows right from wrong	Disagree, Older	48.0 (n=61)	18.1 (n=23)	29.9	0.000*
41	Most infants are ready to be toilet trained by one year of age	Disagree, Older	78.0 (n=99)	11.8 (n=15)	66.2	0.000*
42	An infant will begin to respond to his or her name at ten months	Disagree, Younger	70.9 (n=90)	35.4 (n=45)	35.5	0.000*
44	Five-month-olds know what "no" means	Disagree, Older	47.2 (n=60)	8.7 (n=11)	38.5	0.000*
47	One-year-olds often cooperate and share when they play together	Disagree, Older	71.7 (n=91)	10.2 (n=13)	61.5	0.000*
48	An infant of 12 months can remember toys he or she has watched being hidden	Agree	50.4 (n=64)	77.2 (n=98)	-26.8	0.000*
49	A baby usually says his or her first real word at six months	Disagree, Older	44.9 (n=57)	6.3 (n=8)	38.6	0.000*
<b>Section two (parenting practices)</b>						
24	Some days you need to discipline your baby; other days you can ignore the same thing. It all depends on the mood you're in that day	Disagree	55.9 (n=71)	26.8 (n=34)	29.1	0.000*
31	The more you comfort your crying baby by holding and talking to him or her, the more you spoil him or her	Disagree	41.7 (n=53)	27.6 (n=35)	14.1	0.025*
32	A good way to teach your child not to hit is to hit back	Disagree	31.5 (n=40)	13.4 (n=17)	18.1	0.001*
<b>Section three (parenting principles)</b>						
26	A young brother or sister may start wetting the bed or	Agree	59.1 (n=75)	27.6 (n=35)	31.5	0.000*

	thumb sucking when the new baby arrives in the family					
29	An infant may stop paying attention to what is going on around him or her if there is too much noise or too many things to look at	Agree	30.7 (n=39)	7.9 (n=100)	22.8	0.000*

\* p-value <0.05 thus indicating a statistically significant difference

The pre-test results showed that item 36, in section one, was answered correctly by 74% (n=97) of caregivers, but at post-test, the performance declined to 42.5% (n=73). Item 41, also in section one, was answered incorrectly by 78% of participants (n = 99) in the pre-test and improved to 11.8% (n =15) incorrectly answered. The items that showed the most improvement from pre-test to post-test are items 41 and 47 from section one, whereas item 35 and 36 from section one and item 31 from section two demonstrated minimal improvement. Items answered correctly by most participants post-test were items 25 and 49 (section one) with 96.9% (n=123) and 93.7% (n=118).

## Discussion

The mHealth ( $p=.253$ ) or conventional ( $p=.104$ ) awareness campaigns led to no significant increase in developmental literacy when compared to the control group. Overall, there was a significant improvement of 17.7% ( $p=.000$ ) from pre to post-test scores across the three groups. The participants' level of education does influence the uptake of the developmental literacy resource. The whole sample at pre-test (n=127) performed on a similar level, regardless of their education level. Post-test, caregivers with a higher education level performed significantly better than those with a lower education level. At pre-test, developmental literacy was measured as 53.3% using the abridged KIDI, which is lower than the normative sample of 72% (MacPhee, 1981). A South African study performed in a diverse socio-economic population in the Western Cape, reported a higher developmental literacy level of 61% using the KIDI (September, Rich, & Roman, 2016). A study in Italy, a high-income

country, reported KIDI scores of 65% and 63% for mothers and fathers, respectively (Scarzello, Arace, & Prino, 2016). The post-test developmental literacy score improved to 71% (n= 90) after the intervention, which is close to the normative score of 72%. The post-test improvement in developmental literacy may indicate that the participants have adequate knowledge to support development.

The level of developmental literacy has been linked to the quality of parenting and the provision of high-quality stimulation (Nuttall et al., 2015). When developmental literacy levels are low, positive parenting and thus ECD stimulation is negatively affected during interactions between caregiver and child (Black et al., 2017). An aspect of effective ECD stimulation is knowing what appropriate stimulation at a particular age is. To provide appropriate stimulation, caregivers need to know the norms and milestones of typical child development.

Section one of the KIDI assesses caregivers' knowledge of developmental norms and milestones. The results from a South African study that used the KIDI showed that section one was consistently the worst performing section (September et al., 2016). The results from the current study showed that section three (50.4%) had the lowest pre-test score; however, only by 0.8% in comparison to section one (51.2%). These results may indicate poor levels of developmental literacy in South Africa. However, a promising sign is that, in the current study, section one showed the most improvement post-test (20.4%).

Participants' performance in section three, parenting principles, was the lowest at pre- (50.4%) and post-test (64.8%). As the KIDI was developed in North America, there may be a disparity between how the tool scores parenting principles and the participants' perceptions. The disparity may be due to cultural differences, as culture affects what is believed to be important for children to learn and achieve (Balton, Uys, & Alant, 2019). In South Africa, especially in the underserved communities, parenting is often driven by more informal information, such as guidance from family members and comparisons to other similarly aged children (Mbarathi et al., 2016; Vorster, Sacks, Amod, Seabi, & Kern, 2016). In these communities, different perspectives on what aspects of development are important do exist (Balton et al., 2019).

Thus, what is deemed appropriate parenting principles in North America may not be applicable in South Africa. As a result, the cultural adaptation of section three may be warranted. Furthermore, performing the interview and data collection in caregivers' home language may have been beneficial.

A constant factor across all three groups was a face-to-face (FTF) interviews at the initial interview. Studies have demonstrated the positive effect of face-to-face interviews in health care including, intention to take action, riseffectiveness amongst at-risk populations, and the opportunity to ask individualised questions (Atherton et al., 2018; Carey, Scott-Sheldon, Elliot, Garey, & Carey., 2012; Trivedi, 2014). A meta-analysis that compared mhealth interventions to FTF interviews supported the use of FTF interviews (Carey et al., 2012).

In the current study, participants were only asked questions and received no feedback on their performance. Despite the lack of feedback, the post-test scores improved, indicating that asking questions could have triggered the participants to reflect on ECD. It is possible that by asking questions, participants' awareness of topics that are important in developmental literacy and sensitivity towards them were raised. Further research is required to confirm this hypothesis.

There were no statistical differences in the scores evident between the two different awareness campaigns. The results showed a significant improvement in developmental literacy across the sample, possibly due to the face to face interviews during the pre-test phase. At post-test, the results were well aligned with the KIDI norms. This may indicate that face-to-face interviews are more effective than the awareness campaigns used in improving development literacy. This method may be effective for primary caregivers of young infants in low socio-economic populations by fostering developmental literacy. By doing so, it empowers caregivers to advocate for the child and encouraging positive parenting. However, further research is needed to evaluate the effectivity of face-to-face interviews in improving developmental literacy. Determining the effectiveness of this method in increasing the level of

caregivers' development literacy is vital as it can permanently affect all aspects of a child's life through the improvement of ECD.

## Chapter 4: Discussion and conclusion

**Chapter Aim:** To provide a critical overview of the study. The theoretical and practical implications of the study are presented. Furthermore, the strengths and weaknesses are discussed, and recommendations are made for future research.

### 4.1 Overview of research findings

The current study demonstrated that between the three groups there was no significant difference ( $p = .376$ ) in the improvement of developmental literacy scores after the implementation of the awareness campaigns. Thus, in the current study, neither the mHealth ( $p = .253$ ) nor the conventional ( $p = .104$ ) awareness campaign was more effective in improving developmental literacy. A significant overall improvement from pre-test to post-test across the sample was identified.

With appropriate intervention, a vulnerable, impoverished population could improve their developmental literacy, which can reduce experienced risks. The cause of the entire sample ( $n = 127$ ) showing an improvement in their developmental literacy scores should be investigated. From these results one can deduce that there was a variable that was not controlled for in the study. Evidence supporting this deduction is that the results in the experimental groups and the control group are too similar pre and post-test. The improvement across all three groups thus, there was a variable that was not considered that improved the scores of all the participants.

A face-to-face (FTF) interview was performed with every participant in the initial interview during the pre-test phase. A technique used in health economics called “time trade off” indicates that FTF interviews are the golden standard (Garcia-Molina & Chicaiza-Becerra, 2017). Although electronic alternatives to FTF interviews have been suggested, there may be barriers unique to the underserved communities in South Africa (Hacking, et al., 2016) including poor mobile reception; an inability to access the internet and the high likelihood of confusion and misunderstanding (Chan & Kaufman, 2010; Mars, 2013). Many studies have shown the benefits of FTF intervention due to the ability to tailor the interview to each person as well as the short-term and long-term retention of information (Carey, Scott-Sheldon, Elliot, Garey, & Carey, 2012; Orlowski, et al., 2016).



Participants' scores may also have improved because they were made aware of developmental concepts (Rosenshine, 2012). After completing the KIDI, each participant may have been made aware of their individual gaps in developmental literacy (Lee & Hannafin, 2016). The newly found awareness may have initiated participants to perform their own research or caused the caregiver to be more observant and monitor the child more closely. Similarly, as the infant aged, participants may have witnessed first-hand the unknown answers to previous questions.

Improved developmental literacy can help caregivers to determine if children's milestones are delayed (Jeyaseelan & Sawyer, 2017). Data extrapolated from the current study demonstrated what category of milestones caregivers were aware of. Categories included developmental norms, motor milestones, social milestones, language milestones, cognitive milestones. When considering all milestone related items, cognitive milestones had the lowest performance at both pre- and post-test while developmental norms had the best scores, and language milestones had the most improved scores from pre- to post-test.

Caregivers struggled to accurately answer some questions relating to cognitive milestones pre- and post-test, for example, "An infant of 12 months can remember toys he or she has watched being hidden". At pre-test, cognitive milestones items were answered with 43.46% and at post-test 71.66%. Studies have demonstrated that caregivers from diverse backgrounds struggle to correctly determine cognitive milestones (Safadi, et al., 2015; Zand, et al., 2015). There may be an interaction between caregivers from lower socio-economic statuses and knowledge of cognitive milestones and infants' developmental outcomes (Black, et al., 2017). This is important information to be aware of as this gap in knowledge about cognitive milestones can be targeted in intervention.

When considering the items relating only to developmental norms, there are promising results. An example of an item related to developmental norms is "Babies do some things just to make trouble for their parents, like crying or soiling their diapers". Developmental norms were answered with 63.77% at pre-test and at post-test, 90.6%. This is a positive indicator as it would suggest that knowledge of typical child behaviour is not affected by poverty considering 69.3% of the participants were unemployed.

The language milestones category showed the greatest improvement at post-test, with a 37.53% improvement. At pre-test, the results were 45.67% and post-test, 83.20%. A language-based milestone item is "A baby usually says his or her first real word at six months". This is a positive indicator as language is an indicator for future academic success (Glascoe, et al., 2016). Intervention targeted at language milestones has been shown to be effective in

improving caregivers' knowledge of language development and improving caregivers' language stimulation techniques (Suskind, et al., 2015).

## **4.2 Theoretical and clinical Implications**

The results from the current study indicate that the government should consider alternatives to awareness campaigns that may be more effective. The data gathered in the study identified the gaps in caregivers' developmental literacy. The gaps in knowledge can then be targeted in programs that aim to improve developmental literacy.

Intervention targeted at improving developmental literacy can begin during pregnancy. In 2014, statistics showed that 92.9% of pregnant women attended an antenatal clinic visit (Statistics South Africa, 2015). At antenatal visits, mothers of a child can be targeted, and other caregivers could be targeted at immunisation clinics. Targeting other caregivers in the clinic needs to be a consideration as 20% of children in South Africa do not live with either biological parent (Statistics South Africa, 2018). In 2014, the immunisation rate was approximately 90% nationwide (Hall, et al., 2016). Thus, by targeting caregivers at the antenatal and immunisation clinics, the majority of the population could be targeted.

Approaching any developmental challenge from various channels may increase the probability of improving knowledge. Evidence suggests that a multifaceted approach to managing children with atypical development is the most beneficial (Collins, et al., 2017). Improved childhood outcomes are improved through developmental literacy and positive parenting, which can be improved through various means (figure 2).

Improving developmental literacy of caregivers, especially from low socioeconomic settings, can positively influence the child's future outcomes. Nurses at the local immunisation clinic are uniquely placed in an ideal situation to assist in providing information (Leech, Van Wyk, & Uys, 2015). Developmental literacy intervention can begin with performing the abridged KIDI either at an antenatal visit or the six-week immunisation visit. Both the public and private health care sectors have six-week immunisations which would ensure carryover to the whole population (Davis, 2019). During the next immunisation visit, the caregivers could be provided with intervention resources. Separating the two steps means that there will be more time to spend on each caregiver. The method by which the intervention is provided will be dependent on the setting. Short talks are provided by nurses that are normally targeted at contraception. These talks could be an ideal means by which to provide an intermediary to information acquisition if adapted to address developmental literacy (Leech, Van Wyk, & Uys, 2015). Nurses could be trained to target developmental literacy during short talks. At the end of the talk, caregivers

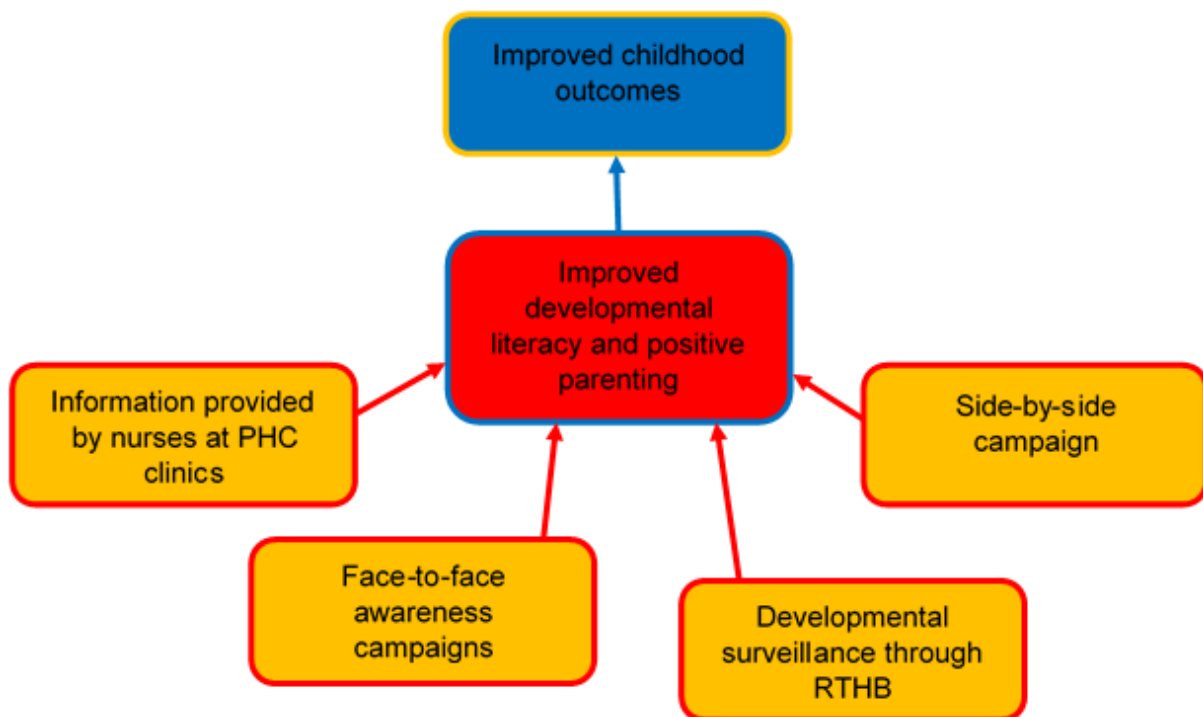


Figure 2 The different approaches that can be used to target developmental literacy

could be allowed the opportunity to ask questions which would not only benefit the individual that asked the question, but the whole group. By addressing the group, it empowers the caregivers that feel they require more specific information to ask the nurses questions relevant to their child during the FTF period of interaction. This may assist the nurses in providing relevant and individualised information to the caregiver, which has been shown to be particularly effective in improving knowledge (Wanyonyi, Themessl-Huber, Humphris, & Freeman, 2011).

Health care practitioners could demonstrate how to track the child's development using the Road to Health Book while performing developmental surveillance. While the Road to Health Book is in use, the health care practitioner could explain the section of the book that provides information on how to stimulate a child's development. The active participation of participants in the study may have positively influenced the degree and extent of the participants learning. Studies have shown the active participation in a school setting exerts a positive correlation on learning (Starmer, Duquette, & Howard, 2015). This positive effect may generalise to adult learning. This factor may make FTF interviews more beneficial in terms of caregiver learning.

The main goal of the Side-by-side campaign is to achieve "optimum child development" (Side-by-Side, n.d.). Some of the objectives used to reach this goal to improve developmental literacy and positive parenting. The campaign utilises many resources to accomplish their

goal. Two such resources are MomConnect, and the recently revised RTHB. MomConnect is a free subscriber-based messaging system that provides the subscriber with developmental information relevant to the age and stage of their child (Side-by-Side, n.d.). The messages are available in all 11 official languages of South Africa (Department of Health, 2019). The purpose of the messages is to provide caregivers with information that could improve their developmental literacy. The RTHB is a tool that records information relevant to the child's growth, immunisations received and medical interventions as well as a source of information about the child's development (Slemming & Bamford, 2018). The information contained within will assist in advancing developmental literacy and positive parenting. The use of these resources should be promoted as it will contribute to the information base from which caregivers can access.

#### **4.3 Strengths, limitations and future recommendations**

The informed consent form, biographical questionnaire, KIDI and the interview were in English. All participants reported that English was a language they spoke, but it was not their home language. Consequently, there is a possibility of misunderstanding and miscommunication during the performance of the KIDI and in their understanding of the intervention. Research has shown that the method by which the data is collected has no effect on bias (Rutherford, et al., 2016). Social desirability may have had an impact on the level of bias, however social desirability affects self-administered questionnaires and interviews (Althubaiti, 2016).

Recreating this study in various languages may provide more exact results as any miscommunication may be negated. Conducting the study in various clinics across different districts may provide a diverse and comprehensive set of results. The sample size greater than 127 may indicate a better possibility for generalisation.

Participants at the facility are given a date to return to the clinic for the next immunization visit. The participants were, however, not consistent in attending the clinic on the given date. Performing the post-test data collection could not consistently and reliably be performed in person. Thus, the decision was made to perform the post-test data collection via telephonic interview to ensure post-test data could be collected. There was an insignificant number (approximately less than 10) of participants interviewed in person in comparison to the participants contacted telephonically. This decision may be an additional variable that may affect post-test data as the researcher did struggle with some factors that are unique to telephonic interviews, for example high turn-over of cell phone numbers and poor reception. As a result, many participants had to be phoned numerous times and some participants' cell phone number was disconnected. Community health workers may be better positioned to

contact caregivers as they could visit the caregivers at their homes (van der Merwe M. N., 2017).

Randomised trials are considered evidence-based medicine and good clinical practice (Ernest, Jandrain, & Scheen, 2015). The current study made use of randomised trials which benefits the study in that the study was comparative, allowed reduced bias and statistically reliable.

Performing an assessment to determine a child's development at pre-test as well as the KIDI then again at post-test, may demonstrate the effectiveness of the campaign on the child's actual development.

#### **4.5 Conclusion**

Research has shown the importance of developmental literacy, due to its impact on ECD and consequently future life outcomes. Determining a method of improving developmental literacy is critical for severely underserved communities. In these communities, future potential is already in jeopardy due to environmental and biological risk factors. The lack of significant difference in post-test scores between the experimental and control groups in the current study, demonstrates how the conventional and mHealth awareness campaigns are lacking regarding effectivity. Further research will be required to determine if the poor effectivity generalises to other populations and settings. There was a significant improvement from pre-test to post-test scores. There is some evidence that face-to-face interventions may be this variable. This study has shown that mHealth and conventional awareness campaigns have limited affects, suggesting that resources may be better utilized in further research into the use of face-to-face interventions.

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## 6. Appendices

### Appendix A: Ethical clearance from the University of Pretoria



UNIVERSITEIT VAN PRETORIA  
UNIVERSITY OF PRETORIA  
YUNIBESITHI YA PRETORIA

Faculty of Humanities  
Research Ethics Committee

22 March 2018

Dear Ms Brown

**Project:** The effect of mHealth and conventional awareness campaigns on caregiver knowledge of early childhood development  
**Researcher:** C Brown  
**Supervisor:** Dr J van der Linde  
**Department:** Speech-Language Pathology and Audiology  
**Reference numbers:** 13028465 (GW20180104HS)

Thank you for your response to the Committee's correspondence of 5 March 2018.

The **Research Ethics Committee** notes that the outstanding permission from the *Stanza Bopape Hospital* was submitted as requested. Final **ethics approval** for the above application was granted at an *ad hoc* meeting on 22 March 2018. Data collection may therefore commence.

Please note that this approval is based on the assumption that the research will be carried out along the lines laid out in the proposal. Should the actual research depart significantly from the proposed research, it will be necessary to apply for a new research approval and ethical clearance.

We wish you success with the project.

Sincerely

PP  
**Prof Maxi Schoeman**  
Deputy Dean: Postgraduate and Research Ethics  
Faculty of Humanities  
UNIVERSITY OF PRETORIA  
e-mail: tracey.andrew@up.ac.za

cc: Dr J van der Lind (Supervisor and HoD)

## Appendix B: Signed permission form for use of facility



The general manager,  
Stanza Bopape Clinic  
Sir,

### **Request for use of facilities**

I am a masters student of the Department of Speech-Language Pathology and Audiology University of Pretoria. I am conducting a research project entitled, **“The effect of mHealth and conventional awareness campaigns on caregiver knowledge of early childhood development”**. This research study is in the process of being granted ethical clearance from the Faculty of Humanities at the University of Pretoria.

The amount of knowledge that a caregiver has of infant development can be a determining factor in a child’s life and growth. The study aims to identify whether a mHealth awareness campaign or a conventional awareness campaign is better in improving knowledge of infant development. The results will demonstrate which method of information delivery leads to the best retention and implementation of the information supplied. The study will be conducted from April 2018 to January 2019.

The participant will complete a questionnaire about their background information. The participant will then complete the Knowledge of Infant Development Inventory, a 2 page multiple-choice questionnaire about what the participant knows about milestones in infants. Depending on the group the participant is assigned to, the participant may receive information about early child development from a pamphlet, text message or no information until the end of the study. At the child’s 9-month visit, the participant will be requested to complete the Knowledge of Infant Development Inventory again. The results obtained will be used for a postgraduate research study and may be used for further research.

There are no potential risks or risks for discomfort for the participant or their child during this study. I will be able to provide the participant with feedback regarding their knowledge of infant development, which can help the participant in supporting their child’s development. Participation in this study is voluntary. The participants are free to withdraw at any time during the study without any negative consequences. All information obtained will be treated as confidential. No names and/or other identifying information will be revealed. The data collected during this study will only be accessible to the researchers and the involved research supervisors.

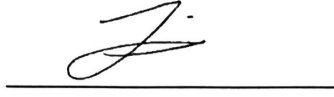
You are kindly requested to assist in providing access to the people attending the immunisation clinic and a private space in which to conduct the interview and data collection.

Looking forward to your favourable response.

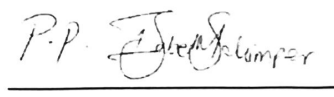
Sincerely



Courtney Brown  
Research Student  
0834170517



Dr. van der Linde  
Head of Speech-Language  
Pathology  
Department of Speech-Language  
Pathology and Audiology



Ms. Mosca  
Lecturer  
Department of Speech-Language  
Pathology and Audiology

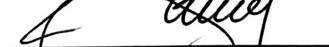
---

PERMISSION FROM THE FACILITY

I hereby confirm that I have been informed by the researcher about the nature, procedure, benefits and risks of the research study entitled: **"The effect of mHealth and conventional awareness campaigns on caregiver knowledge of early childhood development"**. I give permission to Courtney Brown to make use of the facilities and to collect data at Stanza Bopape Clinic in 2018



Name



Signature

16.03.2018

Date

Mishkaya Lalbahadur

Witness name



Witness signature



**GAUTENG PROVINCE**  
HEALTH  
REPUBLIC OF SOUTH AFRICA

**Annexure 1**

**Declaration of intent from the clinic manager or hospital CEO**

I give preliminary permission (name of researcher) to do his or her

research on "The effect of mHealth & conventional awareness campaigns on caregiver  
(research topic) in

Knowledge of ECD\* Stanza Bopape (name of clinic) or

Stanza Bopape (name of CHC ) or

\_\_\_\_\_ (name of hospital).

I know that the final approval will be from the Tshwane Regional Research Ethics Committee and that this is only to indicate that the clinic/hospital is willing to assist.

Other comments or conditions prescribed by the clinic or CHC manager or hospital CEO:

Stanza Bopape  
Signature  
Clinic Manager/CHC Manager/CEO

16.03.2018  
Date

**Appendix C: Permission from Tshwane District**



**GAUTENG PROVINCE**  
HEALTH  
REPUBLIC OF SOUTH AFRICA

Enquiries: Dr. Lufuno Razwiedani  
Tel: +27 12 451 9036  
E-mail: [lufuno.razwiedani@gauteng.gov.za](mailto:lufuno.razwiedani@gauteng.gov.za)

**TSHWANE RESEARCH COMMITTEE: CLEARANCE CERTIFICATE**

MEETING: 03/2017  
PROJECT NUMBER: 19/2018  
NHRD REFERENCE NUMBER: GP\_201803\_020

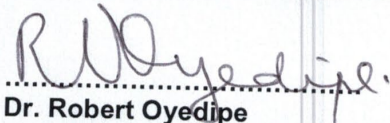
TOPIC: The effect of mHealth and conventional awareness campaigns on caregiver knowledge of early childhood development

Name of the Researcher: Courtney Brown  
Supervisor: Dr. Jeannie van der Linde  
Miss Renata Mosca  
Facility: Stanza Bopape chc  
Name of the Department: University of Pretoria


**NB: THIS OFFICE REQUEST A FULL REPORT ON THE OUTCOME OF THE RESEARCH DONE AND**

**NOTE THAT RESUBMISSION OF THE PROTOCOL BY RESEARCHER(S) IS REQUIRED IF THERE IS DEPARTURE FROM THE PROTOCOL PROCEDURES AS APPROVED BY THE COMMITTEE.**

DECISION OF THE COMMITTEE: APPROVED



Dr. Robert Oyedipe  
Acting Chairperson: Tshwane Research Committee  
Date: 19/03/2018

  
Mr. Pitsi Mothomone  
Chief Director: Tshwane District Health  
Date: 2018.03.23

## Appendix D: Informed consent letter



Faculty of Humanities  
Department of Speech-Language Pathology and Audiology

To whom it may concern

### Participant information leaflet and informed consent form

**Title of the research study:** The effect of mHealth and conventional awareness campaigns on caregiver knowledge of early childhood development

#### INTRODUCTION:

This letter is to invite you to participate in a research study. This research study will be conducted by a master's student from the Department of Speech-Language Pathology and Audiology, University of Pretoria. Before you agree, you should fully understand what is involved. If you have any questions do not hesitate to contact the research student.

#### PURPOSE OF THIS STUDY:

The amount of knowledge that a caregiver has of infant development can influence a child's development. This study aims to compare an mHealth awareness campaign to a conventional awareness campaign in determining which campaign is most effective in improving knowledge of infant development. The results will demonstrate which method of information delivery leads to the best retention and implementation of the information supplied.

#### DURATION OF THIS STUDY:

The study will begin in February 2018. The researcher will visit participants at the Stanza Bopape immunization clinic between February and June 2018. The interview should not take more than 60 minutes of the participants time.

#### EXPLANATION OF PROCEDURES:

You will complete a background questionnaire and the Knowledge of Infant Development Inventory, a 3-page multiple-choice questionnaire about infant development. You will then receive information regarding infant development. Information will be given either via weekly text message, pamphlets or will be provided after your 9-month immunization visit. At the child's 9-month visit, you will be requested to complete the Knowledge of Infant Development Inventory again. The results obtained will be used for a postgraduate research study and may be used for further research.

#### ETHICAL APPROVAL

This research study has been granted ethical clearance from the Faculty of Humanities at the University of Pretoria and permission has been obtained from the Department of Health and Stanza Bopape Clinic.

#### PARTICIPANT RIGHTS:

Participation in this study is entirely voluntary. You are free to withdraw at any time during the study without any negative consequences. Participation in this study will not affect the services received at Stanza Bopape. All information obtained will be treated as confidential. No names and/or other identifying information will be revealed. The data collected during this study will only be accessible to the researchers.

## **THE RISKS AND BENEFITS OF PARTICIPATING IN THIS STUDY?**

There are no potential risks or risks for discomfort for you or your child during this study. I will be able to provide you with feedback regarding your knowledge of infant development, which can help you in supporting your child's development.

## **CONFIDENTIALITY:**

No identifying information will be reported by the researcher in the scientific article. A numeric code will be provided to you in order to identify you as a participant. Data will be securely stored for a minimum of 15 years at the University of Pretoria.

The participants are free to contact the researchers at any time should any doubts or enquiries arise. The researcher may be contacted on the following number for further information: Courtney Brown - 0834170517


If you are willing to participate in this research study, please sign the attached consent form.

Kind regards



---

**Ms. Courtney Brown**  
Research student



---

**Ms. Renata Mosca**  
Research supervisor

Email [u13028465@tuks.co.za](mailto:u13028465@tuks.co.za)

Email [renata.mosca@up.ac.za](mailto:renata.mosca@up.ac.za)



---

**Dr. Jeannie van der Linde**

Research supervisor

Email [jeannie.vanderlinde@up.ac.za](mailto:jeannie.vanderlinde@up.ac.za)

**HEAD of Department of Speech-Language Pathology and Audiology**

**Appendix E: Informed consent form**

**Title of research study:** The effect of mHealth and conventional awareness campaigns on caregiver knowledge of early childhood development. I .....  
hereby voluntarily grant my permission for participation in the above-named study as explained to me by .....  
The nature, objective, possible safety and health implications have been explained to me and I understand them. I have read and understood the information in the leaflet provided. I understand my right to choose whether to participate in the study and that the information furnished will be handled confidentially. I understand that I may withdraw from this study at any time. I am aware that the results of the investigation may be used for the purposes of publication and that the results of this investigation may be used for further research.

Yes  No

Caregiver: name and signature: \_\_\_\_\_ Date: \_\_\_\_\_

Researcher: \_\_\_\_\_ Date: \_\_\_\_\_

**VERBAL PATIENT INFORMED CONSENT**

I, the undersigned, \_\_\_\_\_, have read and have explained fully to the parent/caregiver, named \_\_\_\_\_, the patient information leaflet, which has indicated the nature and purpose of the research study titled: The effect of mHealth and conventional awareness campaigns on caregiver knowledge of early childhood development in which I have asked the parent/caregiver to participate. The explanation I have given has mentioned both the possible risks and benefits of the study. The parent/caregiver indicated that he/she understands that he/she will be free to withdraw from the study at any time for any reason.


\_\_\_\_\_  
Courtney Brown  
Researcher name

  
\_\_\_\_\_  
Researcher: Signature

\_\_\_\_\_  
Date



## Appendix F: Case history

		Faculty of Humanities Department of Speech-Language Pathology and Audiology			
<b>Participant and family information</b>					
Please answer all the questions below					
		For office use only			
Contact number		Participant code			
Own number/ family member other (specify):		V1			
<b>Section A: Background Information</b>					
Question 1		For office use only			
What <b>ward</b> do you live in?		V2			
	1				
Question 2					
What is <b>your</b> birth date? (Please use dd/mm/yy)					
	6	V3			
Question 3					
In terms of the Employment Equity Act, to which population					
Black	1			V4	
Coloured	2				
White	3				
Asian	4				
Other (specify):	5				
Question 4					
What is your infant's <b>birth</b> date? (Please use dd/mm/yy)					
	1	V5			
Question 5					
What is the <b>gender</b> of your infant?					
Male	1			V6	
Female	2				
Question 6					
What was the <b>length</b> of the pregnancy? (Whole weeks)					
	1	V7			
Question 7					
What is your <b>relationship</b> to the infant?					
Mother	1			V8	
Father	2				
Family member	3				
Non-family member	4				

Question 8				
Does the infant go to day-care?				
Yes	1	V9		
No	2			
Question 9				
How many children are in the home?				
	1	V10		
Question 10				
Who spends the <b>most time</b> with your infant? (primary caregiver)				
Mother	1	V11		
Father	2			
Both parents	3			
Grandparents	4			
Extended family members	5			
Foster parents	6			
Other (specify):	7			
Question 11				
What is the highest education level of the <b>caregiver</b> ?				
I do not know	1	V12		
No formal schooling	2			
Less than Grade 8	3			
Grade 8 to Grade 10	4			
Grade 11 to Grade 12	5			
Diploma/Degree	6			
Postgraduate	7			
Other	8			
Question 12				
What is your housing status?				
Own my house	1	V13		
Own my flat	2			
Informal housing	3			
I am renting house/flat/room	4			
I stay with friends/family	5			
Question 13				
Is this the first child the caregiver is <b>raising</b> ?				
Yes	1	V14		
No	2			
If no, how many before this infant?:	3			
Question 14				
Is the caregiver employed?				
Yes	1	V15		
No	2			
Question 15				
What is the caregiver's home language?				

Setswana	1	V16	
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Questions continue on the next page

Sepedi	2
IsiZulu	3
Shangaan	4
English	5
Afrikaans	6
Venda	7
Ndebele	8
Xhosa	9
Southern Sotho	10
SiSwati	11
Tsonga	12
Other (specify):	13

Question 16

What other languages is the infant exposed to?

Setswana	1	V17	
Sepedi	2		
IsiZulu	3		
Shangaan	4		
English	5		
Afrikaans	6		
Venda	7		
Ndebele	8		
Xhosa	9		
Southern Sotho	10		
SiSwati	11		
Tsonga	12		
Other (specify):	13		

Question 17

How many adults are living with the infant?

	1	V18	
--	---	-----	--

Question 18

What is the average household income per month?

	1	V19	
--	---	-----	--

Signature	
Date	

Thank you so much for your time and participation!

## Appendix G: Abridged KIDI

### SECTION K: INFANT DEVELOPMENT

K1. The next questions ask about normal infant development. Each item describes what might be the behavior of a typical infant or what could affect an infant's growth and behavior. Please answer each question based on your knowledge of infants in general, not how your baby behaved at a certain age. Please tell me if you agree or disagree with each statement or if you are not sure of the answer.  
 READ STATEMENTS.

	AGREE	DISAGREE	NOT SURE
a. Talking to the baby about things he or she is doing helps the baby's development and later competence . . . . .	1	2	8
b. Babies do some things just to make trouble for their parents, like crying or soiling their diapers . . . . .	1	2	8
c. The baby should not be held when he or she is fed because this will make the baby want to be held all of the time . . . . .	1	2	8
d. In general, babies cannot see and hear at birth	1	2	8
e. Some days you need to discipline your baby; other days you can ignore the same thing. It all depends on the mood you're in that day . . . . .	1	2	8
f. The newborn can see a face six feet away as well as an adult can . . . . .	1	2	8
g. A young brother or sister may start wetting the bed or thumb sucking when the new baby arrives in the family . . . . .	1	2	8
h. A two-year-old's sense of time is different from an adult's . . . . .	1	2	8
i. Some mothers do not get really involved with their infants until the baby starts to smile and look at them . . . . .	1	2	8
j. An infant may stop paying attention to what is going on around him or her if there is too much noise or too many things to look at . . . . .	1	2	8
k. Some normal babies do not enjoy being cuddled . . . . .	1	2	8
l. The more you comfort your crying baby by holding and talking to him or her, the more you spoil him or her . . . . .	1	2	8
m. A good way to teach your child not to hit is to hit back . . . . .	1	2	8

K2. Each of the following statements ask about the age at which infants can do something. If you think the age is about right, then "Agree" with the statement. If you don't agree, then decide whether a Younger or Older infant could do it. If you aren't sure of the age, answer "Not Sure." READ STATEMENTS. IF DISAGREE, PROBE FOR YOUNGER OR OLDER.

	AGREE	DISAGREE		NOT SURE
		YOUNGER	OLDER	
a. Most babies can sit on the floor without falling over by seven months . . . . .	1	2	3	8
b. Most two-year-olds can tell the difference between a make-believe story on TV and a true one . . . . .	1	2	3	8
c. Infants usually are walking by about 12 months of age . . . . .	1	2	3	8
d. An eight-month-old acts differently with a familiar person than with someone not seen before . . . . .	1	2	3	8
e. A baby is about seven months old before he or she can reach for and grab things . . . . .	1	2	3	8
f. A two-year-old is able to reason logically, much as an adult would . . . . .	1	2	3	8
g. A one-year-old knows right from wrong . . . . .	1	2	3	8
h. An infant of three months often will smile when he or she sees an adult face . . . . .	1	2	3	8
i. Most infants are ready to be toilet trained by one year of age . . . . .	1	2	3	8
j. An infant will begin to respond to his or her name at ten months . . . . .	1	2	3	8
k. Babies begin to laugh at things around four months of age . . . . .	1	2	3	8
l. Five-month-olds know what "no" means . . . . .	1	2	3	8
m. A four-month-old lying on his or her stomach can lift his or her head . . . . .	1	2	3	8
n. Babbling, "a-bah-bah" or "bup-bup" begins around five months . . . . .	1	2	3	8
o. One-year-olds often cooperate and share when they play together . . . . .	1	2	3	8
p. An infant of 12 months can remember toys he or she has watched being hidden . . . . .	1	2	3	8
q. A baby usually says his or her first real word at six months . . . . .	1	2	3	8

## Appendix H: Proof of submission of article to ECD & Care

10/15/2019

Gmail - Early Child Development and Care - Manuscript ID GECD-2019-0383



Courtney Brown <courtney.paige.brown11@gmail.com>

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### Early Child Development and Care - Manuscript ID GECD-2019-0383

1 message

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**Early Child Development and Care** <onbehalf@manuscriptcentral.com>

14 October 2019 at 14:13

Reply-To: profrevans75@gmail.com

To: courtney.paige.brown11@gmail.com

14-Oct-2019

Dear Miss Brown:

Your manuscript entitled "The effect of mHealth and conventional awareness campaigns on caregivers' developmental literacy" has been successfully submitted online and is presently being given full consideration for publication in Early Child Development and Care.

Your manuscript ID is GECD-2019-0383.

Please mention the above manuscript ID in all future correspondence or when calling the office for questions. If there are any changes in your street address or e-mail address, please log in to Manuscript Central at <https://mc.manuscriptcentral.com/gecd> and edit your user information as appropriate.

You can also view the status of your manuscript at any time by checking your Author Centre after logging in to <https://mc.manuscriptcentral.com/gecd>.

Thank you for submitting your manuscript to Early Child Development and Care.

Sincerely,  
Early Child Development and Care Editorial Office