

**MEASURING PARENT-ADOLESCENT
COMMUNICATION AND INTERACTION USING
VIDEO: A PILOT STUDY OF THE 'TEENCAM' VIDEO
OBSERVATIONAL METHODOLOGY IN SOWETO,
SOUTH AFRICA**

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A Dissertation submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Science in Medicine in the Department of Paediatrics.

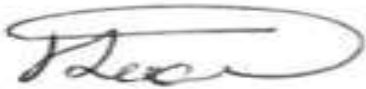
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Declaration

I, Fortunate Lekhuleni, declare that this Dissertation is my own, unaided work. It is being submitted for the Degree of Master of Science in Medicine at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.



19th day of August 2024

Dedication

To my dearest Neo...
You inspire me to be the best version of myself.

Abstract

Background: Adolescents in South Africa deal with many challenges pertaining to their development and mental health. Parent-adolescent communication is essential for promoting and fostering strong parent-child relationships, which in turn promote increased supervision and monitoring of adolescent behaviour, which is known to improve adolescent outcomes. Generally, parent-adolescent communication is measured using subjective self-report questionnaires, which are known to have bias and tend to focus more on broader aspects of parenting and adolescent behaviours or attitudes, and less on communication and quality in parent-adolescent relationships. Similarly, qualitative interviews tend to have an individual rather than a didactic focus, relying on audio recording transcripts which provide limited insight into relational interactions and communication. Observational video methodology has for a long time been used in early childhood research to measure parent-child relationships objectively, and video feedback methods are often used as an intervention tool in parenting programs. However, video observation has seldom been applied to parent-adolescent interactions, and potentially offers a new and objective method to measuring communication and interaction between parents and adolescents. Little is known about the acceptability or feasibility of this methodology for this age group or its potential for use in a South African urbanised context, or its relative advantages to other current observational methods.

Aim: The aim of this qualitative study was to explore the acceptability and feasibility of using 'Teencam' to observe parent-adolescent communication and interaction in a South African urban setting and, to explore its potential acceptability as a video feedback intervention tool.

Methods: The study enrolled 16 parent-adolescent pairs in Soweto, South Africa (SA). The adolescents (60% females), aged 11 to 15 years, were paired with their biological parent, who identified as the adolescent's current primary caregiver, and the pair needed to be co-resident to be eligible for participation. Communication and interactions between the parents and adolescents were assessed over several time-points, using a novel video observational portable headcam device called 'Teencam'. Video data were coded using manual (audio and video coding) and automated coding (FaceReader software – capable of detecting basic facial expressions). Feasibility was evaluated by the reliability of the Teencam device to record

interactions that were usable or codable in terms of audio and video content, and by evaluating the Teencams relative performance and added value against other methods of self-report (audio transcripts only) and analysis (automated software). To determine acceptability, 14 parents participated in one-on-one interviews about their perceptions on their adolescent's behaviour during observation, the comfortability of wearing the Teencam device, and the feasibility of using the observational game tasks during their interactions with their adolescents.

Results: The Teencam methodology proved to be feasible and acceptable amongst parent-adolescent pairs in Soweto, South Africa (SA). The Teencam device was able to capture verbal and non-verbal communication and interactions amongst parent-adolescent pairs enhancing the quality of data available for interpretation, and the inferences that could be made, when compared to audio transcript only.

Limitations in the Teencam device's capacity to handle participant movement and some operational constraints, such as turning on and off and beginning recording were noted. Furthermore, the quality of lighting in the assessment rooms and the colourful decoration of the headcam device impeded the performance of the FaceReader software in analysing facial expressions. Parents reported the method to be acceptable and engaging, with specific preferences for card game interactions and endorsed that the approach could be helpful in interventions that aimed to improve the parent-adolescent relationship and communication.

Conclusion: This study demonstrates that with some technological enhancements, the feasibility and acceptability of measuring parent-adolescent communication and interaction in research using Teencam video observational methods in urban South Africa is promising. The highest quality of analytic output stemmed from manual coding and triangulation of data, which while appropriate for qualitative investigations or pilot studies, would be unfeasible to replicate at a larger scale without significant human and time resources. Advances in technology are needed to use this method on a larger scale.

Keywords

Parent-adolescent, communication, interaction, pilot study, video observation

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Publications arising from the study

Lekhuleni F, Desai R, Pearson R and Rochat T.J.R. (2023) Testing the acceptability and feasibility of video observational methodology to measure parent-adolescent communication and interaction. *Front. Child Adolesc. Psychiatry* 2:1122841. doi:10.3389/frcha.2023.1122841

List of Abbreviations and Acronyms

AI	Artificial Intelligence
AVI	Audio Video Interleave
BAG	BEACON Advisory Group
BEACON	Behaviour executive function, in adolescent with conduct problems
DPHRU	Developmental Pathways for Health Research Unit
FR	FaceReader
LMIC	Low-Middle-Income Country
SA	South Africa
SSA	Sub-Saharan Africa
USB	Universal Serial Bus

Chapter 1 Introduction

This chapter entails a detailed background and introduction on the topic, the aim, and objectives of the study.

1.1 Introduction and background

Approximately 1.2 billion adolescents (10–19 years old) comprise 16% of the global population, with approximately 90% residing in developing countries (1). Adolescents in South Africa face a multitude of threats to their health and well-being. Their experience of adolescence is often dampened by the possibility of contracting HIV infection, sexually transmitted infections (STIs) and adolescent pregnancies (2) exposure to violence in the home, school and community (3), and the potential consequences to mental health risks (4). For example, adolescents in South Africa have high rates of mortality and morbidity (5) oftentimes due to neglect, abuse or crime. Adolescents in South Africa face many mental health challenges, including almost double the rates of conduct problems than are seen in high-income country settings (6). The transition from childhood to adolescence is a critical developmental period and parenting and the quality of the parent-child relationship is proven to be an important mediator in preventing negative adolescent outcomes (7). However, at the same time, the transition into adolescence brings about substantial changes in, and re-negotiation of, the parent-adolescent relationship, which is frequently stressed due to developmental adjustments that adolescents go through as they move towards autonomy (8). Establishing sufficient relationship supports for parents and adolescents is crucial in high-risk environments so that adolescents can develop their independence and autonomy while managing potential risks with parental support.

1.2 The role of parenting in adolescent development

Several studies, including South African research, have shown a strong relation among the quality of the parent-child relationship and favourable outcomes for adolescents and the parent-child relationship quality, particularly during the early stages of adolescence (9). Despite the widespread perception that the parent-child

relationship quality automatically declines in adolescence (10), evidence suggests that while relationships may potentially become strained, appropriate support and responsive or positive parenting (11), are important in preserving the parent-adolescent relationship. Improved parent-child relationships are directly connected to positive behavioural, social and psychological outcomes (12) and health throughout adolescence. These positive outcomes have been shown to persist to later psychosocial functioning (13). Conversely, adolescent mental health issues, like depression symptoms, are linked to negative or dysfunctional parent-adolescent relationships (14) and other mental disorders which in turn also makes adolescents susceptible to health (15) and risky sexual behaviours (16). Although parents may occasionally question their impact, research suggests that parents have a significant role in guiding and supporting their adolescent children's healthy development (17).

Parenting involves numerous dimensions including communication, supervision and monitoring. Parental supervision and monitoring has been demonstrated to be crucial for promoting healthy adolescent development, irrespective of the depth and quality of the relationship (18). Literature suggests that greater parental engagement, involvement and monitoring has a protective effect, not only for psychological outcomes but also for preventing risk behaviours such as early sexual debut (19), risky sexual behaviours (20) and other delinquent behaviours such as substance and alcohol abuse (3).

1.3 Parent-adolescent communication

Communication is central to the maintenance of all human relationships, and the parent-adolescent relationship is no exception. Parent-adolescent engagement and communication are pointers in the parent-adolescent relationship quality. Although, patterns of parent-child communication and interactions are likely formed earlier in childhood, parents need to adjust during adolescence to be responsive to the adolescents evolving developmental needs and to changes in the parenting context (6). In early adolescence, conflict (such as bickering, squabbling, and disagreements) over everyday issues is a characteristic of parent-adolescent communication (8). Styles of parenting, which may have been effective in the early stages of development (in particular authoritarian styles) may become ineffective, leaving both

parents and adolescents frustrated and alienated. However, during adolescence (a period of rapid biological, social, emotional and psychological development), maintaining open or healthy communication between an adolescent and their parent has been shown to be beneficial and to reduce individual health-risk behaviours (21).

1.4 Social cognition and parent-adolescent interaction

Alongside the rapid emotional and biological changes that accompany puberty (22), early adolescence is also known to be a developmental stage when the brain undergoes rapid development, particularly in the development of metacognition (23). Pronounced changes in socio-emotional engagement take place (24), including in motivation, sensation seeking, and risk-taking, as well as emerging sensitivities to peer relationships (25). Adolescent capacities emerge progressively over time, not always in line with other biological or emotional progressions, and are shaped by social and environmental exposures, in which parenting and peer influences are shown to be central. Hence this period of rapid development can be strongly moderated by the quality of relationships around them, and the support provided by the parenting environment is important for the healthy development of social cognition.

1.5 Limitations in existing literature

Existing research on parent-adolescent communication and interactions in South Africa has two significant limitations that inform the aims of this research: Firstly, the methodology for studying parent-adolescent relationships has traditionally depended heavily on self-reported surveys which may contain imitations including systematic and social desirability biases (26). The validity of self-report measures is questioned when data is solicited from both the parent and adolescent, as concordance between their accounts of one another's emotions and behaviours tends to be low (27). Furthermore, studies have shown that most parents exaggerate their own reports when compared to objective measures of parenting (28). Research is often limited to using internationally developed measurement tools which may not capture cultural nuances in communication and relationship and are usually limited to one perspective (either the adolescent or the parent).

Secondly, parent-adolescent communication and interaction have been under-researched as an intervention tool in South Africa. This is a missed opportunity because when research has focused on improving the parent-child relationship in younger age groups in South Africa (6), positive impacts have been shown. Adolescent literature in South Africa has focused heavily on documenting the prevalence of harsh discipline amongst South African parents (29) and describing the consequences of negative parenting styles and behaviours on adolescent outcomes (26). Unfortunately, reported interventions, which often have high intensity and high costs, have had only marginal effects on harsh discipline or minimising the negative effects for adolescents (29) and the extent to which any improvements can be maintained remains undetermined. Little research has investigated the quality and nature of parent-adolescent communication as an explanatory variable in adolescent behaviour. Without the ability to measure these interactions accurately in the South African socio-cultural context, we are limited in our ability to innovate in intervention and prevention approaches. There is evidence, that video feedback can be very useful for improving the quality of relationships and communication in other age groups and other settings, so video observations may not only be a useful methodology for enhancing our understanding of the nature of parent-adolescent communication, but also a potential intervention entry point to improving the quality of parent-adolescent relationships (28).

1.6 Observational measures of parent-adolescent communication and interaction

Having qualified researcher's rate observed parenting behaviours is considered to be more accurate than self-report data (26, 27, 30). However, these methods also have limitations in that they are expensive to implement, and until recently, they required a lot of time to score and code. Consequently, the use of these methods is far less common in lower-income contexts. There is no available research to guide developmentally standardised approaches for measuring parent-adolescent communication and interaction in low- and middle-income countries (LMIC), and the majority of observational studies involving children and parents have concentrated on early childhood. Nonetheless, new technological advances in observational methodologies such as cheaper headcam video cameras (31) and increasingly sophisticated coding software such as FaceReader (32), which automate the coding

of facial expressions, can significantly cut down on the amount of time required to code observations. These technologies have the potential to improve methodologies in settings similar to South Africa since they require limited resources and less time to gather and code objective data. Conversely, there is a lack of knowledge regarding the feasibility or acceptability of this method in these settings, as well as the validity and reliability of parent-adolescent observational protocols.

1.7 Problem statement

Previous studies have demonstrated the importance of the parent-adolescent relationship and the communication and interaction styles that are linked with it for the development and outcomes of adolescents. Lack of objective methodology and data from the local context limits our understanding of the communication and interaction process between parents and adolescents and how this might inform interventions that could impact adolescents' development and outcomes in SA. Prior to developing further intervention research, the potential of new objective methodologies needs to be explored and tested for accuracy, feasibility, and acceptability.

1.8 Rationale

Adolescence is a period of significant developmental risk and the parent-adolescent relationship is important and can strongly impact adolescent development and outcomes. Gaining more insight into the parent-adolescent relationship could assist in identifying suitable intervention opportunities during this sensitive developmental stage. However, there is very little research in South Africa on parent-adolescent communication and interaction, and existing research is limited in its reliance on self-report. Therefore, we need good observational methodologies that are user-friendly and easy to analyse, to help explore this better. New technologies have emerged making it more feasible to conduct observational research in South Africa, but, three barriers remain:

- a) Currently there are no existing protocols for objectively measuring parent-adolescent communication and interactions in urban South African settings;
- b) There is limited knowledge on coding observational data within the South African socio-economic and cultural context;

- c) There is limited evidence on the acceptability of these observational methods on parent or adolescent participants in this context.

This research holds significance in that it could result in enhanced methodologies for measuring the communication and interactions between parents and adolescents. This pilot study may eventually lead to novelties in our understanding of how to promote adolescent development and parenting practices in high-risk contexts.

1.9 Study aims and objectives

This qualitative study aims to explore whether it would be feasible and acceptable to observe, code and analysis parent-adolescent communication and interactions in an urban South African setting using "Teencam".

This study has the following five research objectives:

1. To determine whether it is feasible to research parent-adolescent interactions using the Teencam video observational methodology, which records audio and video footage
2. To establish whether parent-adolescent pairs can engage in naturalistic conversation and interaction through observational game tasks.
3. To investigate the acceptability of the Teencam video observational methodology and observational game tasks from individual interviews with parents of adolescents
4. To investigate whether automated coding software can recognise and detect facial expressions from video footage of parent-adolescent interactions
5. To develop a locally adapted age-relevant protocol for Teencam and to make refinements and enhancements based on participant feedback

1.10 Overview of chapters

Chapter one - this introduction chapter included a discussion of the background, problem statement, significance, aim and objectives of the study.

Chapter two – through a literature review this chapter will especially address the developmental period of adolescence, the significance of the parent-adolescent relationship, parenting styles, parental monitoring, and the ways in which these

factors affect the parent-adolescent relationship. The chapter will include a description of the novelty video observational methodology and a review of previous studies that have used the same device.

Chapter three – this chapter will provide a discussion of the study's research methods, including the materials, sampling strategy, research design, data collection, and data analysis

Chapter four – this chapter will present the results of this study, the feasibility and acceptability of the Teencam methodology as well as the coding of the video data, both manually and automatically.

Chapter five - the final chapter will provide an analysis of the study's findings, a comparison and contrast of the results with previous research, and an interpretation of the results. There will also be a discussion of the limitations and suggestions for further research.

Chapter 2 Literature Review

2.1 Introduction

This chapter provides a review of available literature around parent-adolescent relationships, with a specific focus on communication and interaction. Attention will also be drawn to the methodology of studies which have conducted similar research, and how their findings implicate the current study.

The chapter begins with a brief description of adolescence and the difficulties associated with this important developmental transitional period. Thereafter, an overview of relevant theories of the parent-child relationship is provided, highlighting the role that relationship quality, parenting styles, and parental monitoring play in protecting adolescents from risky behaviours. Following this section, parent-adolescent communication and interaction will be explained in-depth, including their significance and impact on the parent-adolescent relationship, and their implications on adolescent outcomes. The chapter concludes by describing the clinical and methodological significance of the current study.

2.2 Adolescence

Adolescents – individuals aged between 10 and 19 years – account for approximately 16% of the world's population. In sub-Saharan African however, adolescents make up the largest proportion of the population at 23% (1). Similar to global rates, 17.4% of the South African population is aged between 10-19 years, according to the 2022 Census data (33). If we consider that adolescents are a key demographic (as future parents, workforce, leaders) then understanding and meeting their needs is critical for promoting not only their own lifelong health and well-being, but also that of their future offspring, and to ensuring the sustainable development of their communities.

The period of adolescence is one of change, growth and transition from childhood to adulthood. The changes that take place in adolescence are influenced by both hormonal influences on physical development and socio-cultural influences on behaviour (34). This period is unfortunately also associated with the inception of

several health and wellbeing-related problems including depression, eating disorders, substance abuse and dependence, risky sexual behaviour, antisocial and delinquent activity, and school dropout (35). For adolescents in South Africa, they also enter this period facing multiple, often cumulative problems including poverty, exposure to crime, violence and abuse, poor infrastructure, barriers to accessing quality education, high rates of non-communicable disease, and high rates of HIV (16).

The mostly observable biological, cognitive, and neurological changes that adolescent's undergo (36) also have an impact on psychosocial functioning and relationships (37, 38). Adolescence is often viewed as a 'difficult' phase for both adolescents and their parents. Many parents worry about raising teenagers, stating that they believe this to be a stressful and highly conflictual period in life (8). The parent-adolescent relationship may experience some challenges as children grow towards independence, parents find it difficult to find new ways to support their children.

In summary, adolescence comes with major changes in all areas of functioning. It is during these periods of rapid development, when there are often challenges in the parent-child relationship, and parental-sensitivity and support play a huge role in ensuring that children transition successfully to the next developmental stage (37, 39). Therefore, understanding theories of parent-child relationships may help shift our widespread preconceptions of adolescence being a period of detaching from others and being rebellious towards a more accurately and nuanced description of this stage of development that emphasises the importance of positive communication and interaction in the parent-child relationship.

2.3 Theories of parent-child relationships

The parent-child relationship is one of the most influential and important relationships in shaping an individual's psychological wellbeing and social functioning (40). While many theories exist, the focus here will be on developmental and psychoanalytic theory – both of which see the parent-child relationship as key to understanding how individuals develop over time (41).

Sigmund Freud's psychoanalytic theory postulated that early parent-child interactions influence adult personality and emotional development. For example, if a woman struggled in intimate relationships with males, Freud may have attributed this to an unhealthy relationship with her father (42). Erik Erikson expanded upon Freud's ideas by introducing the concept of psychosocial stages, each characterised by a unique developmental challenge. Erikson believed that the parent-child relationship was central to the child successfully overcoming these 'challenges'. For example, a child who experiences consistent caregiving and responsive interactions during the "trust versus mistrust" stage of childhood will develop into a trusting adult (43).

Vygotsky's sociocultural theory (44) and Albert Bandura's theory on parent-child relationships (45) focus on parents as teachers – both explain that children are taught social norms and how to relate to others through their relationships with their parents (46). Vygotsky's sociocultural theory states that a child's environment – including parents, peers, society and even culture – supports their continuous process of social learning and ultimately their development of higher psychological functions (44). Albert Bandura's social learning theory compares parents to models who demonstrate behaviour that children then mimic (45). For example, if a child grows up in an environment where adults are physically affectionate, Bandura's theory would assume the child would mimic this affection toward others.

Attachment theories in psychology also influence the understanding of the parent-child relationship. John Bowlby's attachment theory suggests that early relationships between infants and caregivers shape emotional bonds and social development (46). His work which showed that children experience intense distress when separated from their mothers, and that they will demonstrate behaviours such as crying, clinging, and frantically searching to avoid separation to re-establish proximity to a missing parent (46). While young children need their parents to be physically close to them and available to comfort them when they are upset, adolescents may not require the same level of closeness and might find comfort in the knowledge that their parents are there to support them even when they are not present (14). Still, secure attachment is crucial in adolescence as it is associated with decreased high-risk conduct problems, uncommon mental health problems, improved social skills and better coping mechanisms (37), and has a positive impact on the quality of the parent-adolescent relationship.

In summary, these theories demonstrate that attachment and parent-child relationships have significant effects on cognitive, social and emotional functioning across the life course.

2.4 Parent-adolescent relationship quality

The quality of parent-child relationship has long been recognised as significant to child development (47), with psychoanalytic theories positing that the early mother-child relationship becomes a blueprint for all future relationships in an individual's life because it nurtures all aspects of the child's development – emotional, social and physical (48-50).

The importance of the relationship with either or both parents remains important well beyond childhood, despite altered levels of dependency and patterns of interaction. The parent-adolescent relationship is dynamic, bidirectional and transactional (51), and it includes the diverse ways that individuals continually influence one another through time. However, it is a challenge to change the long held perception that parent-child relationships decline in quality during the adolescent years (48). Moreover, research suggests that parent-child relationships are more likely to be unrestricted during adolescence (51).

The quality of parent-adolescent relationships may be described as complex and five-dimensional, namely; 1) autonomy and conflict; 2) closeness, attachment, and warmth; 3) monitoring and limit setting; 4) socialization; and 5) variations (52, 53). These dimensions go through significant transformations during adolescence due to major developmental changes that are taking place in the adolescent's life, affecting the quality of the parent-child relationship.

Across cultural groups, the quality of the parent-child relationship has consequences for children's mental and physical health, as well as their social outcomes (13). There is increasing evidence that poor quality parent-child relations result in negative outcomes in adolescence or early adulthood, such as poor emotional intelligence, inability to socialise, psychological and behavioural dysfunction (54), and are most likely to develop conduct disorders (55).

It has been shown that the quality of the parent-adolescent relationship is associated with a number of adolescent health and behavioural outcomes (15). Experiencing positive parenting increases, the adolescent's likelihood to reporting higher self-esteem and emotional wellbeing, and achieving better educational outcomes (56). On the contrary, experiencing low-quality parenting relationships is associated with poorer emotional wellbeing including experiencing depressive symptoms and social withdrawal, and higher rates of aggression and delinquency (47).

2.5 Parenting styles

Parenting involves nurturing, guarding, and directing a child or adolescent as they grow. Parenting style refers to parental techniques, attitudes and behaviours that parents use to respond to and reinforce the behaviour of their children in various contexts (9, 57-59).

Parenting styles were originally conceptualised as a collection of parenting behaviours that parents use in a variety of contexts to raise their children and create and enduring child-rearing environment (60). The three most prevalent parenting philosophies revealed by parenting research are authoritarian, authoritative and permissive (58). Below is a brief description of each:

Authoritarian parents are strong on control and lacking in warmth. They place a high value in conformity and obedience to a set of standards. The children tend to have poor social skills and decision making skills.

Authoritative parents are high in controlling but also have a lot of warmth. They exhibit autonomy, self-discipline and self-will towards their children. The children tend to be independent, self-confident and have more adaptive behaviour.

Permissive parents are less on control and greater in warmth. They are more receptive to their children's wishes and behaviours and employ less discipline. Therefore, the children tend to have poor self-control, and they are too demanding and struggle to form relationships.

Parenting styles are often influenced by gender roles. Research suggests that fathers tend to adopt authoritarian and permissive parenting styles while mothers lean more towards authoritative parenting (61). Overall, a recent systematic review provides more proof that parent's methods of raising their children have an impact on the child. According to this review, the authors found that negative parenting approaches were associated with the maladaptive behaviour of children and adolescents (62).

2.5.1 Parenting and behavioural disorders

Research shows that parents play a dominant role in shaping their children's behaviour, hence child and adolescent conduct problems are also found to stem from the reciprocal difficulties in the relationship between the parent and the child or adolescent (63, 64). These studies also demonstrated that children and adolescents engage actively in interactions with their parents rather than being passive objects of their care. For instance, studies looking at parenting as a risk factor for behavioural issues in children and adolescent's highlight the dynamic, reciprocal interaction that exists between parents and children. Poor parenting, which includes low parental involvement, poor supervision, and harsh inconsistent discipline, is one of the many risk factors implicated in the development of conduct problems (64-66)

2.5.2 Harsh parenting and its effects on adolescent outcomes

Harsh parenting is defined as intimidating behaviours and negative emotional expressions that parents use on their children, including such as yelling or name calling, and physical aggression, such as pinching or spanking (67). In South Africa (62) and the United States (61), the use of corporal punishment as a form of child discipline is still one of the remaining traditional childrearing practises. Evidence suggests that, for many children, especially those who grow up in lower-class urban South African homes, physical punishment is a common occurrence, even though the Constitutional Court of South Africa essentially outlawed all forms of corporal punishment of children on September 18, 2019.

Using comparable data from 63 countries, it has been reported that on average about four in five children and adolescent's (aged 2 to 14 years) experience violent or harsh discipline in their homes (66). In a community sample of 2,582 parents and their fifth

and sixth-grade children in Vermont, USA, it was revealed that dads disciplined boys more severely than mothers did, and that boys experienced harsher verbal and physical punishment than girls (68). In the South African Birth to Twenty study, researchers have demonstrated over 3 generations that harsh parenting and violent behaviour towards children and adolescent's is commonplace in contexts such as Soweto and has been shown to have negative effects (69). This is true regardless of whether it has been reported in childhood or adolescence, and research from this cohort has also shown that adolescents are able to report reliably on their experience of harsh and violent parenting across the life-course (70).

Although, parents tend to spank their children in an effort to stop them from acting in an improper or undesired way, severe physical discipline or punishment has frequently been linked to a poor course for children's growth and results (71). In a recent study, it was revealed that physically disciplined children had lower IQ scores (72). However, positive parenting which is warm and consistent, has been demonstrated to protect children from negative influences of verbal and physical punishment because it uses age-appropriate supervision and non-violent discipline (66, 73, 74).

Maternal sensitivity and positive parenting in high-income countries, have been demonstrated to improve with video feedback interventions and has ongoing positive outcomes (74, 75). Whilst parental sensitivity is important in the parent-child relationships, it is also connected to the monitoring of adolescents (18).

2.5.3 Parental monitoring, disclosure and secrecy in the parent-adolescent relationship

Parental monitoring is defined as "a set of correlated parenting behaviours involving attention to and tracking of the child's whereabouts, activities, and adaptations" (76) (p.61). Effective parental monitoring includes structuring the child's environment and actively tracking the child's activities. However, research indicates that parental knowledge is a strong predictor for adolescent self-disclosure rather than active monitoring (77). The importance of parenting behaviours for child disclosure has been confirmed in previous research (78).

There is widely accepted evidence that active parental monitoring such as checking what time a child gets home, protects against participation in antisocial behaviour, drug taking, alcohol misuse, or deviant peer association (79). Insufficient parental monitoring may put children and adolescents at risk of developing conduct problems (79). In addition, numerous studies show that when adolescents' whereabouts and activities are monitored, they are less likely to be involved in delinquency behaviours, and scholars conclude that parents should track their children more carefully (55). However, a seminal set of studies questioned this conclusion by challenging the supposed protective role of parental monitoring (77). Their findings pointed out that the information that parents are knowledgeable about has nothing to do with their active monitoring but is instead reliant on the adolescent's ability to self-disclose. These studies further criticised parental monitoring measures for being useful in knowing the whereabouts, activities, and friendships of their children, rather than being useful in fostering active parenting behaviours such as tracking and supervision (76).

During adolescence, to support the adolescent's development the parent needs to move towards a less supervisory and control approach to a more autonomy granting approach. Researchers have found that parents who are able to grant increasing autonomy as opposed to parents who try to maintain control, tends to have adolescents who are able to be honest and report mutual trust (80). For instance, research showed that when children view parental monitoring as intrusive and overbearing, they may react or respond by engaging in more delinquent or risky behaviours (77).

2.5.4 Ethnicity and cultural norms within parental monitoring

Differences in ethnic and cultural groups have been found in parental monitoring (9). Comparisons across measurements of parents, adolescents and relationships from various cultural groups greatly overlaps and there is even more diversity within ethnic groups (81).

Gender differences in parental monitoring have been found in previous studies. In general, parents are often attentive or knowledgeable of girls' behaviour, which might in turn foster an easier way for them to adjust the intensity of their monitoring to suit

the situation. On the contrary, parents tend to be lenient in terms of monitoring boys, since delinquent behaviour is often viewed to be more normative for boys than for girls (64). There is evidence in South Africa that these gendered roles can foster risks, especially for boy children who are seen to be less vulnerable than girls but who often fall victim to abuse potentially because they are subject to less monitoring and supervision or support (69, 82).

In general, 44% of participants in the South Africa-Tanzania (SATZ) survey, which involved adolescents aged 11 to 17, said they would rather talk about their sexuality with their mothers, while 15% said they would rather talk with their fathers (83). In this regard, mothers have been found to be better informed than fathers regarding the life of their children (84). This result is consistent with research that showed that adolescents confided in their mothers more than in their fathers, especially when it came to private matters, although moms exaggerated what girls disclosed (85). A post-apartheid study conducted in South Africa on communication between parents and adolescents, also highlighted the key role played by mothers in parent-adolescent communication (2). Given the high percentage of female-headed households in SA, the latter study is in line with South Africa's social and political history. Therefore, this strengthens the relevance of the current study in its focus on observing the communication and interaction between mothers and their adolescents, and importantly this study included both boy and girl adolescent's.

There are several obstacles that South African parents must overcome in order to complete their parental responsibilities. For example, poverty increases the likelihood of emotionally distant, harsh, and inconsistent parenting and adds to the stress parents experience in trying to protect and care for their (29). Poverty and low socio-economic circumstances as well as family structure may have implications on parenting practices and child outcomes (29, 86, 87). High unemployment rates may cause parents to feel stressed and feel they would be better parents if they had a job (86). Additionally, parents may feel inadequate when they cannot fulfil their children's basic needs. Family structures, particularly being a single parent with no partner support, may exacerbate negative parenting experiences as parenting responsibilities cannot be shared (29, 86). Parents may also engage in strict and reactive parenting practices in communities characterised by violence and high crime rates, possibly as a way to protect their children from these exposures (88).

2.6 Parent-adolescent communication

Effective communication is a crucial element of the parent-adolescent relationship. Parent-child communication refers to the daily back-and-forth (verbal or non-verbal) exchange of thoughts, feelings and information between parents and children (89). Parent-child communication includes everyday conversations, discussions about emotions, opportunities for parents and children to learn about themselves and each other (90), and is associated with healthy adolescent development and improved family functioning (91). Effective or positive parent-child communication builds trust and connection, provides social support, makes sense of their life experiences, promotes problem solving and conflict resolution, and strengthens family relationships (54).

Parent-adolescent communication is the process by which parents and teenagers exchange information, expectations, values, attitudes, and beliefs (92). Parents are regarded as crucial actors in their children's development since they usually have a chance to communicate with their children daily (92). Communication between parents and children not only enhances the bond in their relationship but is also important in defining roles, boundaries, and disciplinary strategies (93). Communication between the parent and the child has an impact on the behaviour of the child. For example, children who have clear and transparent communication with their parents are less prone to peer pressure, compared to children who do not communicate well with their parents (94).

2.6.1 Parent-adolescent communication: globally

A systematic literature review (79), also discovered that effective communication can help mitigate risky behaviour such as early sexual debut. Effective parent-child communication on sexuality has been linked to a number of benefits, including postponed sexual debuts, improved sexual negotiating skills, increased knowledge, better parent-child interpersonal communication, and higher levels of self-efficacy (95). International (96) and local (97) research emphasises the protective role that parent-child communication plays in adolescent sexual and reproductive health. Findings, however vary, other research showed no correlation between risky behaviours, attitudes, and knowledge among adolescents and communication

between parents and adolescents (98). On the other hand, a cross-sectional study in Nigeria found that earlier sex-related conversations were said to encourage early sexual debut (99).

2.6.2 Parent-adolescent communication: Sub-Saharan Africa

The majority of research in this area is conducted internationally, and the literature that is currently available on parent-adolescent communication, to the best of my knowledge, focuses on risky behaviours, particularly substance misuse and sexual health issues rather than parent-child relationship (79, 100, 101).

Sub-Saharan Africa (SSA) has a well-documented history of parent-child communication on sexuality being taboo (102). Direct parent involvement in sexual socialization tends to be minimal and authoritarian (100), making it difficult for these conversations to take place effectively. There is very little available research in South Africa on parent-adolescent communication, which is not focussed on adolescent risky behaviours, but some research has found a strong association between poor parent-child communication and negative outcomes for children and adolescent's (6). Therefore, open and effective communication between parents and their children enhances the parent-child relationship, and it can help children develop good communication skills and get through conflicts successfully (89).

2.6.3 Parent-adolescent conflicts

Parent-child conflict rises as children enter puberty and despite the negative effects associated with conflict, during the development of parent-adolescent relationship, the short-term dyadic processes that take place during conflict exchanges are crucial (103). Parent-adolescent conflict is common, and it includes challenging authority, sibling disagreements, negotiating new responsibilities, and autonomy seeking (104). For example, parent-adolescent conflict focuses mostly on family life issues, such as doing chores and arguing with siblings. It intensifies with age, and as adolescents get older, it is reasonable to anticipate frequent arguments about technology (such as computers, video games, and/or cell phones) and homework. Parenting practises, particularly those pertaining to parent-adolescent communication, may need to change in order to address these issues. The quality of the parent-adolescent relationship may suffer from increased and intensifying conflict (104). In most cases

adolescents challenge values to check whether their parents believe in those particular values, for example, an adolescent may miss his/her curfew to see their parent's reaction. Therefore, parents need to be consistent in upholding their values and remind their children why they feel these values are important.

Research on parent-adolescent communication, suggests that adolescents of both sexes report more conflict with mothers than with fathers (105). Although this finding may imply that adolescents interact more frequently with their mothers than they do with their fathers, it is important to be critical of the literature which overstates the maternal role at the expense of the paternal role since fathers are often present but not always included in research (106). Literature on parent-adolescent conflict found that both parents tend to perceive the intensity of their conflict differently and that with the fathers, the extent of differences in their perceptions was subject to the personalities of the father and adolescent (107).

Parents and adolescents have different views on behaviour and expectations, particularly when it comes to the timing of authority, autonomy, and responsibility transitions, which can lead to conflicts. Research shows that adolescents want autonomy and less parental control while they develop less self-regulation, while parents wish they could balance the two more (103). Consequently, parents and their adolescent children feel less connected and an increase in confrontations and conflicts. Despite the fact that excessive conflict poses a harm to adolescents' psychosocial growth and overall wellbeing, the ability to express a range of emotions during a disagreement allows the adolescent and the parent to explore new patterns of interaction (108).

2.7 Parent-adolescent interaction

Parent-child interactions are reciprocal and mutually beneficial (109). In addition to meeting their fundamental physiological needs for nourishment and health, children also require emotional warmth and affection, protection, calming during times of distress, and the ability to navigate the environment in an appropriate way to lead the best possible lives (110). Good quality parent-child relations can therefore have a favourable impact on the course of a child's development, when children have parents who are engaged and responsive. A child's personality development, is partly

hereditary but is also largely predicted by the type and quantity of parent-child interaction (111). Social skills including sharing, cooperating, and respecting others' belongings are taught to children through interactions with parents (110). Youth outcomes are positively correlated with positive parent-adolescent interactions (54). For example, positive parent-child relationships reduce the likelihood of externalising behaviours such as bullying (112) and substance use (79) in young people. In addition, a recent cross-sectional study conducted among 2354 students with a mean age of 14.5 years in Brazil, revealed that while poor family relationships raise the likelihood that teenagers may become involved in bullying and victimisation, positive family interactions have a protective effect against these scenarios (113).

Personality traits of the parent and the child are likely to have an impact on parent-child relationships (111). Available literature is mostly centred on European and American children and typically uses questionnaires to quantify parent-child interactions rather than observing behaviour during interactions (113). In the context of parent-child relationships, the personalities of both parents and children are related to their behaviours.

2.7.1 Family structure and its impact on parent-adolescent relationships

Family structure may be described as the different family types, such as married-couple families, cohabiting-couple families, single-parent families, stepfamilies, adoptive families, and relatives. Recent research suggests that family transitions (divorce, loss of a family member) and instability (cohabiting couples as they are more likely to separate) are particularly damaging to children (114). In addition, a study on the effects of family structure on parent-child relationships in nine European countries found that the likelihood to engage in early sexual behaviours is lower for adolescents raised in intact families (93). Despite this, happier parents have been found to have considerably better parent-child communication within all family types, regardless of their marital status (115). Furthermore, research suggests that happy parent-child relationships are consistently linked to improved outcomes for children and families (116). This link is true for both children and families from all socio-economic and educational backgrounds and for a variety of racial, ethnic and family structures (116). With that being said, the family structure may also introduce some

unfavourable barriers to the parent-adolescent relationship, in particular communication.

2.7.2 Barriers to parent-adolescent communication

Studies have shown that adolescent communication with parents is of paramount importance to minimise sexual and reproductive health issues such as early sexual debut, risky sexual behaviours, sexually transmitted infections (STIs), and teenage pregnancy (93). Four major areas were discovered by a literature review of the barriers to parent-adolescent sexual health communication: demographic characteristics, parental comfort in talking about sex, perceptions of adolescents' readiness for sex, and poor sexual health knowledge (117). Similarly, a cross-sectional study in Ethiopia reported that parent-adolescent discussions about reproductive health issues hardly occur and are confined by sociocultural norms, and parental fear that talking about them will encourage premarital sex (116). In addition, a South African study of high school learners showed that the communications between parents and adolescents were unplanned, infrequent, unidirectional, characterised by warnings and threats (117).

Furthermore, adolescents in this study perceived the harsh and ambiguous tone of the discussions as a barrier to effective communication. The chance for parents and adolescents to have early discussions about sexual health issues is frequently delayed by parents' cultural and religious beliefs that their adolescents are too young to discuss such subjects. On the contrary, findings from studies conducted in Tanzania (101) and Southern Nigeria (116), showed that parent-adolescent communication about sexual and reproductive health issues was frequent in these regions. Research has shown that parents may be unwilling to have these kinds of conversations due to discomfort in discussing sex or the perception that adolescents are not ready to discuss sex, even though communication between parents and adolescents about sex and sexuality generally improves adolescents' sexual health (117).

It has been established that one of the protective factors for young people at risk of behavioural and psychological issues is open communication between parents and

children (118). Therefore, there is a need for parent-adolescent communication and interaction studied through objective observational methods.

2.8 Observational research methods

Compared to self-report data, bidirectional parent-adolescent relationships provide a different real-time perspective of the observational assessment of their interaction. A study of 102 dyads of parents and 4-6-year-old children in San Francisco, investigating discrepancies between self-reported and video-based observational assessments of positive and negative parenting, showed less correspondence between self-report and observational measures (27). Although observational measures are susceptible to observer biases, the measurement error is likely to be random and can be effectively addressed by carefully developing coding schemes and inter-rater reliability standards (119).

In addition to being extensively used over time, video observational methodologies have also been shown to have various advantages, including being objective, reliable, and ability to conduct in-depth analysis (120). However, there are issues with video observational techniques pertaining to camera reactivity, wherein adults or participants alter their behaviour due to camera knowledge, and children are negatively impacted by the camera. Direct relationship observations have the benefit of objectivity, but they also have a number disadvantages, including high implementation costs and lengthy coding and usage times (121). More recently, the traditional tripod video observational equipment has been modernised with the introduction and body-mounted portable cameras. Unlike previous methods, headcams worn on the head or body, sometimes known as spy cameras, are a novel technology that records audio and video of participants' perspectives, actions, and surroundings in a more natural manner (31). The wearable cameras have several benefits, such as the ability to record participant viewpoints under more naturalistic conditions and the elimination of the need for a researcher to be present, which reduces the researcher's potential influences on parent-adolescent behaviour.

These head-mounted cameras have only been used in three international studies (31, 122, 123) and one local study (124) examining parent-child relationships, although this study was limited to infants and no research appears to exist in South

Africa that has studied parent-adolescent communication and interaction using the head camera video observational methodology. To my knowledge only these four studies have used a similar headcam video measurement approach, and each are described, in turn, below.

Mother's and infants' viewpoints

A study conducted in the United Kingdom (UK), used head-worn cameras to measure the mother's and infant's viewpoints. The study included 15 mothers with infants aged three to twelve months. The mothers were instructed on how to use the head cameras and asked to record at least three 30-minute sessions during different play, meal, and bedtime times in their homes. Results showed that the head camera footage exhibited good inter-rater reliability, and that the footage recorded at alone home captured more "negative" maternal behaviour per minute than head camera observations made with a researcher present (31).

Infants' eye views of the environment

Similar to the above-mentioned study, research conducted in Toronto with 30 (one- and three-month-old) female infants, used head-mounted cameras to record the infants' visual experiences, paying particular attention to their everyday, natural exposure to faces. Parents were given the cameras for a period of 14 days and instructed to put them on their infant's head anytime the child was awake and alert. Results in this study showed that infants spent a large proportion of their time (25%) exposed to faces, and the faces were successfully captured by the head camera (122).

Third-person versus first-person view

A study of four mothers and their 2- to 2½-year-old children conducted in the United States (US), which recorded parent-child interactions of play sessions from both a head-mounted camera that produced 'child's eye view and a third-person tripod-mounted camera to assess how to better record child's eye views. Children and parents were asked to play naturally with toys while their interaction was recorded for approximately 10 minutes. Results demonstrated that perspective matters and the child's view contained usable information that was different from the third-person view (123).

Mother-infant interaction assessment tool

In a recent study conducted in SA, nineteen mother-infant (6–24 months) pairs were asked to wear headcams while participating in group and individual activities. The mothers were provided with instructions on headcam use and were then asked to use the headcams, in at least three, 5-min mother-infant engagement sessions at home over one week. Results showed that headcams are both an acceptable and feasible method for assessing mother-infant interactions in Soweto and sufficient data was available to code (124).

2.9 Conclusion

There is a strong indication that positive parent-child communication influences the reduction of risky behaviours among adolescents such as substance use and abuse, delinquent behaviours, and risky sexual behaviours (125). Most existing literature on parent-adolescent communication and interaction has been done in European countries and particularly in Western culture (126). Research conducted in South Africa is limited and has only focused on parent-adolescent communication in the context of its association with sexual risky behaviours and reproductive health (2), sexuality, and HIV/AIDS, and it has largely done so using self-reported methodology (100). Furthermore, there are limited studies conducted on parent-child communication from the perspectives of both the parent and the adolescent in SA which could lead to a better understanding of how parent-adolescent relationships can be supported to minimise adolescent risk and enhance resilience.

A first and important step in advancing adolescent research in South Africa is to develop methodological approaches which measure parent-adolescent communication and interaction objectively and which provide in-depth rich contextual data, using video observational methodology. The current study piloted an observational method of measuring parent-adolescent communication and interaction in a low-income urbanised setting characterised by a diverse ethnic and cultural, predominantly African population. The study findings will also inform and strengthen the development of interventions to increase parent-adolescent communication and interaction.

Chapter 3 Methodology

3.1 Introduction

This chapter on research methodology will provide an overview of the research setting and design, as well as the recruitment and inclusion criteria of the study participants. This will be followed by a description of the methods and procedures used for data collection and analysis. Finally, the ethical considerations in this study will be discussed.

3.2 Research setting

This research took place at the Developmental Pathways to Health Research Unit (DPHRU) research site at Chris Hani Baragwanath Academic Hospital in Soweto, a low-income urban setting in South Africa (SA). Soweto is the most populous urban residential area in South Africa, with over 1,2 million residents living in 200 square kilometres (6357 per km²) an estimate of over 300,000 of whom are adolescents aged 11-18 years, according to Census 2022. Soweto faces challenges common to highly urban metropolitan areas in LMIC including poor housing, overcrowding, high unemployment, and poor infrastructure (127). This research was embedded in an existing study called the Behaviour, Executive function in Adolescents with Conduct problems (BEACON), a repeated measure longitudinal cohort of adolescents aged 11-13 years and their parents, which aims to test the role of executive function in adolescent risk behaviours. The BEACON study consisted of three phases:

Phase one of the BEACON study consists of participant engagement activities which included qualitative work with parents and adolescents such as a community drive and mapping, focus group discussions, and a video-observation activity which measures parent-adolescent communication and interaction called the Teencam activity. The Teencam pilot study was conducted in this phase and is the focus of this master's research project.

Phase two consists of two rounds of data collection. Both rounds collect objective data which includes observed interactions (Teencam video methodology) and psychometric tests (Kaufman Assessment Battery for Children, Inquisit and NEPSY) as well as measurements (Weight, height, body fat and blood pressure), clinical (22), and self-report (social, psychological, and family) information from the parent-adolescent pairs. The first round took place when the adolescents were 11 years (2021-2022) and is followed up at 13 years (2023-2024).

Phase three of the BEACON project will consist of developing and testing intervention approaches to mitigate violent and risky adolescent behaviours which will take place after the data analysis of phase two have been completed.

3.3 Research design

This research project was designed as a qualitative feasibility and acceptability pilot study. The design is appropriate as it provides an approach to examine a new method of data collection in order to assist in the preparation of a larger more comprehensive examination of a study area. The results of feasibility and acceptability pilot studies are important in the design of future larger studies for both epidemiological and intervention studies (128). Pilot studies are also a useful way to engage potential participants and to understand the acceptability of, and face validity of new measurement methodologies (124). Engaging participants in formative work that includes the finalisation and optimisation of research protocol and assessment tools is known to increase the quality of larger study protocols and provides researchers an opportunity to become experienced with new methodologies or the application of existing methodologies in new settings (129).

The Teencam pilot was designed to test the feasibility of several aspects of the Teencam protocol including the feasibility and acceptability of the wearable device for recording parent-adolescent interaction and communication, to test a series of potential task stimuli's conditions to elicit naturalistic recordable data to measure parent-adolescent communication and interaction, to assess the validity of captured data and the feasibility and potential methods for coding and analysing it.

Acceptability was evaluated after the completion of the feasibility workshops by conducting one-on-one semi-structured interviews.

3.4 Study participants

The BEACON Advisory Group (BAG) was constituted by recruiting 16 parent-adolescent pairs, based on guidance for qualitative sample sizes in implementation research (130). Recruitment of participants involved a two-stage sampling strategy, firstly, we used purposeful and convenience sampling to identify eight parent participants from several studies at the DPHRU research site. These participants were approached based on information provided by study co-ordinators about their suitability and availability given participation at the study site during the week of recruitment. This included information that they had expressed an interest in participating in other studies, and had an adolescent aged 11-15 in their care. Secondly, using a snowball strategy we requested the eight seed participants to identify a further eight other potential parent-adolescent pairs in their communities, specifying that they should identify these based on their part of being a parent-adolescent pair and based on their availability and willingness to participate. Using the list of potential contacts provided by the existing participants, pairs were consecutively approached until a total of 16 parent-adolescent pairs were recruited and consented and assented.

Inclusion criteria required that:

- I. Adolescent child was aged 11 to 15 years.
- II. Adolescent child was resident with a biological parent, who is also their primary caregiver, and who was willing to participate.
- III. Living in Soweto, with an intention to remain living in the study area for the foreseeable future.
- IV. Both parent and adolescent had the mental and physical capacity to participate.
- V. Parent willing and legally qualified to consent to their own and their child's participation.
- VI. Adolescents willing to assent to participate.

Consent form and Assent form attached as **Appendix A**

3.5 Data collection

Data was collected over three separate workshops as illustrated in **Figure 3.1**. At workshop one, parent and adolescent participants received joint training and orientation on the Teencam device and protocols to be tested, following which participants signed consent and assent forms. Given the possibility that adolescents might be shy or unsure about how to engage, and to minimise the power differential between parent and adolescent, the researcher trained the adolescent on the stimuli's condition separately so that during the task the adolescent was responsible for 'teaching' their parent how to play the game. At the third workshop, the researcher completed the parent one-on-one interviews.

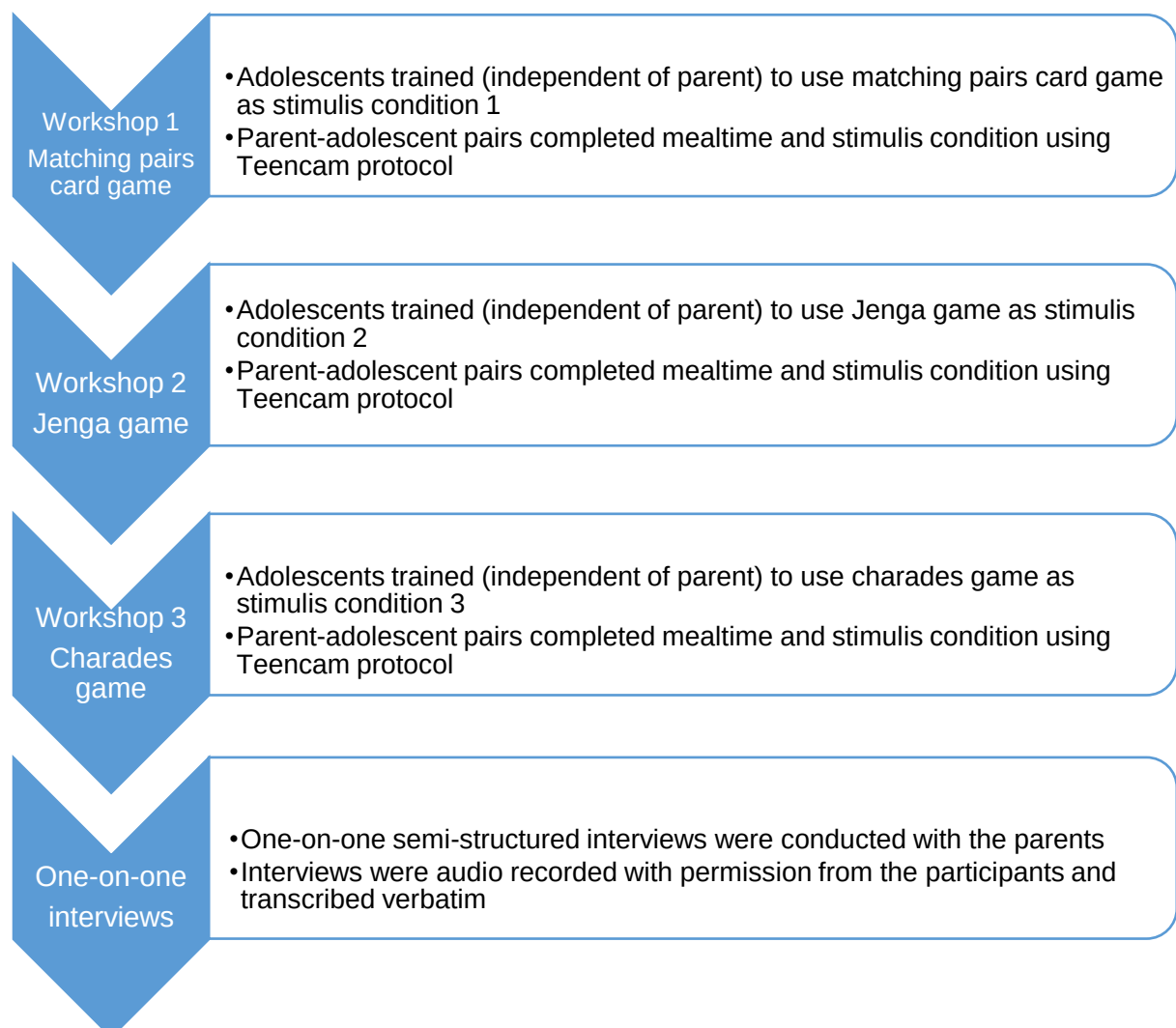


Figure 3.1: Data collection activities and flow chart

3.5.1 Materials

The researcher facilitated the Teencam activity at the DPHRU research site, with support from other BEACON research assessors. Two research rooms were used for the Teencam activity. The research rooms were setup with small square tables and two chairs on each table, to accommodate a maximum of four pairs per room. Given the size of the room and its capacity to host pairs, the Teencam activity was conducted in two groups, with groups being constituted based on the participating adolescents age. Group 1 included younger adolescents (<13 years) and group 2 included the older adolescents (>13 years).

3.5.1.1 Recording Device: Teencam

The audio and video footage of parent-adolescent interactions were captured using low-cost, head-worn cameras, called 'Teencam', that have previously been used in a study conducted in the United Kingdom (UK), for measuring parent-infant behaviour from both viewpoints (31). The Teencams are in the form of lapel badges and are yellow in colour with a black smiley face as seen in **Figure 3.2**.



Figure 3.2: Teencam device

Figure 3.2 shows an image of the head camera called 'Teencam' in the current study. The lens of the camera is in the left eye of the happy face. The Teencams were attached to headbands and worn on the head of the parent and adolescent,

just above the eyebrows and in-between the eyes. The Teencams record observations in Audio Video Interleave (AVI) format. AVI files hold audio and video data, with available features allowing for synchronised audio and video playback. The video has a resolution of 720 × 480. The Teencams store video on an SD card of up to 16 GB capacity or approximately 1 hour of video and audio and have a battery life of approximately 2 hours.

3.5.1.2 Stimuli's Conditions: Parent-Adolescent Games

The study materials comprised of three different observational games namely the Matching pairs card game, Jenga and Charades that were played at three different workshops. The games were selected as potential stimuli for eliciting naturalistic interactions and communication based on having the following features: engaging and require active participation; involves turn taking to ensure engagement from both participants in a pair; able to complete within 15 minutes; easy to teach an adolescent to lead without being too complex; able to elicit emotional expression and excitement and or frustration.

At the first workshop the parent was instructed to place their and the adolescent headcams and adjust them for comfort, with the researcher assisting to ensure correct placement. Parents were instructed to switch on both their and the adolescent's camera before beginning the task, in later workshops the researchers assisted in completing this task. The researcher switched on the Teencam to start the recording and provided instructions for participants not to touch the Teencams before exiting the room.

Table 3.1 over the page provides the detailed instructions for each game. The researcher explained the instructions of the games to the adolescents while also demonstrating how they should be played, in a room separate from the parents at each workshop just before the Teencam activity.

Games used in the Teencam activity are shown in **Appendix B**.

Table 3.1: Teencam activity guide across the workshop

Workshop number	Activity	Activity Instruction
1	Matching pairs card game	• A pack of cards (Old Maid & Go Fish: designed for 11-12-year-olds, Hearts and Crazy: designed for 13-15-year-olds), was given to each pair, which included 10 Matching pair cards with different images and words on them such as animals, people and activities. • At the start of the game all cards were placed facing down on the table. • Each participant takes a turn to turn over two cards, if they were a matching pair, they took the pair off the table into their pack. If the cards didn't match, they were turned back over to face down again. • As the turns proceeded the players had to remember where they had seen the card before that was matching. • The participant with the most matching card pairs won the game.
2	Jenga game	• The Jenga game set includes a set of blocks with the aim for them to be placed and balanced, using turn taking, to build as tall a tower as possible. • Participants were given 27 blocks divided into two sets (the Jenga game includes 54 blocks', but fewer were used in the task given time and space constraints. • While Jenga can include movement and standing. In order to facilitate recording participants were asked to remain seated while playing the game to limit movements. • The players took turns removing a block from the tower and balancing it on top, creating a taller and increasingly unstable structure as the progresses. • The game ended when the tower fell – either completely or if any block fell from the tower (other than the block a player moves on a turn). The player who collapses the tower loses the game.
3	Charades game	• The charades card game is a card set with images that need to be described; the card deck includes emotional stimuli like portrayals of 'embarrassed' 'scared' 'disgusted' characters. • The charades game started with placing word and image card printouts on the table facing down, the adolescent had to start the game by pulling one card and facing it to the parent and having the parent act out clues about the image or word on the card and the adolescent had to guess what they thought the clues refer to. • The player guessing the game had three chances to guess what was on the card, if not successful the player giving clues had to give them the correct answer. • Players had to alternate to give clues and guess the words or images as shown to them by the opponent. • The player who guesses the most correct answers won the game.

3.5.1.3 *Interview schedule*

A semi-structured interview guide with a relatively flexible framework for discussion was used (Interview schedule attached as **Appendix C**). The interview guide focused on the acceptability and feasibility of the Teencam device and each of the stimuli's games testing in the observational sessions. Parents were asked to report on any realised or foreseeable barriers to using the Teencams and any concerns they had. They were also asked to reflect on practical issues that arose, including (but not limited to) how they felt about being recorded, whether the Teencams were comfortable to wear, whether they acted naturally during the observations, and their perceptions on how their adolescents acted during the observations, and which game they enjoyed the most. They were also asked if they would be willing to participate in a video-feedback intervention wherein the parents and adolescents would have the opportunity to watch their footage together and discuss what they observed from their interaction.

3.5.2 Procedure

3.5.2.1 *Feasibility to orientate and use Teencam with participants*

During the first workshop, the participants were instructed on how to use the Teencams by the researcher. These instructions included a demonstration on how to use the Teencams, how to operate them (switch them on and off, and how to record), and how to wear them. The Teencam training lasted approximately 15-20 minutes. Participants were allocated a table to sit at facing each other, which were already setup with meals on the table and the game for that particular workshop.

To allow participants time to get used to, and be less self-conscious of the recording device, participants were invited to first eat a light meal together with the headcams on and recording before proceeding to the stimuli's activity. Mealtime took an estimated 15 minutes, and was recorded, followed by the game which took an estimated 15 minutes, which was recorded. Participants were instructed to remain at the table allocated to them and to try to remain seated throughout the tasks.

The researcher vacated the room after recording devices were activated and participants were invited to start eating and playing the game. The researcher timed the session to 30 minutes and the researcher then returned to switch off the Teencams when the time was up.

3.5.2.2 Acceptability

After the completion of the observational tasks at the third workshop, the researcher explained the purpose of the interviews to the parents. Interviews were only completed with parents and not with adolescents, as the adolescents had to proceed to other BEACON formative work activities.

The parents consented to be audio recorded during the interviews. The researcher completed the interviews in a private office, in the participant's native languages, IsiZulu, Sesotho, or Xitsonga. An interpreter was not needed, given that the researcher is multilingual. Interviews lasted between 10 and 25 minutes. A semi-structured interview schedule was followed and probing where necessary to get more clarity and in-depth data.

3.6 Data analysis

3.6.1 Data transformation and management

Although the recording included both the mealtime and stimulus game activity, analysis was limited to the stimulus activity. The Teencam had capacity to record a few hours of footage at a time, limited only by the memory card size. The data source included recordings of approximately 30-minute sessions of interactions for each participant. This created an estimated total of 60 minutes of video data for each pair because the video is recording from two perspectives at the same time, one from the camera on the child's head and one from the camera on the parents' head. In total each pair had 1.5 hours of footage recorded across the three stimulus conditions.

After each workshop, the researcher downloaded the video footage of the parent-adolescent pairs from the Teencams by using a USB cable to connect the Teencam to a laptop. The downloaded footage from each pair was labelled as per the participant identification number (PID) and saved as either “mum’s or adolescent’s viewpoint.

The Teencam memory capacity is limited to ten-minute slots, this meant that once data was extracted from the memory card it was transformed into 3 clips of 10 minutes each, so each participant had 3 clips and each pair together had 6 clips available for analysis. This meant the total pool of clips that could be produced during the pilot was 16 pairs x 6 clips x 3 workshops = 288 10-minute clips, of these it was expected that at least 50% would include game footage.

The video and audio recordings were stored in a password-protected database on a secure University server (OneDrive) with access limited the designated researcher, the BEACON primary investigator (supervisors) and study site data scientist.

3.6.2 Researcher role in data collection, transformation, and analysis

The master’s candidate was responsible for the setting up of all workshop activities and make arrangements in advance. On the day of the workshop, other BEACON research assistants who the researcher had trained to assist with the Teencam protocol assisted the researcher. Given the volume of data produced, the audio from the video footage was transcribed verbatim (without reference to the imagery or video activities) with the assistance of the BEACON assessors who were fluent in the respective languages used in the study. The researcher without any assistance from BEACON assessors completed the micro coding of the video content (words alongside imagery and interaction) for all participating pairs. The researcher conducted the semi-structured interviews, transcribed all the audio recordings verbatim and analysed the data.

3.6.3 Data sources

Different data sources were used for different research questions:

1. The assessment of the overall feasibility of the Teencam device and games to produce the required data as expected, was analysed from feasibility data available across all three workshops.
2. Given that micro-coding is extremely time-consuming, the researcher used video data from all three workshops to create the micro-coding guide. Thereafter only one workshop was selected for complete micro-coding. The first workshop was selected in order to avoid order or learning effects and because it had the highest attendance of the three workshops, with 13 parent-adolescent pairs with complete audio and video recordings available for analysis.
3. The acceptability of the Teencam device and games was analysed from data from all fourteen of the one-on-one interviews with parents.

3.6.4 Analysis of the feasibility of the Teencam device and stimulus

The researcher repeatedly viewed the video footage of the parents' and adolescents' observations from the three workshops, watching footage both separately and side by side (parents' and adolescents' viewpoints) to gain an understanding of what the process which had taken place during the data collection, and the data that it had produced. Once familiar with the data set the researcher assessed the feasibility of the Teencam device and games using the following dimensions:

- *Technical reliability*: The Teencams ability to successfully record interactions.
- *Usability*: The ability for the Teencam to be switched on and off, start and stop recording.
- *Audio quality*: The extent to which the researcher could hear the vocalizations articulated by the participants from the audio recordings and be able to transcribe them verbatim.
- *Video quality*: The ability for the researcher to detect facial expressions, eye gaze, and general facial and body movements and responses.

- *Feasibility of the game*: This was determined by the participant's ability to understand the rules of and carry out the game, and for the game to elicit communication and interaction.
- *Quality of the interaction*: The extent to which the game elicited conversation and engagement between the parent-adolescent pairs

3.6.5 Analysis of the acceptability of Teencam device and stimulus

To analyse the transcripts of the individual interviews with parents, the researcher used ATLAS.ti (version 8) to code and analyse the data using inductive categorical content analysis (131). This was important as the interview was open ended and inductive approaches strengthen the opportunity to explore the perceptions and experiences of the participants.

Analysis of the interview transcripts began with a period of reflection and internalisation of the data by the researcher. The researcher kept notes of the feelings elicited by the coding of transcripts and has regular supervision sessions to practice reflexivity in the analysis of the data.

Preliminary codes were developed and defined based on the objectives and emerging patterns from the transcripts and considering the content of the questions in the semi-structured guide. The preliminary codebook was tested on three transcripts and then discussed with the supervisors, and codes were further refined, and these final codes were used for categorical content analysis. Illustrative quotes for each category or thematic area were extracted and presented in the dissertation (132).

3.6.6 Analysis of codability using manual micro-coding

A mixed approach was used with a cycle of deductive and inductive processes, aimed as deepening the understanding of both the process being observed and the content and meaning assigned to the content. This deductive-inductive approach was followed in the manual micro-coding of the data. The researcher developed a

codebook (codebook attached as Appendix D) with codes that emerged from the review of all videos from all three workshops as part of the feasibility analysis described above. This initial codebook was then supplemented and adapted with some codes from the Mental Health Intergenerational Transmission (MHINT) coding scheme (133). The MHINT coding scheme was designed to be used between parents and infants, on footage obtained from video cameras installed in the home, those used by an observer, or through wearable headcams and a 'spy' photo-frame video camera (31). The developed codebook included two categories namely verbal (spoken words or expressions, tone, and any vocalizations) used for the audio analysis and non-verbal communication (facial expressions and physical gestures or body language) used to code the video footage. The researcher tested the codebook on one pair and checked against a second coding of the same pair by an independent research assistant from the University of Bristol who was familiar with Teencam observational codebook and had experience with coding parent-infant video in the UK. The researcher, supervisors, the research assistant, and an expert researcher (Rebecca Pearson) reviewed codes in order to finalise the codebook. This codebook was used for the manual analysis of the audio and video data.

Micro-coding was completed using data from workshop one, and the data was analysed in a series of steps, part of which aimed to develop a robust coding system for future studies, and part of which to allow for the assessment of the relative contribution of audio transcripts versus audio and video transcripts combined added to the interpretation of the data. In the first step of coding the researcher used the audio data transcripts from the stimulus observation recording from workshop one for each participant pair. These were coded using ATLAS.ti (version 8) using the verbal communication codes (see **Appendix D**) to code the quotations in the transcripts. Thereafter, the researcher read all the transcripts of the audio footage for each pair multiple times, while also looking at the transcripts in parallel with the video footage to ensure the quality of the transcripts. After the initial quality review to identify discrepancies or error in the transcripts, the researcher used the codebook to code non-verbal communication from the parents and adolescents' viewpoints separately. The manual analysis involved playing the video footage at a slow speed to carefully record the frequency of the observed participant's non-verbal communication.

3.6.7 Analysis of codability using automated software

This study used FaceReader (version 9) software purchased from Noldus (32), to automatically analyse the video data of the observations. This automated coding process followed a deductive analysis approach, matching muscular biomarkers of facial expressions to six categories of emotion using a pre-determined algorithm. FaceReader (FR) automatically analyses the video every 0.033 seconds and produces an analysis on 1) whether the face was detected and analysed on any of the seven basic facial expressions (happy, sad, surprise, disgust, angry, fear, neutral) 2) the face was detected but could not be analysed or 3) no face was detected. The intensity of a facial expression detected was recorded on a scale between 0 (no intensity) to 1 (high intensity).

The FR analysis output was exported into 'state logs' in excel sheets, which provided information on the presence of dominant facial expressions (happy, sad, surprise, fear, disgust, anger, and neutral), and the time that it was present. In time points where FR could not recognise the facial expression, due to movement, or face not being in view, it was logged as 'unknown'. The seven basic emotions detected by FR were then classified into three codes: positive (happy), neutral (surprise, neutral) and negative (sad, anger, disgust and fear).

Inter-rater reliability in this study was achieved by having two researchers run the same video clips on FR to add additional rigour to data analysis (134), as well as for the credibility and validity of the findings. The researcher (FL) together with a PhD candidate (Ilaria Costantini) from the University of Bristol in the United Kingdom (UK) who is also involved in Teencam observational research in the UK, independently ran the same video clips on FR, then exported the analysis into excel sheets. Thereafter the two researchers had a virtual meeting to discuss and compare findings. The findings were highly convergent, which increased confidence in the findings of the study, given that the other researcher was not part of the data collection for this pilot study.

3.6.8 Analysis of coding of the sections of the stimulus

The data was then triangulated for a final assessment of the relative performance of the various coding approach. The video footage of stimulus 1 the 'Matching pairs card game' interaction was divided and categorised into three sections: the start, middle, and end of the game. The sections of the game were then coded with positive, neutral, and negative codes for the audio coded results, the video coded results, and FaceReader analysis results. The frequency of the codes was grouped and summed for each BAG pair.

Thereafter, the patterns in the codes were observed in the manual, audio, and video coding as well as in the FaceReader output. The total frequencies of the codes during the start, middle and end of the game, were collated for comparison purposes including the audio, video and FaceReader analysis. The main focus of the comparison was on any similarities and differences in the findings of each coding method. The audio coding included verbal communication coding that included speech and other vocalizations. The video coding included non-verbal communication coding that included facial expressions.

The following categories presented in **Table 3.2** were compared in each method of coding in order to compare the information that could be gathered from the parent-adolescent interactions using each.

Table 3.2: Categories for verbal and non-verbal communication

Classification category	Description	Automation of coding
Audio Recordings (Verbal communication)		
Tone	Positive, negative, neutral tones	
Volume and intonations	Loud, quiet, shouting, whispering, stressing	
Non-spoken vocalizations	Laughing, chuckling, giggling, feedback sounds	
Speech	Spoken words	
Video Recordings (Non-verbal communication)		
Facial expressions	Happy, surprised, angry, scared, disgusted, smile, sad, neutral.	Able to code manually and using Face-reader software and categorised into neutral, positive and negative codes
Gaze	Eye contact, interest, intimacy, threat	
Gestures	Hand – pointing, waving arms, face-touching, hand clapping / head – nodding, headshaking	

3.7 Ethical considerations

Study ethical approval: Approval for this pilot study was granted by the University of the Witwatersrand Ethics Committee in the Health Sciences Faculty (M190801), (Ethical clearance certificate attached as **Appendix E**) as part of a formative work protocol for this and other measurement activities in the BEACON cohort.

Informed consent process: Parents consented for themselves and their adolescents to take part in the study followed by adolescent assent. Parents and adolescents were informed in detail that participation was voluntary and that they had the right to opt-out of any of the participant engagement activities at any time. (Consent form and Assent form attached as **Appendix A**).

Participant Confidentiality: A pre-determined protocol for maintaining confidentiality and privacy were followed. To protect confidentiality, Participant Identification Number (PID) was allocated to the parent-adolescent pairs as BAG1 up to BAG16. The data collected from these pairs were stored in a password-protected database on a secure University server (OneDrive) which could only be accessed by designated researchers and a data scientist.

Reimbursements: Transport reimbursement was provided in line with ethical guidance (ZAR 200 per parent-adolescent participant pair per visit, and additional ZAR 100 for the parents for the one-on-one interviews). Given that this study was part of a larger cohort and the participants completed other activities, participants were also provided with a nutritious cooked meal during the refreshment break.

Chapter 4 Results

4.1 Introduction

This chapter will provide an overview of the participant characteristics and a summary of the three workshops used for this pilot study. The chapter will then present the results in three parts:

Firstly, it will focus on the feasibility of the Teencam device to collect high quality usable data, including its technical reliability, the audio and video quality, how user-friendly participants found the method.

Secondly, the chapter will include results of the qualitative interviews that examined the acceptability of the Teencam protocol to parents and the results of the data produced in each of the stimuli conditions used, including a comparison of each of the games and the data they produced and whether the Teencam resulted in codable, naturalistic observations.

Lastly, the chapter will focus on feasibility from an analytic and interpretive perspective, presenting results of the comparison of the audio and video data and the findings of testing the potential to increase efficiency using automated coding software called FaceReader and strategic coding will be outlined.

4.2 Study participants

A total of 31 BEACON Advisory Group (BAG) members were recruited as participants in this study and consented to participate. The sample included 15 parents and their 16 adolescent children. One parent enrolled with two adolescent children and repeated activities with each of them. One parent passed away during the course of the study, they had completed the workshop activities but had not completed the interview and socio-demographic questionnaires. Participant consent included permission to use data collected prior to the parents' death, and additionally the adolescent's legal guardian consented to their continued participation in the study.

Attendance was good at all three workshops of the 16 parent-adolescent pairs, 16/16 (100%) attended the first workshop, 12/16 (75%) the second and 15/16 (94%) the third. Similarly, 14/16 (88%) of parents attended the qualitative interview and completed the socio-demographic questionnaires. **Figure 4.1** which show the number of participants for each workshop.

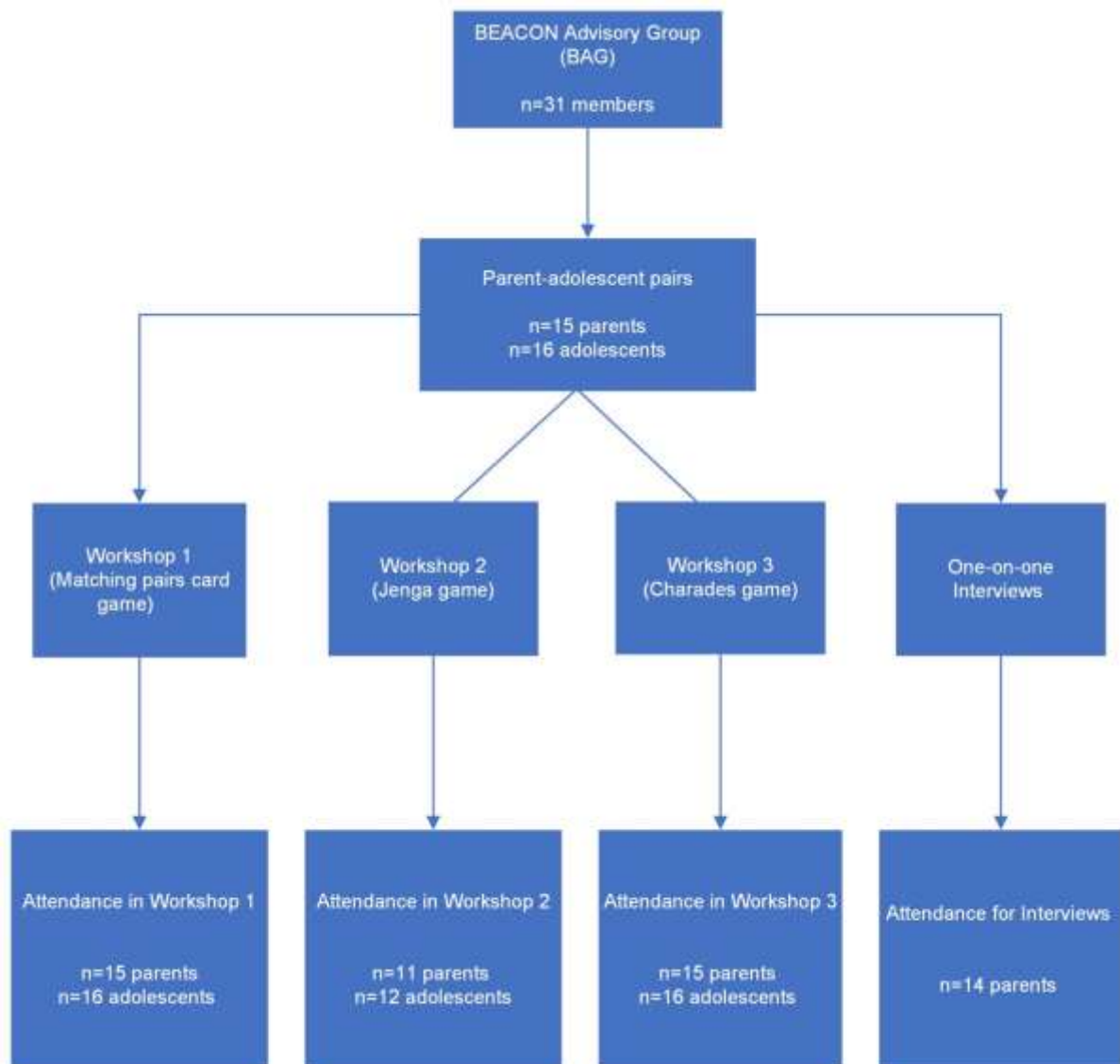


Figure 4.1: Participant flow chart

4.3 Participant characteristics

Table 4.1 presents sample characteristics for the pilot study. The adolescents ranged in age from 11 years to 15 years of age with the average age being 12.3 years. There were slightly more female than male adolescent's in the sample (9:6). The parents were mostly biological mothers who were no longer in a relationship with the father of the child, their ages ranged from 29 to 56 with an average age of 37.2 years. All the pairs identified themselves as African, the majority of the parents were unemployed (85.7%) and over half of the parents reported to have completed primary school education only. The majority of the parents (64.3%) self-reported their socio-economic status as "just getting by".

Table 4.1: Participant characteristics

Adolescent	n	%/mean
Age		
<i>Range 11-15 years</i>	15	12.3 (1.3)
Gender		
<i>Male</i>	6	40.0
<i>Female</i>	9	60.0
Parenting environment		
<i>One parent home</i>	14	93.3
<i>Two parent home</i>	1	6.7
Father involvement		
<i>Parents in a relationship</i>	14	93.3
<i>No longer in relationship</i>	1	6.7
Parent age		
<i>Range 29-56 years</i>	14	37.2 (7.1)
Parent gender		
<i>Male</i>		
<i>Female</i>	14	100
Parent education		
<i>Primary school</i>	8	57.1
<i>Matric</i>	5	35.7
<i>Post-matric</i>	1	7.1
Parent employment		
<i>Employed</i>	2	14.3
<i>Unemployed</i>	12	85.7
Household socio-economic status		
<i>Comfortable</i>	14.3	7.1
<i>Just getting by</i>	85.7	64.3
<i>Poor</i>	14.3	28.6

4.4 Teencam device

The section presents the results on the performance of the Teencam device. It will examine the feasibility of using the Teencam devices to reliably record good quality parent-adolescent communication and interactions and whether there are any barriers when using the Teencam devices and will explore the acceptability of using the Teencam device for research in an urban setting in Soweto, South Africa.

4.4.1 Feasibility of the Teencam device

Quantity of video recordings reliably captured

Table 4.2 illustrates the number of successful recordings across all the workshops, considering both the parent and the adolescent video clip.

Table 4.2: Workshop attendance and available video recordings

Workshop	Attendees (in pairs)	Parent video	%	Adolescent video	%
Workshop 1	16 pairs	13 video recordings (19 clips of 10 minutes each or 190 minutes footage)	81	14 video recordings (21 of 10 minutes each or 210 minutes footage)	87
Workshop 2	12 pairs	12 video recordings (18 clips of 10 minutes each or 180 minutes footage)	100	12 adolescent recordings (18 clips of 10 minutes each or 180 minutes footage)	100
Workshop 3	15 pairs	12 video recordings (18 clips of 10 minutes each or 180 minutes footage)	80	12 adolescent recordings (18 clips of 10 minutes each or 180 minutes footage)	80

Overall, Teencam demonstrated excellent technical reliability in recording the game interaction with an overall reliability exceeding 80% usable recordings.

The Teencam camera demonstrated a capacity to record valid observations of 1120 minutes of parent-child interactions over the course of 3 workshops each with a different activity. This suggests the technology is robust, can manage high volume and produces a large amount of data for analysis.

An assessment of the technical problems showed the following:

In workshop one there was one pair with total technical failure in that both the adolescent and parent's video failed to record. Additionally, another parent camera did not record. This meant that there were 13 recordings of parent's viewpoints of children in the game while there were 15 videos of adolescent's viewpoints parents. In workshop two, no technical errors were detected from 12 participating parent-adolescent pairs. In workshop three, two pairs experienced total technical failure in that both the adolescent and parent's video failed to record. Additionally, another adolescent camera did not record. In total technical failures led to a total of 4/16 (25%) interactions being 'lost or unrecorded' resulting total data loss rate of >20% was found in this pilot study. Additionally, in three participant pairs (9%) there was only a 'partial recording' in that one of the two headcams in the pair did not record. In these instances, at least some data could be recovered from the audio of the other perspective, which had recorded without technical difficulties. Possible reasons for the technical difficulties could be that the camera ran out of battery and switched off during the interactions or maybe the recording button was not pressed successfully as there was no indication that the camera was recording.

Quality of video and audio recordings captured

The video clips of the parent-adolescent interactions show the participant's face, and shoulders from the point of view of either the adolescent or the parent. The field of view, which is estimated to be about 60 degrees, sometimes resulted in participants being cut out of view, especially when there was a lot of movement. The lighting

conditions of the room also played a role in the quality of the videos. The lighting conditions in the assessment rooms were average, with most videos being slightly dark and or with light reflections appearing on faces. The video footage from the Teencam was automatically split into two video clips (10-minute video clips) for each viewpoint.

The Teencam device could record the speech of both the parent and the adolescent. The audio was successfully transcribed verbatim with timestamps. Only two parent-adolescent pairs were inaudible at some points, irrespective of multiple playbacks of the recordings. Inaudible vocalizations were indicated in the transcripts with timestamps. The video and audio quality of the recordings was affected by the fact that the sessions were being conducted with up to four pairs in a room. Therefore, the other participants could be seen in view and their voices could be heard from the recording of a particular pair.

Usability of the Teencam device

The Teencam device attached on headbands and worn on the head, above the eyebrows was able to record the parent-adolescent interactions. However, the Teencam device had several features associated that hindered user friendliness and functionality. The Teencam devices did not have a clear indication of whether the cameras were recording or not, because they did not have an obvious start and stop recording button. As such, switching the device on and off, and starting and stopping the recording was done haphazardly by pressing a combination of different buttons. This haphazard button pressing resulted in several technical errors, such as sessions not being recorded and researcher assistance was required to initiate recordings, which over multiple pairs required significant human resource input. Unfortunately, missed session recordings could only be picked up when screening the video footage after a particular session when the Teencam was connected to a laptop to extract the data.

4.4.2 Acceptability of the Teencam device

Willingness to use the Teencam device

When the parents were asked about their overall experience of using the Teencam device, almost all supported the use of the Teencam device to record parent-adolescent interactions. The parents indicated that it improved their communication with their children because the activity prompted them to communicate and further suggested that the Teencam should be given to them to take home and record their interactions in their home setting.

One parent said *“Teencam has given me the chance to communicate with my child, I wish we could take it home.”* (BAG 3, 41-years-old parent).

The parents believed that it could potentially be a valuable video-feedback intervention tool.

One parent said: *“It would help us improve on what we are not doing right.”* (BAG 13, 46-years-old parent).

Conversely, one parent was concerned about who was going to view the videos and how they were going to be used.

She said: *“I don’t have a problem with Teencam, I was only concerned about who is going to watch the footage”* (BAG 6 and 16, 37-years-old parent).

Another parent felt that the Teencam was too intrusive as it records everything and preferred that researchers ask her questions about what they want to know.

The parent said: *“I don’t like Teencam, I feel like if you guys want to know us you can... I think you can know us better through communication instead of putting cameras on our foreheads.”* (BAG 11, 33-years-old parent)

When asked whether future participants would be willing to use Teencams to record their parent-adolescent's interactions. Most of the parents (n=10) responded positively, stating that other people would be willing to participate if the research is explained well. The remainder were cautious about the approach noting that information was needed to 'trust' the approach and how the findings would be used.

One parent said: *"I think they will be willing as long as it is explained from the onset that it is not played for the other people."* (BAG 2, 29-years-old parent).

Enjoyability of using the Teencam device

A total of 13 out of the 14 parents reported that they enjoyed the overall Teencam activity/experience. However, some of the parents (n=4) reported some negative comments, stating that the placement of the Teencam was uncomfortable causing irritation and limiting their movements.

For example, one parent said: *"It was comfortable to wear; it just irritates my eyes if worn very close to my eyes."* (BAG 6 & 16, 37-years-old parent).

Another parent said: *"I felt a little bit dizzy."* (BAG 11, 33-years-old parent).

While another was concerned that it distracted them, saying: *"it's like it prompts you to look at it, which makes you lose concentration most of the time."* (BAG 8, 35-years-old parent).

Overall, a majority of the parents (n=10) indicated that the Teencams were comfortable to wear. The parents made positive comments regarding the use of the Teencam device and how they felt wearing it.

One parent said that *"I don't have a problem with it, the headband is soft."* (BAG 15, 37-years-old parent).

Naturalistic interactions

During the first workshop, most of the parents (n=9) reported that they were quite nervous and self-conscious about being recorded but as time went on particularly in the second workshop, they had already warmed up to the Teencam and behaved more naturally.

However, one parent reported that it was almost impossible to act natural if you are aware that you are being recorded because they would not want to show negative behaviours.

One parent noted that her child was very aware of the recording where she wasn't, she explained that her child: *"kept on saying that 'mum, remember don't say some things because they can hear what we are saying.'"* (BAG 9, 56-year-old parent).

Other parents reported that felt they acted naturally throughout all the three workshops. One parent was not concerned about the fact that she was being recorded.

She said: *I'm always myself, if I want to reprimand my child I will do so while wearing the cameras. I won't lie about who I am to impress you guys.*" (BAG 11, 33-years-old parent).

The parents described that they had even forgotten that they were being recorded by the third workshop because they were used to the Teencam at the time.

Another parent said that *"you tend to forget that you are wearing it."* (BAG 4, 44-years-old parent).

Another said: *"At some point I totally forgot that I was being recorded."* (BAG 2, 29-years-old parent).

4.5 Teencam games

The section presents results on the performance of the Teencam stimulus namely the Matching pairs card game, Jenga and Charades game, in stimulating communication and interaction among the parent-adolescent pairs. In addition, any barriers encountered in the use of the games with parent-adolescent pairs will also be outlined.

4.5.1 Feasibility of the games

Understanding of the game

The stimulus games were understood differently amongst the parent-adolescent pairs, with some being more easily and clearly understood than others.

During the Matching pairs card game, almost all the parents were able to understand the game the very first time that it was taught to them by the adolescent and instructions were correctly followed. Only one adolescent had to teach her parent the instructions of the game for the second time.

For the Jenga game, two adolescents appeared to have not understood the instructions of the game, therefore they taught their parents the incorrect instructions. For the rest of the adolescents who correctly explained the instructions of the game, it still took at least two teachings for three parents to grasp the instructions of the game. Furthermore, in some instances, the parents asked the adolescents to either repeat or remind them of the instruction of the game.

During the Charades game, all the adolescents were able to explain the instructions of the game very well and the parents were able to understand the instruction on the first teaching. It was found that one parent needed at least two teachings to understand instructions of the game across all the three workshops.

Quality of the Interaction

Given that the pairs had to play different games across the three workshops, the observations showed that some games elicited more interactions and engagements amongst the pairs while it was limited in other games.

The Matching pairs card game and the Charades game elicited the most active engagement amongst the participants and stimulated competitiveness and conversations that were related to the games. All three games were meant to allow for turn-taking in order to give participants a fair chance at effectively communicating and interacting, but it was observed that the Charades game did not allow for turn-taking among the pairs as there was a lot of talking over each other. On the other hand, during the Matching pairs card game and Jenga, the pairs were observed to be taking turns effectively.

Interestingly, there were some cheating accusations between pairs making them compete against each other in the Charades and Matching pairs card game.

The game that elicited the least amount of interaction was the Jenga game as there was limited communication between the pairs. Most pairs remained quiet and focused to ensure that the Jenga tower did not collapse.

Some of the participants experienced some distractions during the interactions. Two pairs had brought toddler siblings to the workshop, both of whom did not want to leave their parent's side; hence they were observed in the video recordings standing next to the pairs. The pair would also interact with the sibling every now and then, which might have distracted the flow of the game, this meant when participants looked away from each other and at the toddler, this resulted in invalid footage to the data collection procedure and a break in the series of data available for analysis.

In addition, some of the pairs were observed checking their phones during the interactions, which meant they looked away from the other resulting in invalid data.

The impact of the game on video and audio quality

The nature of the Matching pairs card game allowed for turn-taking, and it did not elicit a lot of noise from the pairs; therefore, it had the best audio quality. The Matching pairs card game also had the best video quality as there was very little movement and participants were hardly cut out of view.

During the Jenga game, the audio quality was good as the pairs did not talk much nor make noise. However, the video quality was not good as the faces were often not in view in most cases due to a lot of head tilting as the pairs tried to identify blocks to remove and prevent the tower from collapsing. The video quality from the Charades game was relatively poor as there were a lot of movements. However, the faces were still visible as the nature of the game required the pairs to look at each other to demonstrate the clues on the cards. The audio quality was really poor due to a lot of noise in the room coupled with screaming and laughing. Therefore, in the recordings that we had it was difficult to discern what certain pairs were saying due to external noise of other pairs talking.

4.5.2 Acceptability of the games

Enjoyability of the game

The Matching pairs card game and Jenga games were equally reported to be the most enjoyable games amongst the three games that were played. The parents reported that they were familiar with card games, particularly a card game called “crazy eights”, as they also play them at home, hence their adolescent children seemed to enjoy it the most.

One parent said, “It’s the same cards that we usually play in the house. It’s quite easy to understand, It’s not complex.” (BAG 2, 29-years-old parent).

The parents reported the Charades game to be the least enjoyable game as it allowed more opportunities for cheating, and it relied on the ability of the opponent in

the game to demonstrate well. Parents also expressed that playing different games in the different workshops made the Teencam activity enjoyable as it gave them a new challenge every time.

In addition, the parents mentioned that they did not have playtime with their adolescent children at home. One parent reported that she just lends her phone to her child and lets her play games rather than playing games together.

Teaching methods of the game

When the parents were asked whether it was a good idea to have the adolescents teach the parents the game and how they felt about it.

A majority of the parents (n=11) reported that it was a good idea to have the adolescents teach the game as it was a learning opportunity for their children. *“It shows that she was able to listen to you... it makes me proud as a parent.”* (BAG 1, 32-years-old parent).

Furthermore, the parents suggested that the methodology should remain this way in having the adolescents teach the game. However, one parent felt that the adolescent had an unfair advantage because they were already familiar with the instructions of the game. *“I also wanted to win, it’s not fair. The adolescents were winning because they were taught the game before.”* (BAG 11, 33-years-old parent).

In addition, one parents suggested that a rotation between the parents and adolescents in teaching the game would work well as they will both take turns.

4.6 Comparison of audio and video coding

This section presents the results of the individual coding of data and the triangulation of data to compare the relative contribution of audio and video coding. This section includes the results to indicate the processes used in increasing the efficiency of coding.

4.6.1 Audio recording and transcripts

Tone

A neutral tone was dominant in all the pairs. A moderate number of positive expressions were recorded from both the parents and adolescents. With only a small number of occurrences for negative expressions, such as *“You are cheating”*, or *“I’m not playing anymore”*, this mostly sounded to be negative whilst looking at the transcripts only. However, when looking at both the transcript and the video recording, it was said with a smile or laughter. All the 13 pairs were accusing each other of cheating, either the parent or the adolescent, in a playful way.

Table 4.3: Codes from the Audio recording transcripts

	BAG1	BAG2	BAG3	BAG4	BAG5	BAG6	BAG8	BAG9	BAG11	BAG12	BAG13	BAG14	BAG16	TOTAL
Positive	50	8	9	14	6	14	7	6	24	8	1	13	31	191
Neutral	30	4	7	3	3	11	6	1	12	5	2	5	3	92
Negative	9	6	6	9	0	7	6	6	9	4	9	4	19	94

Number of occurrences for positive, neutral and negative codes for each of the transcripts and the totals for all of them

Table 4.3 shows results for the audio codes for each parent-adolescent pair. Almost all the parent-adolescent pairs had predominantly positive codes, with one pair (BAG 9) having an equal number of positive and negative codes. Only one pair had predominantly negative codes (BAG 13).

Volume and intonations

Some pairs were communicating loudly with each other. For example, some participants were shouting or screaming at some points expressing emotions of excitement, *“You lost, you lost (screams with joy) Play, I won and you lost”*, (11-year-old adolescent). On the contrary, some pairs were quiet most of the time unless they

needed to speak due to the demands of the activity. This resulted in a lot of silence in the transcripts.

Speech

Vocalization is the act of expressing feelings and ideas in words. Both positive and negative vocalizations were highlighted in the transcripts. The transcripts revealed a positive conversation wherein parent was giving advice to her adolescent child which also showed that the adolescent child is able to disclose information to their parent.

“...you told me that Nthabiseng is now sleeping around. Isn’t it? A friend who is dating will teach you bad manners. You see? So how are you going to end your friendship? Did they teach you how to leave such friends?”, (BAG 1, 32-year-old parent).

The findings revealed two scenarios of harsh parenting or physical punishment during the parent-adolescent communication and interaction session. The conversations about physical discipline emerged in a similar way in both pairs. During workshop 1, the parents and adolescents were separated in the morning for focus group discussions (FGD) related to qualitative work in the BEACON cohort. The pairs were only reunited for the Teencam activity; thus, the parents were curious to know what was discussed in the FGDs. A majority of the pairs started off with discussing or sharing the different topics covered in their respective FGDs, which led to the physical punishment topic.

In the first scenario, a mother revealed during the interaction in workshop 1 before they started playing the game, that she uses corporal punishment with her 11-year-old daughter, *“Don’t tell them that I hit you”*, (BAG 3, 41-years-old parent). This conversation started when the mother was trying to warn the child not to mention this incident to the researchers. However, the child quickly told the mother not to mention this information as they were being recorded. In the second, an adolescent revealed to her mother that she once hit her with a shoe *“Do you still remember that you once hit me with a shoe? I still have a mark for it”*, (BAG 16, 16-year-old adolescent). Although the mother insisted that she did not remember the incident, the child further stated that she still has a scar from the incident.

Non-spoken vocalizations

An example of non-spoken vocalizations includes laughter, giggles, chuckles, coughs, sigh, and feedback sounds such as “hmm-mm”. Laughs, giggles and chuckles were observed amongst the 12 pairs. However, in one pair (BAG 3) the positive non-spoken vocalizations (laugh, chuckles, and giggles) were only observed on the adolescent while the parent only expressed a few sighs, mostly indicating tiredness. Seven pairs (BAG 2, 4, 6, 8, 11, 14 and 16), also mirrored the non-spoken vocalizations such as laughing and giggling.

4.6.2 Video recordings

Facial expressions

Various facial expressions were observed from the video recordings of the parent-adolescent pairs. The participants appeared to be happy when they seemed to be winning the game. In addition, for the purpose of this study smiles were also coded as a facial expression, and it was observed during the interactions from all the participants, except for one parent (BAG 3) who appeared to have a neutral facial expression throughout the game. A sad facial expression was observed once during workshop 1 from a parent (BAG 2) and was not directed towards the adolescent child, but to the sibling toddler who was being naughty, standing next to the pair. Predominantly, the parents and adolescent's faces were mostly observed to be in a neutral emotional state in during the Matching pairs card game. However, facial expressions such as anger, fear and disgust were not observed in the parent-adolescent interactions. In addition to the manual coding, facial expressions were also coded using automated coding software which will be explained in detail below.

Table 4.4: Video codes from the video recordings

	BAG1	BAG2	BAG3	BAG4	BAG5	BAG6	BAG8	BAG9	BAG11	BAG12	BAG13	BAG14	BAG16	TOTAL
Positive	66	48	26	18	40	52	77	9	24	39	17	47	35	498
Neutral	45	44	68	49	58	65	136	60	12	66	66	68	85	822
Negative	0	1	1	3	0	0	4	6	9	0	9	4	9	46

Number of occurrences for positive, neutral and negative codes for each pair interactions and the totals for all of them

Table 4.4 Represents the results of the video analysis of each parent-adolescent pair. Only three pairs had predominantly positive codes (BAG 1, BAG 2, and BAG 11), while the other pairs were dominated by neutral codes, with the least being negative codes among all the pairs.

Gaze

Eye contact is defined as the state in which two people are looking directly into one another's eyes during an interaction. Eye contact was assessed retrospectively from video recordings of the parent-adolescent interactions. Minimal eye contact was observed in the parent-adolescent pairs. Amongst the 13 parent-adolescent pairs, eye contact was only observed on one pair (BAG 2) during the Matching pairs card game. Eye contact was observed in three instances during the pair's interaction (for 7 seconds, 3 seconds and 8 seconds). A majority of the parent-adolescent pairs in the sample did not maintain eye contact. The adolescents were often looking away, either up, down or sideways, or looking at other objects or participants in the room. Therefore, a gaze which could possibly indicate interest was only observed on the objects which were the stimulus used to stimulate interaction in the Teencam activity.

Physical gestures

Physical gestures observed in the video recordings during workshop one while playing the Matching pairs card game include hand and head gestures. Head gestures were only observed in two adolescents, nodding (BAG 12) which appeared to be affirming his parent that he was listening and head shaking (BAG 3) who was

trying to stop her parent from mentioning that she uses harsh discipline/punishment on her because they were being recording. Hand gestures were observed in two participants: a parent (BAG 13) and an adolescent (BAG 16) who were both clapping during the game.

4.7 Increasing efficiency

4.7.1 FaceReader software coding

The FaceReader software was able to speed up the coding process of facial expressions. The FR software was able to detect emotions or facial expressions from the parent-adolescent pairs. However, in most cases the software could not detect the participant's faces due to poor lighting conditions in the room, movements and participants looking away often, either looking down, looking at other participants or objects. To some participant, the positioning of the headband was covering the eyebrows, which obstructed FaceReader from being able to detect the facial expressions from the participants because the eyebrows need to be in view for the software to perform well. In addition, the sample in this study comprised of middle-late aged mothers and young female and male adolescents. However, FaceReader misclassified the gender and age of the participants in some cases, which could have also affected the software's ability to detect the facial expressions accurately.

Table 4.5 shows the FaceReader output of the emotional states of the adolescents and parents during the Matching pairs card game interaction. The results show that the parents and adolescent's facial expressions were predominantly neutral, with only one adolescent (BAG 13) who displayed mostly 'happy' facial expressions. The FaceReader software managed to detect neutral, happy, sad, angry and disgusted emotions from the participants. The results also show that the FaceReader software was able to detect most emotions from the adolescents than it did from the parents. Some participants had a minimum number of emotions detected, while one participant (BAG 11) had no emotion detected at all. Overall, neutral emotions had the highest frequencies, followed by happy emotion, then sad emotion and lastly anger and disgust emotions. Surprised and scared emotions were not detected from the participants.

Table 4.5: FaceReader output showing frequencies of facial expressions coded

	Adolescents							Parents						
	Neutral	Happy	Sad	Angry	Surprised	Scared	Disgusted	Neutral	Happy	Sad	Angry	Surprised	Scared	Disgusted
BAG1	7	3	1	0	0	0	0	11	5	0	0	0	0	0
BAG2	34	12	0	0	0	0	1	8	4	0	0	0	0	0
BAG3	12	0	1	0	0	0	0	6	0	0	0	0	0	0
BAG4	18	1	0	0	0	0	0	1	0	0	0	0	0	0
BAG5	9	1	0	0	0	0	0	15	0	0	0	0	0	0
BAG6	18	13	11	0	0	0	0	11	3	0	0	0	0	0
BAG8	70	4	0	0	0	0	0	2	0	0	0	0	0	0
BAG11	0	0	0	0	0	0	0	22	4	1	0	0	0	0
BAG12	29	2	0	0	0	0	0	4	0	0	0	0	0	0
BAG13	15	19	0	0	0	0	0	38	2	0	0	0	0	0
BAG14	5	0	3	1	0	0	0	12	2	0	0	0	0	0
BAG16	4	1	0	0	0	0	0	31	8	1	0	0	0	0

4.7.2 Duration of the coding process

The coding process was longer for the manual coding and shorter for the automated coding. The manual coding took approximately four months to code the audio and video recordings of the 13 parent-adolescent pairs for this study. The automated coding using the FaceReader software took approximately 16 hours to code facial expressions for the 13 parent-adolescent pairs.

4.7.3 Consistency in facial expressions with manual and automated coding

Matched facial expressions between manual and automated coding



Figure 4.2: Matched happy facial expression on the FaceReader software

Figure 4.2 shows a clear concordance of a happy emotion of 0.835 at time point 00:16:70 of the parent's point of view (adolescent as a subject) for BAG 6 on the FaceReader software, which matched the manual coding of a happy emotion at the exact time point.

Mismatched facial expressions between manual and automated coding

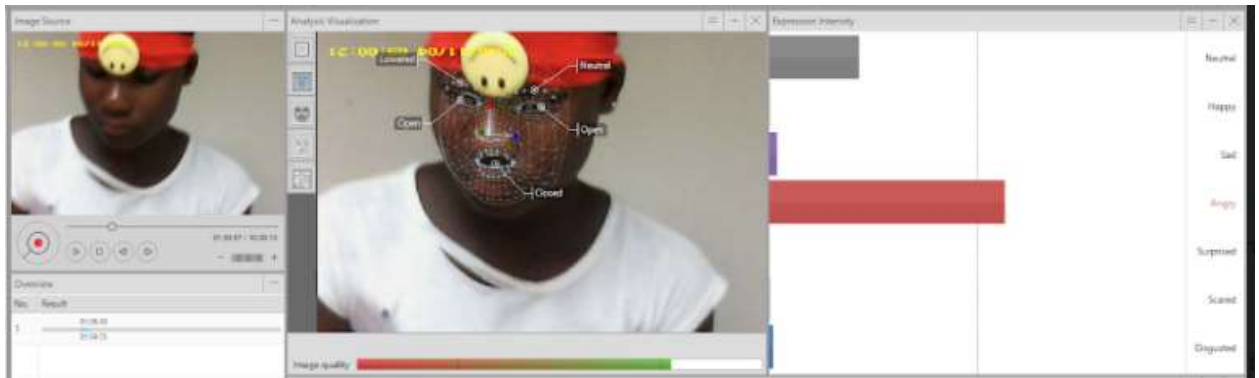


Figure 4.3: Mismatched angry emotion on the FaceReader software

Figure 4.3 shows discordance between the manual and automated coding of an angry emotion of 0.565 at time point 01:59:97 of the parent's point of view (adolescent as a subject) for BAG 11, on the FaceReader software. The exact time point was manually coded as a neutral emotion.

4.8 Strategic Coding

Across the audio, video and FaceReader data - negative, positive, and neutral tones or facial expressions could be observed. The sections of the game showed varying results of the parent-adolescent pairs concerning these codes at the start, middle, and end of the Matching pairs card game. In the middle and end sections of the game, the positive and negative codes increased while the neutral codes decreased. Neutral codes were observed throughout the sections of the game. However, positive codes such as happy or smile, were detected when participants seemed to be winning the game. Whilst negative codes such as sad and angry, were only detected when the participants seemed to be losing the game.

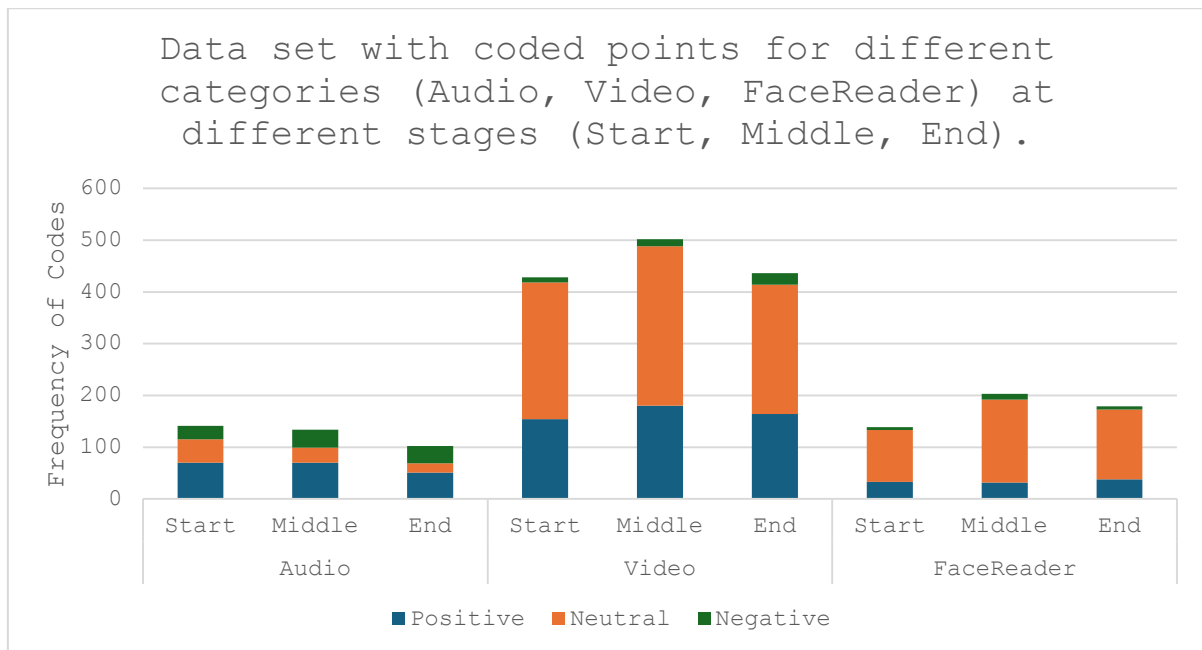


Figure 4.4: Sections of the game for Audio, Video and FaceReader

Figure 4.4, shows the data that was retrieved from the audio transcripts, video recordings and FaceReader output in the start, middle and end of the game. Some sections of the parent-adolescent interactions elicited a lot more data than others, particularly the middle and end sections. The video data produced more data than the audio transcripts and FaceReader output.

Audio analysis of the sections of the game

The audio analysis showed that five pairs (BAG 5, BAG 6, BAG 11, BAG 14, and BAG 16) started the game positively and ended positively. While four pairs (BAG 3, BAG 4, BAG 8, and BAG 9) started the game positively and ended negatively. Three of the pairs (BAG 1, BAG 2, and BAG 12) started the game neutral and ended positively. Only one pair (BAG 13) started the game neutral and ended negatively.

Video analysis of the game sections

The video analysis showed that only one pair (BAG 1) started and ended the game positively. One pair (BAG 6) started the game positively and ended neutral, and three pairs (BAG 2, BAG 11, and BAG 12) started the game positively and ended neutrally. On the other hand, eight pairs remained neutral from the start to the end of the game.

FaceReader analysis of the game sections

The FaceReader analysis showed that the majority of the pairs (n=10) remained neutral from the start to the end of the game. Only one pair (BAG 6) started the game neutral and ended positively, while two pairs (BAG 9 and Bag 13) started the score with no codes and ended with equal positive and negative codes.

Chapter 5 Discussion

5.1 Introduction

The main focus of this chapter is to present a discussion of the study findings. Firstly, the summary of key findings will be discussed. Secondly, the feasibility and acceptability of the Teencam device in recording parent-adolescent interactions will be discussed. The feasibility and acceptability of the games in stimulating interactions among the parent-adolescent pairs will also be discussed. This will be followed by a discussion on verbal and non-verbal communication, the comparison of manual and automated coding as well as the barriers to automated coding. Lastly, the limitations and recommendations for future research are presented as a conclusion to this dissertation.

5.2 Summary of key findings

There are currently four existing studies that have used the same device, called Teencam in this study, three in high-income countries (31, 122, 123) and one in low-middle income countries (124). The previous studies that have used the head camera video methodology are limited to their primary focus on infants, with assessments of parent-infant interactions and recording infant's perspectives. To the researcher's knowledge, this is the first study to use wearable video observational methodology called 'Teencam', to measure parent-adolescent communication and interaction in Africa. The aim of this study was to test the acceptability and feasibility of using Teencam video observational methodology to measure parent-adolescent communication and interaction in Soweto, South Africa. Overall, the findings from this study showed that the use of the Teencam video observational methodology was both acceptable and feasible to measure parent-adolescent communication and interaction in Soweto, South Africa. The stimulus used, including the Matching pairs card game, Jenga and Charades games were acceptable and feasible in stimulating interactions amongst the parent-adolescent pairs, while the Matching pairs card game produced better quality data for analysis. The manual coding process, although laborious and time consuming, provided rich verbal and non-verbal

communication data. The FaceReader software, despite its technical errors and challenges in detecting faces, was able to code the facial expressions of the pairs. Both manual and automated coding showed some efficiency in coding the recordings. The sections of the game (i.e. start, middle and end) showed that the idle of the game elicited more interactions than the others. The coding of the audio data showed more heterogeneity and nuance in the findings whereas the coding done for the two was more neutral. As such, it may be advisable to rely on audio when resources are limited.

5.3 Feasibility and acceptability of the Teencam device

In terms of feasibility as an alternative to other data collection methods, or traditional approaches that use tripod or wall mounted cameras in observation labs, there are some concerns raised. The rate of total data loss due to technical failures was 25%, which is higher than would be generally accepted. On self-report psychometric measures, it would be acceptable to impute for up to 20% missing data in psychological studies. If headcam technology is to be used it would need to be improved to reduce the risk of data loss. Several things contributed to total data loss, including the quality of the camera itself and its reliability to record when switched on but also the participant and researcher error which led to non-recordings. Future research could benefit from enhanced reliability on cameras and two recommendations can be drawn from this pilot. Firstly, it would be helpful to have red or green light indicators that can be observed from a distance to easily show researchers that the camera was working, likewise capacity for the researcher to see a live stream during the video recording could also reduce the potential of only discovering the failure after the interaction was complete. Furthermore, reducing human errors by providing additional training for participants and researchers to ensure cameras are operated properly.

Compared to the discrepancies and biases involved in self-report methodologies (136), objective video observational methodologies offer real-time interactions. The use of the Teencam device was feasible in the setting and has potential to be developed as a method to obtain more objective data that shows behavioural signals and provides a richer more valid source of data for understanding adolescent behaviours, their interaction with their parents, and their communication. The

Teencam device was able to capture parent-adolescent communication and interaction successfully, despite the noted technical operations of the Teencam device. The Teencams were able to capture audio (vocalizations) and video (facial expressions, head gestures and limited hand movements) from the parent-adolescent interactions. The combination of the audio and video aspect of the interactions provided context for some of the audio interactions captured in the transcripts. Wearable devices are rapidly evolving and at the time this dissertation was being completed a new version of the Teencam had already been released by the developers, which had far superior capacities in terms of management of movement, the capturing of audio quality and in having wireless capacity for data transfer. However, without the ability to live stream the researcher would still not be able to be alerted to instances of total failure. In the future more advanced versions of wearable technology are likely to emerge that improve on this, and it is possible that in time other types of wearables like watches, mood rings, and proximity sensors may produce data that can be combined to understand internal states within the context of interaction and communication. In this context this initial feasibility is important to have established and provides a contribution to the ways in which wearables can be enhanced to provide research data.

The use of the Teencam device in recording parent-adolescent communication and interactions was found to be acceptable in this context. Although some of the parents indicated that they were sceptical at first, they eventually warmed up to the Teencam. Some parents indicated that they would even use it at home. However, some parents raised some ethical concerns regarding the use of and interpretation of the video recordings. Informed consent and reassurance regarding privacy and confidentiality plays an important role in observational research (137). This allows the participants to be at ease about their participation and expectations as well as to facilitate trust with the researcher. It is important to consider ways in which participants can be put at ease about analytic protocols that will be used, so that they have a clear understanding of how the data will be used, but these would need to be presented post stimuli to not influence the nature of the naturalistic observation and participation. Such challenges need to be considered when developing and refining protocols for using video observational methodologies more broadly in South Africa, not only amongst adolescents and their parents.

5.4 Feasibility and acceptability of the games

Parent–child interaction is frequently assessed during a somewhat simulated task imposed by the observer or researcher (138). The purpose of introducing a task, in this case an interactive game, rather than watching ‘natural’ interactions may be to elicit the behaviours of interest in an efficient way or to allow pairs or families to engage in both prosocial behaviours and conflictual behaviours that require problem solving, conflict resolution, and communication skills (104). Previous studies have also used board games to study parenting and family relations (139), and as a therapeutic tool to promote child mental health (140).

This study used three different stimuli games to measure communication and interaction amongst parent-adolescent pairs across the three workshops, namely the Matching pairs card game, Jenga game and the Charades game. Given that there is no existing protocol for measuring parent-adolescent communication and their interactions while playing games, the researcher needed to try three different games in order to evaluate which game will be feasible. The study found the Matching pairs card game to be feasible in measuring parent-adolescent communication and interaction in Soweto. The Matching pairs card game was able to elicit interactions among the pairs, it allowed communication, turn-taking and some participants were able to maintain eye contact, and the video recordings could be coded with ease as the faces of the participants were showing better than in the other two games.

The games played across the three workshops were acceptable among the parent-adolescent pairs. The parents and the adolescents enjoyed the Matching pairs card game the most because it was familiar to them, given that they usually play similar games at home. Some of the parents and adolescents enjoyed the Charades game. A reason for this may be that the Charades game was relatable to them as it was designed especially for this sample with relatable content or cue card which may have contributed to it being easy to understand and thus enjoyable.

Overall, the parents enjoyed playing interactive games with their adolescent child. This is important because some of them had not played games at home before. A possible explanation for this finding may be that in some South African homes, it is a norm that children play together and not with parents. Parents in particular may focus

on responsibilities in the house and less on leisure activities (141). In addition, working parents may have limited time to play with their adolescent children due to fatigue after a long day at work. This study suggests that although, some parents were not playing games with their children before, they have learnt or experienced that it is enjoyable, and it helps them to reconnect with their adolescent children and get to know them better while engaging in an activity. Previous studies found that parents' involvement in adolescents' leisure activities has a positive impact on parent-child interaction (142), and promotes family bonding and communication (141).

5.5 Verbal and non-verbal communication

In this study, the audio and visual aspects were transcribed verbatim with timestamps. The parent-adolescent observations were then coded using a codebook that was developed and adapted for this study which added to the lengthy process of manual coding. The codes included two categories; verbal and non-verbal communication, this meant that any vocalizations and non-verbal cues observed were carefully recorded manually. The audio recording transcripts that were analysed could not capture important non-verbal information. The non-verbal information could, in some instances, provide context and change the meaning of some of the statements made during the parent-child interaction. Analysing both the verbal and non-verbal data allowed the researcher to understand the context of the interaction with less chance of possibly misunderstanding verbal responses. For example, there were some instances in the transcripts where what was spoken was interpreted in a negative tone, whilst the behaviour appeared positive when viewing the video. Video data contribute to a better understanding of the elements in the audio data, which could be missed when only analysing the audio data. This study therefore highlights that it is of paramount importance to make use of both audio and video to objectively measure parent-adolescent communication and interaction. A recent study also demonstrated the importance of analysing audio and video when assessing the quality of parent-child interactions in a semi-structured interaction tasks (138).

5.6 Inadvertent disclosure and ethical considerations

The results indicate that parents and children, at times, verbalised warnings to each other, they remind each other that what they were doing or discussing was being video recorded. This is an important finding from two perspectives.

Firstly, it is important to note that these 'warnings' have interpretative value in and of themselves, they may indicate a closeness in the relationship between the parent and the child where one of them is being protective of the other and trying to avoid inadvertent disclosures or embarrassing information being revealed about themselves or others in the family. To better understand this, researchers need to ensure that careful qualitative work is conducted to inform the manner in which these interactions are coded and interpreted.

Secondly, these warnings may have interpretative value as potentially representing a threat towards the other, to not disclose harmful practices by parents towards children for example, as is the example from this research of parenting suggesting that children not disclose harsh parenting practices. This raises important ethical considerations for researchers and requires that during observations to score, researchers be sensitive to any indicators of threat or abuse and treats these as they would any other disclosure of potential harm or adverse event, either by responding, referring or reporting these matters in line with ethical guidance.

Additionally, these interactions also highlight that naturalistic interaction was captured using this methodology, because one of the pair had to remind the other that they were being video recorded. This is valuable as generally one would expect that video observations might need to be longer for participants to forget they were being observed, but equally one of the pair was verbalising that they had not forgotten. So while observational methodology may provide us with a lot of insights, there is still some amount of reactivity bias that could happen. One way in which video observations can be strengthened is by using technological advances to embed video observations within people's lives over a prolonged period of time, using smaller less noticeable and passive recording devices. There is some evidence from literature with parents and infants in the UK and in SA (31, 124) that longer periods of recording with passive smaller devices can elicit more natural parenting behaviours. That the Teencam device was quite noticeable on the forehead and that

it drew attention giving the smiley face to ensure high quality recording of facial features this does also add to the limitation in the ability of the methodology to capture naturalistic behaviours.

5.7 Comparison between manual and automated coding

Manual coding, although precise, is a labour-intensive task and time-consuming. The aspect of time has been a serious barrier to the development of the field and has made it difficult for new scholars to adopt the technique (121). This study confirms the tedious process involved in manual coding of video interactions, which involves developing a codebook, transcribing the audio recordings and repeated viewing or watching of the same video footage coupled with playing back to ensure that all behaviours in the observations are captured.

Compared to the laborious process of manual coding, automated coding is a great source for reduced human effort and time spent in the coding process. The study used automated coding software called Noldus FaceReader to validate the manual coding of facial expressions undertaken in this study. FaceReader (FR) is an automated facial coding system that measures the six basic emotions of happiness, sadness, fear, anger, surprise, and disgust (32). Results of FR analysis can be considered reliable (143, 144), the findings in this study verified this finding. However, there were some barriers experienced while coding using FaceReader software.

5.8 Barriers to coding using FaceReader software

The quality of the video recordings has a great influence on the quality and accuracy of the results (145). The data from the video recordings of the Matching pairs card game although found to have the best quality amongst the three games, it still had some challenges. The following barriers: 1) poor lighting conditions in the room, 2) faces not in view/full view, and 3) misclassification of gender and age, contributed to FaceReader not being completely reliable for coding. Previous studies have also highlighted that poor lighting conditions and faces not being in full view (32, 144) has

a negative impact on the effectiveness of automated coding software in detecting facial expressions.

Similar to the findings in a systematic literature review (145) which returned high values of neutral emotions, the FR software detected mostly neutral emotions in this study. Nonetheless, it was also able to detect happy, sad, angry, and disgust emotions. Surprised and scared emotions were not detected. While this finding may mean that the Matching pairs card game interactions did not arouse these kinds of emotions in the participants, it may also mean that the software performs poorly in detecting 'surprise' facial expressions. Previous literature has already established that the use of FaceReader involves the residual risk of misclassification or misinterpretation of emotions (145).

The sample of this study comprised of African participants only, middle-late aged mothers and young adolescents. Although, the FaceReader software is endorsed to be able to detect all races and genders (32), discrepancies have been reported in literature. Previous research suggests caution with the use of FaceReader in detecting emotions on non-western faces as there may be discrepancies due to the differences in the facial bone structure across races (146). The gender of the participants has also been found to have an influence on the performance of the FR software (147).

5.9 Increasing the efficiency of coding parent-adolescent interactions

In the same way that audio recording transcripts could not capture important physical gestures, such as head and hand gestures, the software could not detect them. Manual coding enables the coding of audio and video while the FR software only codes facial expressions. Therefore, although laborious and time consuming, manual coding does overcome some of the technological barriers of the FR technology and provides contextually rich and detailed observational data than automated software. The most efficient way to manually code may be to code both audio and video at the same time using software designed for this purpose. For example, the Noldus observer software which can be used to code behavioural data for both audio and video in real-time (148) using an existing coding scheme (133).

This study also found a difference in the number of positive, neutral and positive parent-adolescent interactions when comparing the number of interactions depending on whether it was the beginning, middle or end of the interactions. When audio transcripts, video recordings and the FR coding were compared, the findings showed that the middle parts of the video recordings had the most positive, negative and neutral interactions. This means that time in the coding process could be saved by focusing on only coding the middle sections of the video recordings.

In the future, with the rapid advancement of Artificial Intelligence (AI) technologies the likelihood is that software will become more advanced, and in particular that the software will develop in such a way that facilitates the transformation of the spoken verbal data and the behavioural observational data. This would significantly reduce the intensity of the analytic process, but for the foreseeable future, it is likely the researchers need to remain involved in a careful process of behavioural coding.

5.10 Limitations of the study

The sample was restricted to biological mothers, a practical decision because children in rural and urbanised South Africa are mostly raised by their mothers (16). Given that fathers are often perceived as providers and mothers as primary caregivers (106), mothers may spend the most time with the children while fathers are at work, and as is often the case in South Africa, fathers may have been forced to migrate due to work contributing to the absence of a father altogether. Despite the widely held preconceptions that South African fathers are often absent in their children's lives, Census 2022 data confirms that most children in South Africa are raised by both a mother and a father. In addition, research conducted in South Africa revealed that fathers have a desire to have loving relationships with their children, commit to playing nurturing roles and remain present in their children's lives (149). Including both fathers and mothers when studying parent-adolescent communication and interaction can broaden our understanding of the parent-child relationship.

Although, video observational methodology shows promise in understanding and exploring parent-child relationships, it is important to consider that a central component of judging the quality of that relationship includes coding and making

inferences about the extent to which the parent and child participants make and hold eye contact. However, there could be difficulties in applying this methodology and coding system in cultures where eye contact by children towards parents is perceived as potentially being disrespectful. While maintaining eye contact in a social interaction is an important social principle in the Western culture (150), in many African cultures looking someone directly in the eye or holding a “gaze” during a conversation could be regarded as disrespectful (151). This is particularly the case in remote rural communities which are more traditional, where children are taught to avoid eye contact (out of respect for elders) from an early age. This is reinforced through social learning and is modelled by their mothers to their fathers and by younger siblings to older siblings (151). If, for cultural reasons, a participant was avoiding eye contact during a video observation, this may have effects on the quality of the data recorded and may skew the results or place limits on the ability to conduct analysis and interpret of these data using western coding systems.

This cultural phenomenon should be taken into consideration and explored further during formative work in each setting that the methodology is used. Two possibilities are available for researchers, the first would be providing sensitive instructions which are culturally appropriate and offer reassurance about aspects of observational tasks that might be unusual for participants in a particular cultural context; and the second could involve the adjustment of coding systems to allow for cultural variation particularly to make sure the coding system scores appropriately on aspects of interaction which are common and valued in the local culture. For example, as was done in this study, researchers might use participatory approaches to explore with the parents during interviews or focus groups what cultural aspects needed to be considered in interpretation of the data. In the case of eye contact this could explore whether this is something that they, as parents have taught in their children at home, or by conducting formative work to watch and interpret videos of parent-child interactions, together with parents, to explore their perceptions of the meaning of the interaction (showing respect vs being disrespectful) for the purposes of coding (or adjusting the coding system) at the data analysis phase. An example of an adjustment could include for example assessing in eye contact alongside other gestures or behaviours which inform the quality of the interaction (i.e. smiling or verbalising positive comments while also avoiding gaze) or adjusting the weighing of the score assigned to eye contact or shared ‘gaze’ in judging the quality of a

relationship. In this sense it is important for researchers using video observation to consider cultural adaptation to both the video observation task itself and the scoring and coding systems. An example of careful research that is sensitive to the South African research context includes work with parents of substance abusing adolescents (152).

It is noteworthy that the participants in this study were not research naïve, they were already participants in other studies and were engaging in a broader set of research processes within the BAG. This may have led to them being more comfortable and able to adjust to the Teencam methodology more easily than participants who encounter this methodology outside the context of multiple contacts and the benefit of time to develop rapport and trust with the researcher.

Conducting research with technology has challenges. The biggest limitation of the study has to be the performance of the cameras. The lack of obvious indications for switching on/off and starting and stopping recording resulted in technical errors. This limitation resulted in reduced available, complete, and usable audio and video recordings for coding.

The parent-adolescent interactions were conducted in controlled research setting with the presence of the researcher facilitating the process. Despite that, the researcher left the room after switching on the Teencams for the interactions to proceed and only returned at the end of the recording time to switch off the Teencams. The initial objective was to conduct acceptability interviews with both the parents and adolescents. However, due to scheduling issues we could only obtain data on acceptability from parents who took part in this study, and not their children. Consequently, we have limited understanding of whether this methodological approach was acceptable to adolescents nor do we have adolescent suggestions for how the methodology could be improved. Participatory work with adolescents themselves, using participatory and engaging methodologies (153) is an important area for development in future research.

The last limitation of this study was the absence of inter-rater reliability of the use of codebook for the manual coding. Although during development of the codebook a second researcher tested the codebook, during analysis only one coder tested the

coding system, the same researcher who developed the coding system. Testing of the coding system and reviewing data from more than one coder by other independent coders is necessary to validation as an investigative tool.

5.11 Recommendations for future studies

While this pilot study shows that the Teencam is a feasible and acceptable video observational methodology in Soweto, South Africa, it highlights necessary modifications to improve the usability of Teencam and the quality of data collected, in future studies. Attention should be particularly given to headcams that have clear on/off buttons and signify when the device is successfully recording, provide a wider view through the camera lens. An advanced and improved headcam has been developed that solves problems brought up by researchers and users from both high- and low-income environments worldwide (124). Future studies, focusing on using headcam observational methodology will undeniably benefit from these technological improvements, specifically, the greater ease of use, wider field of view and longer battery life. Additionally, future research should consider data collection being facilitated in separate rooms to minimise external noise from surrounding pairs or limiting the number of pairs in a room for observation at a time and conducting pre-test trials to check sound quality prior to data collection.

The study recommends that videos consisting of facial features should be captured under ideal conditions such as well-lit rooms, limited body movements and should be captured using high-resolution cameras, to ensure accurate classification of emotions on FR coding system. In addition to the automated coding method, manual coding using the Noldus Observer software, which codes both audio and video at the same time, can be beneficial in analysing parent-adolescent interactions. To save time during the coding process while still getting detailed observational data, future researchers should consider coding the middle parts of the video because that is where most of the interactions were found.

Finally, it is important to note that this study was conducted in a research setting, where the observations took place in a “controlled” environment under the guidance of a researcher who left the room to allow interactions to occur and returned only to turn off the cameras at the end of the recording period. In order to measure parent-

adolescent communication and interaction in a natural setting, future researchers are advised to consider letting their participants take the Teencams home to record their interactions in their natural environment.

5.12 Conclusion

Despite the limitations, this study showed that using Teencam video observational methodology to measure parent-adolescent communication and interactions is feasible and acceptable in Soweto, South Africa. The interactions were recorded successfully resulting in quality audio and video with minimal technical reliability concerns. Parents found both the Teencam recording process as well as the game interactions with their adolescents enjoyable. This provides an important foundation for the use of video observational methods to objectively measure parent-adolescent communication and interactions in future studies. This study shows that there could be some improvements when using Teencam video observational methodology with interactive games prior to conducting future research. Good lighting conditions are needed, games such as the Matching pairs card game elicited more interactions and engagements and the version of the Teencam device with a wide view should be used. FR software can be used to automate the coding process of facial expressions more efficiently as manual coding of video and audio can be time consuming. However, there are technological barriers to using this kind of software since it does not allow for both video and audio to be coded. Manually coding video and audio at the same time would speed up the coding process while providing rich and detailed observational data, both verbal and non-verbal, that show parent-child interactions in context.

References

1. Unicef. A familiar face: Violence in the lives of children and adolescents. 2017.
2. Coetzee J, Dietrich J, Otjombe K, Nkala B, Khunwane M, van der Watt M, et al. Predictors of parent–adolescent communication in post-apartheid South Africa: A protective factor in adolescent sexual and reproductive health. 2014;37(3):313-24.
3. Khan G. Exploring adolescents' perceptions of the influence of substance abuse on community violence within a Cape flats community. 2013.
4. Turbeville A, Aber JL, Weinberg SL, Richter L, van Heerden A. The relationship between multidimensional economic well-being and children's mental health, physical health, and executive function development in South Africa. *Developmental science*. 2019:e12846.
5. Abrahams N, Mathews S, Lombard C, Martin LJ, Jewkes R. Sexual homicides in South Africa: A national cross-sectional epidemiological study of adult women and children. *PLOS ONE*. 2017;12(10):e0186432.
6. RoCHAT TJ, Stein A, Cortina-Borja M, Tanser F, Bland RM. The Amagugu intervention for disclosure of maternal HIV to uninfected primary school-aged children in South Africa: a randomised controlled trial. *The Lancet HIV*. 2017;4(12):e566-e76.
7. Goin DE, Pearson RM, Craske MG, Stein A, Pettifor A, Lippman SA, et al. Depression and incident HIV in adolescent girls and young women in HIV prevention trials network 068: targets for prevention and mediating factors. *American journal of epidemiology*. 2020;189(5):422-32.
8. Laursen B, Collins WA. Parent-child communication during adolescence. *The Routledge handbook of family communication*. 2004;2:333-48.
9. Roman NV, Makwakwa T, Lacante M. Perceptions of parenting styles in South Africa: The effects of gender and ethnicity. *Cogent Psychology*. 2016;3(1):1153231.
10. Laursen B, Collins WA. Parent—child relationships during adolescence. *Handbook of adolescent psychology*. 2009;2.
11. DeVore ER, Ginsburg KR. The protective effects of good parenting on adolescents. *Current opinion in pediatrics*. 2005;17(4):460-5.
12. Sironga N. Determining the Effects of Parent-Adolescents Relationship on the Psychological Wellbeing of Adolescents: A Case of Dagoretti South Sub-County: United States International University-Africa; 2018.
13. Raudino A, Fergusson DM, Horwood LJ. The quality of parent/child relationships in adolescence is associated with poor adult psychosocial adjustment. *Journal of Adolescence*. 2013;36(2):331-40.
14. Branje SJ, Hale WW, Frijns T, Meeus WH. Longitudinal associations between perceived parent-child relationship quality and depressive symptoms in adolescence. *Journal of abnormal child psychology*. 2010;38(6):751-63.
15. Hair EC, Moore KA, Garrett SB, Ling T, Cleveland K. The continued importance of quality parent–adolescent relationships during late adolescence. *Journal of research on adolescence*. 2008;18(1):187-200.
16. Brook DW, Morojele NK, Zhang C, Brook JS. South African adolescents: pathways to risky sexual behavior. *AIDS Education & Prevention*. 2006;18(3):259-72.
17. Steinberg L, Silk JS. Parenting adolescents. 2002.
18. Slesnick N, Reed S, Letcher A, Katafiasz H, Jones T, Buettner C. Predictors of parental monitoring among families with a runaway adolescent. *Am J Orthopsychiatry*. 2012;82(1):10-8.

19. Lohman BJ, Billings A. Protective and risk factors associated with adolescent boys' early sexual debut and risky sexual behaviors. *Journal of Youth and Adolescence*. 2008;37(6):723.
20. Vilanculos E, Nduna M. "The child can remember your voice": parent-child communication about sexuality in the South African context. *African Journal of AIDS Research*. 2017;16(1):81-9.
21. Riesch SK, Anderson LS, Krueger HA. Parent-child communication processes: Preventing children's health-risk behavior. *Journal for Specialists in Pediatric Nursing*. 2006;11(1):41-56.
22. Buckley L, Broadley M, Cascio CN. Socio-economic status and the developing brain in adolescence: A systematic review. *Child Neuropsychology*. 2019;25(7):859-84.
23. Roebbers CMJDr. Executive function and metacognition: Towards a unifying framework of cognitive self-regulation. 2017;45:31-51.
24. Blakemore S-JJNRN. The social brain in adolescence. 2008;9(4):267-77.
25. Blakemore SJ, Choudhury SJJocp, psychiatry. Development of the adolescent brain: implications for executive function and social cognition. 2006;47(3-4):296-312.
26. Gardner F. Methodological issues in the direct observation of parent-child interaction: Do observational findings reflect the natural behavior of participants? *Clinical child and family psychology review*. 2000;3(3):185-98.
27. Herbers JE, Garcia EB, Obradović J. Parenting assessed by observation versus parent-report: Moderation by parent distress and family socioeconomic status. *Journal of Child and Family Studies*. 2017;26(12):3339-50.
28. Rajyaguru P, Moran P, Cordero M, Pearson R. Disciplinary Parenting Practice and Child Mental Health: Evidence From the UK Millennium Cohort Study. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2019;58(1):108-16. e2.
29. Ward C, Makusha T, Bray RJSACg. Parenting, poverty and young people in South Africa: What are the connections. 2015:69-74.
30. Wang S-w, Repetti R, Sears M. Using direct observational methods to study the real lives of families: Advantages, complexities, and conceptual and practical considerations. 2013.
31. Lee R, Skinner A, Bornstein M, Radford A, Campbell A, Graham K, et al. Through babies' eyes: Practical and theoretical considerations of using wearable technology to measure parent-infant behaviour from the mothers' and infants' view points. *Infant Behavior and Development*. 2017;47:62-71.
32. Noldus L. FaceReader: Tool for automated analysis of facial expression: Version 6.0. Wageningen: Noldus Information. 2014.
33. Census. Census 2022 Statistical Release Pretoria: Statistics South Africa 2023 [Available from: <https://www.statssa.gov.za/wp-content/uploads/2023/10/Mbalo-brief-October-2023-WEB-FINAL.pdf>].
34. Louw D, Louw AE. Child and adolescent development: Psychology publications Bloemfontein; 2007.
35. Patel V, Flisher AJ, Hetrick S, McGorry PJTL. Mental health of young people: a global public-health challenge. 2007;369(9569):1302-13.
36. Crone EA, van Duijvenvoorde AC, Peper JSJJocp, psychiatry. Annual Research Review: Neural contributions to risk-taking in adolescence—developmental changes and individual differences. 2016;57(3):353-68.
37. Moretti MM, Peled M. Adolescent-parent attachment: Bonds that support healthy development. *Paediatr Child Health*. 2004;9(8):551-5.
38. Collins W, Steinberg L. Adolescent development in interpersonal context. Social, emotional and personality development. *Handbook of child psychology*. New York: Wiley; 2006.

39. Steinberg L, Morris AS. Adolescent development. Annual review of psychology. 2001;52(1):83-110.
40. Trommsdorff G. Parent–child relations over the lifespan: A cross-cultural perspective. Parenting beliefs, behaviors, and parent-child relations: Psychology press; 2013. p. 143-84.
41. Lamb ME, Lewis C. The role of parent–child relationships in child development. Social and personality development: Psychology Press; 2013. p. 259-308.
42. Thurschwell P. Sigmund Freud: Routledge; 2009.
43. Masur C. The development of trust and mistrust in childhood. Mistrust: Routledge; 2018. p. 3-18.
44. Tzuriel D, Tzuriel DJMI, modifiability c. The socio-cultural theory of Vygotsky. 2021;53-66.
45. Bandura A, Walters RH. Social learning theory: Prentice-hall Englewood Cliffs, NJ; 1977.
46. Bowlby J. Attachment and loss: Volume II: Separation, anxiety and anger. Attachment and Loss: Volume II: Separation, Anxiety and Anger: London: The Hogarth press and the institute of psycho-analysis; 1973. p. 1-429.
47. Fanti KA, Henrich CC, Brookmeyer KA, Kuperminc GPJTJoEA. Toward a transactional model of parent-adolescent relationship quality and adolescent psychological adjustment. 2008;28(2):252-76.
48. Yaacob MJB. Parent-adolescent relationships and its association to adolescents' self-esteem. Malays J Med Sci. 2006;13(1):21-4.
49. Bornstein MHa, Putnick DLa. Parent–Adolescent Relationships in Global Perspective. New York: Oxford University Press; 2018.
50. Steinberg L. We know some things: Parent–adolescent relationships in retrospect and prospect. Journal of research on adolescence. 2001;11(1):1-19.
51. De Goede IH, Branje SJ, Meeus WHJJoY, Adolescence. Developmental changes in adolescents' perceptions of relationships with their parents. 2009;38(1):75-88.
52. Suizzo MAJTEoC, Development A. Parent–Child Relationships. 2019;1-13.
53. Marceau K, Ram N, Susman EJJJoRoA. Development and lability in the parent–child relationship during adolescence: Associations with pubertal timing and tempo. 2015;25(3):474-89.
54. Kim C, Lee H, Han S-L. A study of parent–adolescent interaction: The impact of family communication patterns on adolescents' influence strategies and parents' response strategies. European Journal of Marketing. 2018;52(7/8):1651-78.
55. Racz SJ, McMahon RJ. The Relationship Between Parental Knowledge and Monitoring and Child and Adolescent Conduct Problems: A 10-Year Update. Clinical Child and Family Psychology Review. 2011;14(4):377-98.
56. Vasquez AC, Patall EA, Fong CJ, Corrigan AS, Pine LJEPR. Parent autonomy support, academic achievement, and psychosocial functioning: A meta-analysis of research. 2016;28(3):605-44.
57. Smetana JG, Rote WM. Adolescent–Parent Relationships: Progress, Processes, and Prospects. 2019;1(1):41-68.
58. Smetana JG. Current research on parenting styles, dimensions, and beliefs. Current Opinion in Psychology. 2017;15:19-25.
59. Sahithya BR, Manohari SM, Vijaya R. Parenting styles and its impact on children – a cross cultural review with a focus on India. Mental Health, Religion & Culture. 2019;22(4):357-83.
60. Smetana JG. Parenting styles and conceptions of parental authority during adolescence. Child development. 1995;66(2):299-316.

61. Liu R. The Role of Gender in Parenting Styles and Their Effects on Child Development. *Lecture Notes in Education Psychology and Public Media*. 2023;18:114-9.
62. Davids E, Roman N, Leach LJAJPHE, Recreation, Dance. The effect of family structure on decision making, parenting styles and healthy lifestyle behaviour of adolescents in rural South Africa. 2015;21(3.2):953-67.
63. Gullotta TP, Adams GR. Handbook of adolescent behavioral problems: Evidence-based approaches to prevention and treatment. *Handbook of adolescent behavioral problems: Evidence-based approaches to prevention and treatment*: Springer Science + Business Media; 2005. p. xxi, 665-xxi, .
64. Hinshaw SP, Lee SS. Conduct and oppositional defiant disorders. 2003.
65. Paschall MJ, Ringwalt CL, Flewelling RL. Effects of parenting, father absence, and affiliation with delinquent peers on delinquent behavior among African-American male adolescents. *Adolescence*. 2003;38(149):15.
66. McKee L, Roland E, Coffelt N, Olson AL, Forehand R, Massari C, et al. Harsh discipline and child problem behaviors: The roles of positive parenting and gender. 2007;22(4):187-96.
67. Chang L, Schwartz D, Dodge KA, McBride-Chang CJJofp. Harsh parenting in relation to child emotion regulation and aggression. 2003;17(4):598.
68. Berthelon M, Contreras D, Kruger D, Palma MI. Harsh parenting during early childhood and child development. *Economics & Human Biology*. 2020;36:100831.
69. Richter L, Mathews S, Kagura J, Nonterah E. A longitudinal perspective on violence in the lives of South African children from the Birth to Twenty Plus cohort study in Johannesburg-Soweto. *South African Medical Journal*. 2018;108(3):181-6.
70. Naicker SN, Norris SA, Richter LM. Secondary analysis of retrospective and prospective reports of adverse childhood experiences and mental health in young adulthood: Filtered through recent stressors. *EClinicalMedicine*. 2021;40.
71. Gershoff ETJL, probs. c. More harm than good: A summary of scientific research on the intended and unintended effects of corporal punishment on children. 2010;73:31.
72. Holland JF, Khandaker GM, Dauvermann MR, Morris D, Zammit S, Donohoe G. Effects of early life adversity on immune function and cognitive performance: results from the ALSPAC cohort. *Social Psychiatry and Psychiatric Epidemiology*. 2020.
73. Koliijn L, Huffmeijer R, Van Den Bulk BG, Vrijhof CI, Van Ijzendoorn MH, Bakermans-Kranenburg MJ. Effects of the Video-feedback intervention to promote positive parenting and sensitive discipline on mothers' neural responses to child faces: A randomized controlled ERP study including pre- and post-intervention measures. *Social Neuroscience*. 2020;15(1):108-22.
74. Juffer F, BAKERMANS-KRANENBURG MJ, Van Ijzendoorn MHJHoa-bi. Video feedback intervention to promote positive parenting and sensitive discipline. 2017:1-26.
75. Juffer F, Bakermans-Kranenburg MJ. Working with Video-feedback Intervention to promote Positive Parenting and Sensitive Discipline (VIPP-SD): A case study. *Journal of clinical psychology*. 2018;74(8):1346-57.
76. Dishion TJ, McMahon RJJCc, review fp. Parental monitoring and the prevention of child and adolescent problem behavior: A conceptual and empirical formulation. 1998;1(1):61-75.
77. Kerr M, Stattin H. What parents know, how they know it, and several forms of adolescent adjustment: further support for a reinterpretation of monitoring. *Developmental psychology*. 2000;36(3):366.

78. Soenens B, Vansteenkiste M, Luyckx K, Goossens LJDp. Parenting and adolescent problem behavior: an integrated model with adolescent self-disclosure and perceived parental knowledge as intervening variables. 2006;42(2):305.
79. Ryan J, Roman NV, Okwany AJTOFSJ. The effects of parental monitoring and communication on adolescent substance use and risky sexual activity: A systematic review. 2015;7(1).
80. Bureau JS, Mageau GAJJoA. Parental autonomy support and honesty: The mediating role of identification with the honesty value and perceived costs and benefits of honesty. 2014;37(3):225-36.
81. Harkness S, Super CMJHop. Culture and parenting. 2002;2(2):253-80.
82. Edwards T, Mkwanazi N, Mitchell J, Bland RM, Rochat TJ. Empowering parents for human immunodeficiency virus prevention: Health and sex education at home. Southern African Journal of HIV Medicine. 2020;21(1).
83. Namisi FS, Flisher AJ, Overland S, Bastien S, Onya H, Kaaya S, et al. Sociodemographic variations in communication on sexuality and HIV/AIDS with parents, family members and teachers among in-school adolescents: a multi-site study in Tanzania and South Africa. 2009;37(2_suppl):65-74.
84. Crouter AC, Head MRJHop. Parental monitoring and knowledge of children. 2002;3:461-83.
85. Smetana JG, Metzger A, Gettman DC, Campione-Barr NJCd. Disclosure and secrecy in adolescent-parent relationships. 2006;77(1):201-17.
86. Adebisi BO, Goldschmidt T, Benjamin F, Sonn IK, Rich E, Roman NVJBph. Enablers and barriers to effective parenting within the first 1000 days: an exploratory study of South African parents and primary caregivers in low socio-economic communities. 2022;22(1):793.
87. Taliep N, Ismail G, Titi NJCARiSA. Reflections on parenting practices that impact child-rearing in a low-income community. 2018;19(2):1-13.
88. Kaminer D, Du Plessis B, Hardy A, Benjamin AJP, Psychology CJoP. Exposure to violence across multiple sites among young South African adolescents. 2013;19(2):112.
89. Branje S, Laursen B, Collins WJTRhofc. Routledge handbook of family communication. 2012:271-86.
90. Lewis JM, Wallerstein JS, Johnson-Reitz LJHofc. Communication in divorced and single-parent families. 2004:197-214.
91. Koerner A, Fitzpatrick M. Communication in Intact Families on Handbook of Family Communication (pp. 177–195). Mahwah, NJ: L. Erlbaum Associates; 2004.
92. Jerman P, Constantine NAJJoy, adolescence. Demographic and psychological predictors of parent-adolescent communication about sex: A representative statewide analysis. 2010;39(10):1164-74.
93. Lenciauskiene I, Zaborskis A. The effects of family structure, parent-child relationship and parental monitoring on early sexual behaviour among adolescents in nine European countries. Scandinavian journal of public health. 2008;36(6):607-18.
94. Dessie Y, Berhane Y, Worku A. Parent-Adolescent Sexual and Reproductive Health Communication Is Very Limited and Associated with Adolescent Poor Behavioral Beliefs and Subjective Norms: Evidence from a Community Based Cross-Sectional Study in Eastern Ethiopia. PLoS One. 2015;10(7):e0129941.
95. Wight D, Williamson L, Henderson MJJoa. Parental influences on young people's sexual behaviour: A longitudinal analysis. 2006;29(4):473-94.
96. Kumi-Kyereme A, Awusabo-Asare K, Biddlecom A, Tanle AJAjr. Influence of social connectedness, communication and monitoring on adolescent sexual activity in Ghana. 2007;11(1):133.

97. Phetla G, Busza J, Hargreaves JR, Pronyk PM, Kim JC, Morison LA, et al. "They have opened our mouths": increasing women's skills and motivation for sexual communication with young people in rural South Africa. 2008;20(6):504-18.
98. Diiorio C, Pluhar E, Belcher LJJoHAP, Adolescents Ef, Children. Parent-child communication about sexuality: A review of the literature from 1980–2002. 2003;5(3-4):7-32.
99. Amoran O, Onadeko M, Adeniyi JJIQoCHE. Parental influence on adolescent sexual initiation practices in Ibadan, Nigeria. 2003;23(1):73-81.
100. Bastien S, Kajula LJ, Muhwezi WW. A review of studies of parent-child communication about sexuality and HIV/AIDS in sub-Saharan Africa. *Reproductive health*. 2011;8(1):25.
101. Kajula LJ, Sheon N, De Vries H, Kaaya SF, Aarø LEJA, Behavior. Dynamics of parent–adolescent communication on sexual health and HIV/AIDS in Tanzania. 2014;18(1):69-74.
102. Paruk Z, Petersen I, Bhana A, Bell C, McKay MJAR. Containment and contagion: how to strengthen families to support youth HIV prevention in South Africa. 2005;4(1):57-63.
103. Branje S. Development of Parent–Adolescent Relationships: Conflict Interactions as a Mechanism of Change. 2018;12(3):171-6.
104. Smetana JGJAv, Constructivist o, perspectives d. Adolescents' social reasoning and relationships with parents: Conflicts and coordinations within and across domains. 2011:139-58.
105. Allison BNJJoF, Education CS. Parent–adolescent conflict in early adolescence. Research and implications for middle school programs. 2000;18(2).
106. Richter L, Chikovore J, Makusha T, Bhana A, Mokomane Z, Swartz S, et al. *Fatherhood and families*. 2011.
107. Mastrotheodoros S, Van der Graaff J, Deković M, Meeus WHJ, Branje S. Parent–Adolescent Conflict across Adolescence: Trajectories of Informant Discrepancies and Associations with Personality Types. *Journal of Youth and Adolescence*. 2020;49(1):119-35.
108. Fogel AJHD. Systems, attachment, and relationships. 2000;43(6):314-20.
109. Parrott A, Zvara BJ, Keim SA, Andridge R, Anderson SEJm. Design of the Play & Grow Cohort: A prospective study of parent-child mealtime interactions. 2020.
110. Daunhauer LA, Schworer E, Howshar M. Chapter One - Parenting Matters: Parent–Child Interactions in Down Syndrome and Recommendations for Future Research. In: Hodapp RM, Fidler DJ, editors. *International Review of Research in Developmental Disabilities*. 53: Academic Press; 2017. p. 1-43.
111. Clark DA, Donnellan MB, Robins RW. Personality traits and parent–adolescent interactions: An observational study of Mexican origin families. *Journal of Family Psychology*. 2018;32(4):544-51.
112. Kim-Spoon J, Longo GS, McCullough ME. Parent-adolescent relationship quality as a moderator for the influences of parents' religiousness on adolescents' religiousness and adjustment. *Journal of youth and adolescence*. 2012;41(12):1576-87.
113. OLIVEIRA WAd, SILVA JL, FERNANDEZ JER, SANTOS MAd, CARAVITA SCS, SILVA MAJEdP. Family interactions and the involvement of adolescents in bullying situations from a bioecological perspective. 2020;37.
114. Umberson D, Thomeer MBJJoM, Family. *Family Matters: Research on Family Ties and Health, 2010 to 2020*. 2020;82(1):404-19.
115. Cavanagh SE, Fomby PJARoS. Family instability in the lives of American children. 2019;45:493-513.

116. Obono K. Patterns of mother-daughter communication for reproductive health knowledge transfer in Southern Nigeria. 2012.
117. Malacane M, Beckmeyer JJ. A Review of Parent-Based Barriers to Parent-Adolescent Communication about Sex and Sexuality: Implications for Sex and Family Educators. *American Journal of Sexuality Education*. 2016;11(1):27-40.
118. Guilamo-Ramos V, Jaccard J, Dittus P, Bouris AM. Parental expertise, trustworthiness, and accessibility: parent-adolescent communication and adolescent risk behavior. *Journal of Marriage and Family*. 2006;68(5):1229-46.
119. Repetti RL, Reynolds BM, Sears MSJJOM, Family. Families under the microscope: Repeated sampling of perceptions, experiences, biology, and behavior. 2015;77(1):126-46.
120. Flameling LJ, Mesman JJI. Using video observation in the family context: The association between camera-related behaviors and parental sensitivity. 2022;27(1):115-34.
121. Fujiwara K, Bernhold QS, Dunbar NE, Otmar CD, Hansia M. Comparing Manual and Automated Coding Methods of Nonverbal Synchrony. *Communication Methods and Measures*. 2021;15(2):103-20.
122. Sugden NA, Mohamed-Ali MI, Moulson MCJDp. I spy with my little eye: Typical, daily exposure to faces documented from a first-person infant perspective. 2014;56(2):249-61.
123. Yurovsky D, Smith LB, Yu C. Statistical word learning at scale: the baby's view is better. *Dev Sci*. 2013;16(6):959-66.
124. Wrottesley SV, Pearson R, Prioreschi A. The headcam mother-infant interaction assessment tool: testing the feasibility and acceptability in Soweto, South Africa, using participatory engagement. *Pilot and Feasibility Studies*. 2021;7(1):140.
125. Emelumadu O, Ezeama N, Ifeadike C, Ubajaka C, Adogu P, Umeh U, et al. Parents' perceptions of timing of initiation of sexuality discussion with adolescents in Anambra State, South Eastern Nigeria. 2014;27(5):294-300.
126. Marta E. Parent-adolescent interactions and psychosocial risk in adolescents: An analysis of communication, support and gender. *Journal of adolescence*. 1997;20(5):473-87.
127. Ware LJ, Kim AW, Prioreschi A, Nyati LH, Taljaard W, Draper CE, et al. Social vulnerability, parity and food insecurity in urban South African young women: the healthy life trajectories initiative (HeLTI) study. *Journal of public health policy*. 2021;42(3):373-89.
128. In J. Introduction of a pilot study. *Korean journal of anesthesiology*. 2017;70(6):601.
129. Murad MH, Asi N, Montori V, Sloan J, Eton D, Erwin P, et al. Patient engagement in research: a systematic review. 2014.
130. Palinkas LA, Horwitz SM, Green CA, Wisdom JP, Duan N, Hoagwood K. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and policy in mental health and mental health services research*. 2015;42:533-44.
131. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative research in psychology*. 2006;3(2):77-101.
132. Braun V, Clarke V. Thematic analysis. *APA handbook of research methods in psychology, Vol 2: Research designs: Quantitative, qualitative, neuropsychological, and biological*. Washington, DC, US: American Psychological Association; 2012. p. 57-71.
133. Costantini I, Cordero M, Campbell A, Burgess R, Glen K, Moraitopoulou G, et al. *Mental Health Intergenerational Transmission (MHINT) Process Manual*. 2021.

134. Nancy Carter R, Bryant-Lukosius D, Alba DiCenso R, editors. The use of triangulation in qualitative research. *Oncology nursing forum*; 2014: Oncology Nursing Society.
135. Palinkas LA, Horwitz SM, Green CA, Wisdom JP, Duan N, Hoagwood K. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and policy in mental health and mental health services research*. 2015;42(5):533-44.
136. Caqueo-Úrizar A, Urzúa A, Villalonga-Olives E, Atencio-Quevedo D, Irrarázaval M, Flores J, et al. Children's Mental Health: Discrepancy between Child Self-Reporting and Parental Reporting. *Behavioral Sciences*. 2022;12(10):401.
137. Wilfond B. Ethical considerations about observational research in children. *The Journal of trauma*. 2007;63(6 Suppl):S146-51; discussion S52-4.
138. Jebeli A, Chen LK, Guerrero K, Papparotto S, Berlin L, Harden BJ. Quantifying the Quality of Parent-Child Interaction Through Machine-Learning Based Audio and Video Analysis: Towards a Vision of AI-assisted Coaching Support for Social Workers. *ACM Journal on Computing and Sustainable Societies*. 2024;2(1):1-21.
139. Berge JM, Telke S, Tate A, Trofholz A. Utilizing a Board Game to Measure Family/Parenting Factors and Childhood Obesity Risk. *Journal of nutrition education and behavior*. 2019;51(4):419-31.
140. Streng I. Using therapeutic board games to promote child mental health. *Journal of Public Mental Health*. 2008;7(4):4-16.
141. Craig L, Mullan K. Shared parent-child leisure time in four countries. *Leisure Studies*. 2012;31(2):211-29.
142. Xie H, Weybright EH, Caldwell LL, Wegner L, Smith EA. Parenting practice, leisure experience, and substance use among South African adolescents. *Journal of leisure research*. 2020;51(1):36-55.
143. Lewinski P, Uyl T, Butler C. Automated Facial Coding: Validation of Basic Emotions and FACS AUs in FaceReader. *Journal of Neuroscience, Psychology, and Economics*. 2014;7:227-36.
144. Burgess R, Culpin I, Costantini I, Bould H, Nabney I, Pearson RM. Quantifying the efficacy of an automated facial coding software using videos of parents. *Frontiers in Psychology*. 2023;14.
145. Landmann E. I can see how you feel—Methodological considerations and handling of Noldus's FaceReader software for emotion measurement. *Technological Forecasting and Social Change*. 2023;197:122889.
146. Li Y-T, Yeh S-L, Huang T-R. The cross-race effect in automatic facial expression recognition violates measurement invariance. *Frontiers in Psychology*. 2023;14:1201145.
147. Lewinski P, Den Uyl TM, Butler C. Automated facial coding: Validation of basic emotions and FACS AUs in FaceReader. *Journal of Neuroscience, Psychology, and Economics*. 2014;7(4):227.
148. Noldus LPJJ. The Observer: A software system for collection and analysis of observational data. *Behavior Research Methods, Instruments, & Computers*. 1991;23(3):415-29.
149. Makusha T, Richter L, Naicker S, Swartz S, Desmond C. Regarding baba: perceptions about father and fatherhood in South Africa. 2019.
150. Uono S, Hietanen JKJPo. Eye contact perception in the west and east: A cross-cultural study. 2015;10(2):e0118094.
151. NTULI CDJICS. Intercultural Misunderstanding in South Africa: An Analysis of Nonverbal Communication Behaviour in Context. 2012;21(2).

152. Groenewald C, Bhana AJIJoMH, Addiction. "It was bad to see my [Child] doing this": Mothers' experiences of living with adolescents with substance abuse problems. 2016;14:646-61.
153. Groenewald C, Khumalo S, Essack ZJSAJoCH. Speaking through pictures: Canvassing adolescent risk behaviours in a semi-rural community in KwaZulu-Natal Province, South Africa. 2018;2018(1):s57-s62.

Appendices

Appendix A: Consent and Assent forms

A. ADOLESCENT ASSENT and PARENT CONSENT FOR BAG ACTIVITIES

I understand that this project will involve meetings, trainings, interviews and focus groups with the researchers and other members of the Beacon Advisory Group (BAG). All the details and purposes of this study have been explained to me. I have had an opportunity to ask questions and my questions have been answered in a satisfactory way.

I understand that all the information collected during the study will be treated with the strictest confidentiality by the researchers and will only be used for scientific research purposes. All records will be kept in a locked room and in a secure computer database in the research unit. My name will not be used in any publication of the results. I understand that for data verification and quality control purposes regulatory authorities and/or members of the Wits Human Research Ethics Committee (Medical) may be allowed access to my personal data under conditions of strict confidentiality.

I agree to participate in all activities of the study on the condition that:

1. I can withdraw from the study at any time voluntarily and that no adverse consequences will follow on withdrawal from the study.
2. I have the right not to answer any or all questions posed in the interviews and not to participate in any or all of the procedures / assessments.
3. The University of the Witwatersrand Human Ethics committee has approved the study protocol and procedures.
4. All results will be treated with the strictest confidentiality. Only group results, and not my individual results, will be published in scientific journals and in the media.
5. The study scientific teams are committed to treating participants with respect and privacy through interviews and measurements conducted in private.

PARTICIPANT ASSENT

Printed Name

Signature / Mark or Thumbprint

Date and Time

PARENT CONSENT

Printed Name

Signature / Mark or Thumbprint

Date and Time

RESEARCH ASSISTANT

Printed Name

Signature

Date and Time

WITNESS

Printed Name

Signature

Date and Time

B. ADOLESCENT ASSENT and PARENT CONSENT FOR VIDEO RECORDING

I agree to be a participant in this study. I understand that the study will involve being part of a training session, using head cameras to record myself and my mother, being part of small focus group discussion. All the details and purposes of this study have been explained to me. I understand that my data will not be anonymous to the researchers involved. I understand that I have the right to refuse to participate in the study. I understand that I have the right to delete any portion of, or the whole video without anyone viewing it first.

I agree to participation in the headcam mother-adolescent interaction assessment study on condition that:

1. I can withdraw from the study at any time voluntarily and that no adverse consequences will follow on withdrawal from the study.
2. I have the right not to answer any or all questions posed in the interviews and not to participate in any or all of the procedures / assessments.

3. The University of the Witwatersrand Human Ethics committee has approved the study protocol and procedures.
4. All results will be treated with the strictest confidentiality.
5. Only group results, and not my individual results, will be published in scientific journals and in the media.
6. The study scientific team are committed to treating participants with respect and privacy through interviews conducted in private and follow-up counselling available on request.
 - Yes, I give my permission for video-recording
 - No, I do not give my permission for video-recording

PARTICIPANT ASSENT

Printed Name	Signature / Mark or Thumbprint	Date and Time
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PARENT CONSENT

Printed Name	Signature / Mark or Thumbprint	Date and Time
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RESEARCH ASSISTANT

Printed Name	Signature	Date and Time
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WITNESS

Printed Name	Signature	Date and Time
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C. ADOLESCENT ASSENT and PARENT CONSENT FOR AUDIOTAPING

I have read and understood the project information sheet, and I understand that it is up to me whether or not interviews I participate in are audio recorded. I understand that if I do not wish to be recorded, it will not in any way affect how the interviewer

treats me. I understand that if the interview is recorded, the tape will be destroyed five years after the interview. I understand that I can ask the person interviewing me to stop recording, and to stop the interview completely at any time. I understand that the information that I give will be treated in the strictest of confidence, and that my name will not be used when the interviews are typed up.

- Yes, I give my permission for the interviews to be recorded
- No, I do not give my permission for the interviews to be recorded

PARTICIPANT ASSENT

Printed Name	Signature / Mark or Thumbprint	Date	and
Time			

PARENT CONSENT

Printed Name	Signature / Mark or Thumbprint	Date	and
Time			

RESEARCH ASSISTANT

Printed Name	Signature	Date	and
Time			

WITNESS

Printed Name	Signature	Date	and
Time			

Appendix B: Interview Schedule

Semi-structured interviews

Thank you for your participation in the research study. We will be capturing your experience of using the Teencam data collection method while sharing a meal with your parent/child and playing a game, to explore acceptability and feasibility issues by asking you to participate in this interview. Please ask me at any time if you do not understand a question, if you need more clarification, or would prefer not to answer a question.

The interview will be audio recorded with your verbal consent. Do you have any questions before we begin?

I would like to ask you some questions about your experience of using the Teencams during your mealtime and game activities.

1. Do you understand the reason for having you and your child recorded?
2. Could you tell me how you experienced the Teencam activity?
 - 2.1. Were the Teencams comfortable to wear?
 - 2.2. How did you feel about using the Teencams?
3. What did you think of the Teencam activity?
 - 3.1. What did you think of recording mealtime?
 - 3.2. What did you think about the Matching pairs card game? Jenga game? Charades game?
 - 3.3. How did you feel about the change of games over the three different workshops/ times you did it?
 - 3.4. Which Teencam activity did you enjoy the most/ was more comfortable to you? Why?
4. How did you feel about recording your interaction with your child?
 - 4.1. Did knowing that you are recording your interaction changed the way you interacted with your child?
 - 4.2. Do you think your child/parent acted naturally when wearing the Teencam?
5. Did you fully understand how the Teencams should be used?
 - 5.1. Was there anything that could have been better explained about what we wanted you to do during the Teencam activity?
6. Were there any barriers to effectively using the Teencams?
7. How was it that the adolescent had to be the one to teach the parent the game?
 - 7.1 Do you think this would be acceptable to other participants? If not, what would you suggest we do to make it more acceptable?
8. Do you think BEACON participants/other participants will have any concerns about the Teencam? If so, what would they be?
9. Is there anything else about your experiences or feelings that you would like to share with us about the use of the Teencams for data collection?
10. Do you have any other questions you would like to ask us?

Appendix C: Games used in the Teencam Activity

The Teencam activity included three different games across the three workshops. Below are images of each game.

1. Matching pairs card game (Played at Workshop 1)



2. Jenga game (Played at Workshop 2)



3. Charades game (Played at Workshop 3)

			
			
Baragwanath Hospital	School	Park	Tuckshop

Appendix D: Codebook for manual coding of the video footage of the parent-adolescent interactions

Verbal Communication				
Categories	Definition	Code	Code description	examples
Vocalizations (Speech)	Spoken expressions that communicate an emotional state or attitude of themselves or towards an individual.	<i>positive</i>	encouragement	"you can do it"
			praise	"well done"
			turn-taking without interruption	"letting the other person speak, without speaking over them"
			telling a joke	
			gratitude	"thank you mum"
			singing	singing any song
		<i>negative</i>	discouragement	"you won't win"
			criticism	"your younger sister explained it better than you"
			abrupt interruptions	
			swearing	"Fuck" in a snapping way
			sarcasm or mocking	"nice hey" or ""continue just like that" said to a person that is losing
			accusations	"you cheating!"
			complains about physical pain	"my head/stomach/tooth hurts"
			boredom	"when are we finishing? I want to go home"
			commanding	"stop that"
			suspicion	"I think you are trying to cheat me"
			possible lie	"you always win"
Vocalizations (Other)	Speech-like sounds characterised by fluctuations of intonation.	<i>positive</i>	laughing	chucking, giggling
			humming	humming tunes
			cheering	"wohoo"
			gasp (surprise)	sharp inward breath
		<i>negative</i>	shouting	"huh eh"
			groan	"hhmm hhmm"
			gasp	"eh eh!"
			sigh	"ouch"
			tongue clicking	"Nxaah"

Non-verbal Communication

Categories	Definition	Code	Code description	examples
Facial expressions	Convey or transmit information regarding the emotional state of an individual that is either directed to: the parent, the adolescent, the game	<i>positive</i>	smile	
			happy	
			surprise	
			wink	
		<i>negative</i>	frown	
			sad	
			anger	
			fear	
			disgust	
			confusion	
Physical gestures (hand and body)	Movements and actions obtained mainly by arms, head and body movements is either directed to: the parent, the adolescent, the game	<i>positive</i>	nodding	
			clapping	
			thumbs up	
			wave	
		<i>negative</i>	head shaking	
			fidgeting	
			thumbs down	
		<i>neutral</i>	hands on cheeks	
			crossed arms	
Mirroring	The behavior in which one person unconsciously imitates the gesture, or attitude of another	<i>positive</i>	eye contact	
			clapping	
		<i>neutral</i>	looking at same object	
Distractions	An object or person that prevents someone from concentrating on the main interaction or activity - coded for any presence of distraction regardless of whether the participants attend to the distraction or not	<i>negative</i>	phone usage	checking the phone or texting
			focusing on other participants	
			looking at the wall	
		<i>neutral</i>	presence of a toddler sibling	Having a toddler sibling standing next to the pair in the lab
			presence of a phone	having a phone placed on the table

Appendix E: Ethical Clearance Certificate



R1445 Dr T Rochat: Professors SA Norris & A Stein

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL) CLEARANCE CERTIFICATE NO. M190801

NAME: Dr T Rochat: Professors SA Norris & A Stein
(Principal Investigator)
DEPARTMENT: School of Clinical Medicine
Department of Paediatrics and Child Health
Developmental Pathways for Health Research Unit
Chris Hani Baragwanath Academic Hospital

PROJECT TITLE: The BEACON Cohort

DATE CONSIDERED: 2019/08/30

DECISION: Approved unconditionally

CONDITIONS: This approval covers AIM 1 only
Separate applications are required for AIMS 2 and 3

SUPERVISOR: Not applicable

APPROVED BY: 
Dr CB Penny, Chairperson, HREC (Medical)

DATE OF APPROVAL: 2019/10/23

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Philip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

We fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. I agree to submit a yearly progress report. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in August and all therefore reports and re-certification will be due early in the month of August each year. Unrequited changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature

Date

PLEASE QUOTE THE CLEARANCE CERTIFICATE NUMBER IN ALL ENQUIRIES