

ABSTRACT

An Examination of Attachment, Bonding and the Role of Prenatal Diagnostic Testing in Low Risk Pregnancy and Pregnancies Resulting in Neonatal Death

Emily Hurt

Director: Joyce Nuner, Ph. D

Mental health and wellbeing following the loss of a baby is a topic of significant interest due to both the short term and long term impact that such a loss may have on individuals and families. While there is an abundance of research on the topic of attachment pertaining both to children and children with illnesses, there seems to be a lack of information regarding the psychological impact of a terminal prenatal diagnosis leading to infant death occurring during the neonatal period. The unique circumstances surrounding neonatal death requires that the subject be examined separately from infant deaths occurring outside of the neonatal period or infant death without a prenatal diagnosis. This thesis examines attachment and bond formation of parents in both low risk pregnancies and in pregnancies involving prenatal terminal diagnosis. An in depth review of existing research literature was conducted to explore the topic. The review of the literature examined the impact of prenatal diagnostic testing, including testing that resulted in a terminal diagnosis, on the attachment and bond formation as well as grief response of parents.

APPROVED BY DIRECTOR OF HONORS THESIS

Dr. Joyce Nuner, Department of Family and Consumer Sciences

APPROVED BY THE HONORS PROGRAM

Dr. Elizabeth Corey, Director

DATE: _____

AN EXAMINATION OF ATTACHMENT, BONDING AND THE ROLE OF
PRENATAL DIAGNOSTIC TESTING IN LOW RISK PREGNANCY AND
PREGNANCIES RESULTING IN NEONATAL DEATH

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By

Emily Hurt

Waco, Texas

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CHAPTER ONE

Introduction

Introduction

This study was an extensive review of the research literature exploring parental attachment and bonding in relation to neonatal death. The goal was to better understand the psychological impact that fatal neonatal conditions, neonatal death and prenatal diagnosis have on parental-fetal attachment formation, bonding and ultimately on decisions regarding pregnancy. The unique circumstances surrounding neonatal death combined with the recent increase in the development of prenatal diagnostic testing options requires that this subject be examined separately from infant deaths occurring outside of the neonatal period.

Statement of the Problem

There has been an abundance of research conducted both on attachment theory in general and also attachment formation in families with children who have been diagnosed with long-term illnesses and conditions (Barnett, Clements, Kaplan-Estrin, & Fialka, 2003; Fonseca, Nazaré, & Canavarro, 2015; Gray, Edwards, O'Callaghan, Cuskelly, & Gibbons, 2013; Kayfitz, Gragg, & Orr, 2010) . However, there has been a lack of information regarding attachment, bonding and pregnancy decision making in pregnancies with terminal diagnoses or pregnancies resulting in neonatal death (Laxton-Kane, 2002). Data from the World Health Organization stated that in 2015, approximately forty-five percent of deaths that occurred in individuals under the age of five occurred during the neonatal period (2015). Neonatal mortality is defined as the

death of an infant which occurs in the first 28 days of life (Vahratian, Hicken, Schwalberg & Kotelchuck, 2013). The March of Dimes reported that in 2006, approximately 19,000 babies in the United States died in their first month of life (2010). As in many other circumstances of loss, the loss of a baby during the neonatal period can have a significant impact on different individuals for a variety of reasons. However, because these losses occur within the first month of life, it is important to examine attachment, bonding, and the grief and coping processes of loss during the neonatal period and how or if it differs in relation to other instances of fetal or infant death (Muller, 1992).

Additionally, with the continual development in medicine and growth of technology, prenatal testing has become an integral part of standard medical care administered to pregnant women throughout their pregnancies. Prenatal diagnostic testing often includes ultrasounds, but may include more invasive tests such as amniocentesis and chorionic villus sampling in certain situations. These tests are used to track the progress of the baby and provide information about the mother and baby's health (White, Zieve & Ogilvie, 2014). For many individuals, these tests are only precautionary measures taken to ensure that harmful complications do not occur during the pregnancy. For others, these tests can bring bad news regarding the health of the mother or the developing baby. Following diagnostic testing, parents may be made aware that their baby is suffering from either a treatable or fatal health condition. In cases involving the diagnosis of a terminal neonatal health condition the family has the decision of whether or not to continue the pregnancy or terminate. If it is decided to continue with the pregnancy, the possibility of fetal death either later on in the pregnancy

or during the neonatal period following birth still may remain. Regardless of how long the pregnancy may be continued, as long as the mother is carrying the baby there is still the possibility that attachment formation and bonding may occur. This study was primarily concerned with the examination of attachment and bond formation during pregnancy because of its significance related to the parent's mental well-being and decisions they may make concerning the pregnancy. How attachment and bond formation will influence interactions with the baby pre and post-partum, as well as the long term effects that attachment and bond formation may have on parents was also of interest.

Purpose of the Study

The purpose of this study was to examine the circumstances surrounding pregnancies involving a prenatal terminal diagnosis. Specifically, the way that attachment and bonding between the parent and baby differ in these circumstances and affect the remainder of the pregnancy was examined. The study also examined the advancements that have taken place in prenatal diagnostic testing. After exploring the types and purposes of the various testing options, consideration was also given to how test results impact the family's attachment and bond formation with their baby and their decisions regarding the continuation of their pregnancies if a terminal diagnosis is given. It is possible that information gathered through this extensive literature review may bring forth additional questions that may be later investigated through an original research project.

Research Questions

The primary question examined in the research project was how attachment formation differed in the context of neonatal death. This examination was conducted by examining existing attachment theory, literature clarifying the differences between attachment and bonding, as well as research concerning attachment and long term child illness and other situations involving loss. Defining attachment and looking at what literature already exists that links attachment to the prenatal period, was the first topic to explore.

Attachment theory was then juxtaposed to the concept of bonding, with consideration given to the various perspectives that contribute to bonding (i.e. biochemical, parental).

The project also examined if and how attachment, bonding and continuance of pregnancy are affected by prenatal diagnostic testing. Finally, neonatal death was defined and the most common types and causes of neonatal death were organized into categories and presented to aid in the understanding of the causes of neonatal death.

Common Causes of Neonatal Death

According to the March of Dimes, major causes of neonatal death fall into two main categories: those related to pregnancy and birth complications and those caused by birth defects (2010). The first category includes problems such as complications of pregnancy, complications involving the placenta, umbilical cord and membranes, infections and asphyxia (March of Dimes, 2010). Premature birth is the most common cause of neonatal death, accounting for 25% of neonatal deaths (March of Dimes, 2010). Birth defect related neonatal deaths were commonly attributed to heart defects, lung defects, chromosomal abnormalities and brain and nervous system defects (March of Dimes, 2010).

1. Pregnancy and Birth Complications	<ul style="list-style-type: none"> a. Pregnancy complications b. Complications involving placenta c. Umbilical cord and membranes d. Infections e. Asphyxia
2. Birth Defects	<ul style="list-style-type: none"> a. Heart defects b. Lung defects c. Chromosomal abnormalities d. Brain and nervous system defects

Table 1: Common Causes of Neonatal Death

Definition of Terms

Amniocentesis- A test that can be performed during pregnancy to look for problems in the developing baby such as birth defects, genetic problems, infection and lung development. Amniocentesis removes a small amount of fluid from the sac around the baby in the uterus by inserting a long needle through the belly into the womb (National Library of Medicine, 2015).

Asphyxia- A condition arising when the body is deprived of oxygen, causing unconsciousness or death (Oxford Dictionaries, 2015).

Attachment- A deep and enduring emotional bond that connects one person to another across time and space (McLeod, 2009).

Attachment Behaviors- Behaviors which involve seeking care from someone who can provide comfort and protection (Walsh, Hepper & Marshall, 2014).

Birth Defect- A problem that happens while a baby is developing in the mother's body. It may affect how the body looks and works (National Library of Medicine, 2015).

Bonding- An emotional attachment that one person has for another that need not be reciprocated (Cassidy, 1991; Walsh, 2014).

Bonding Behaviors- Any action of behavior which aids in the formation of emotional and psychological closeness between a parent or caregiver and the infant (Linwood, 2016).

Chorionic Villus Sampling- A prenatal test in which a sample of the chorionic villi is removed from the placenta. The sample can be taken through the cervix of the abdominal wall (Mayo Clinic Staff, 2015).

Chromosomal Abnormalities- Any change in the number or structure of chromosomes. In humans this is associated with a number of physical disabilities and disorders (Mosby's Medical Dictionary, 2009).

Fatal Disease- A disease resulting in death (Cambridge Dictionary, 2016).

High Risk Pregnancy- Anything which puts the mother or fetus at an increased risk for poor health during pregnancy or childbirth. A pregnancy where complications are more likely than normal (National Institute of Health, 2013).

Low Birth Weight- A baby born weighing less than 5 pounds, 8 ounces (March of Dimes, 2010).

Low Risk Pregnancy- A pregnancy in which an uncomplicated birth is expected (American College of Obstetricians and Gynecologists, 2015).

Miscarriage- Fetal death in the womb before 20 weeks of pregnancy (March of Dimes, 2013).

Neonatal Death- When a baby dies in the first 28 days of life (March of Dimes, 2010).

Omnipotence Guilt- Relates to the misplaced belief that one is personally responsible for the misfortunes of others (Barr, 2012).

Parity- The condition of having given birth (The American Heritage Medical Dictionary, 2007).

Prenatal Attachment- The unique relationship between a mother and her unborn baby represented by the way in which the mother conceptualizes the unborn baby. “It is characterized by the behaviours, attitudes, thoughts and feelings that demonstrate care and commitment to the fetus” (Laxton-Kane & Slade, 2002; Muller, 1993).

Premature Birth- Birth occurring prior to 37 weeks of pregnancy (March of Dimes, 2010)

Prenatal Diagnostic Testing- Testing performed during pregnancy to determine if a fetus is affected with a particular disorder (Genetics Home Reference, 2016).

Still Birth- The death of a fetus in the womb after 20 weeks of pregnancy (March of Dimes, 2015).

Survivor Guilt- Guilt that arises when one’s good fortune occurs at the expense of another’s misfortune (Barr, 2012).

Ultrasound- An imaging method that uses high-frequency sounds waves to produce images of structures within your body (Mayo Clinic Staff, 2015).

Summary

Neonatal loss remains a significant issue today in examining overall infant mortality rates. Despite the wealth of information that exists regarding loss and attachment or bonding, even in cases of child illness and death, there is a lack of information specifically regarding attachment, bonding and loss in respect to neonatal death. Neonatal death presents unique circumstances when examining overall infant mortality. The time period for attachment and bond formation is limited. This bring to

light the question of how different instances of infant mortality compare in attachment and bond formation.

Current advances in both medicine and in medical technology have contributed to an increased need for more information on this topic. The development of prenatal diagnostic testing has allowed parents and doctors to monitor the health of the mother and baby throughout pregnancy and to detect any health concerns earlier on in the pregnancy. While most babies are born healthy, prenatal and diagnostic testing may also reveal that there are health concerns or complications in a pregnancy. Advancements include the development of an increased variety of diagnostic testing which carries increased levels of sensitivity which allows for more accurate detection of certain anomalies during pregnancy. Information obtained from prenatal diagnostic testing can be used in developing interventions to treat or cure some illnesses that the mother or developing baby may be facing. However, in some instances there is a terminal diagnosis that brings into question whether or not the family would like to continue with the pregnancy, and if so how. This matter is even more relevant to pregnancies involving the diagnosis of imminent fetal or neonatal death. If parents receive information that their baby will not survive the pregnancy or past the neonatal period, how does this affect the decision to continue the pregnancy? Do they elect to terminate the pregnancy or do they choose to continue the pregnancy? What motivates the decision making process and how is parental-fetal attachment and bonding involved?

This extensive literature review brought forth existing information on these topics which was analyzed in respect to the current research questions. The goal of the review was to gain better insight into the experience that parents face when they discover that the

baby they are carrying will not live through pregnancy or past the neonatal period. By exploring these questions a new understanding may be gained. This new understanding could contribute to the formulation of future research projects addressing prenatal testing, terminal diagnoses, parental decision making and bonding and attachment patterns.

CHAPTER TWO

Theoretical Foundations

There are many ways to approach the topic when attempting to describe the relationship that exists between a mother and a baby. In the process of describing the relationship qualitatively, there are often two terms that are used frequently: attachment and bonding. To many these two terms would appear synonymous. They are often used interchangeably, even by professionals in the field studying the mother-infant relationship (Habib & Lancaster, 2006). However, more recent research has explored the terminology in further depth in hopes of clarifying what each term means. What is attachment? What is bonding? Is there a difference? Analysis reveals that the two are in fact not synonymous (Cassidy, 1991).

Attachment theory has been well grounded historically, with research dating back to the late 19th century. However, the concept of bonding has not received the same research attention until recently. The following chapter will outline some of the key differences that have been established between attachment theory and bonding. Concepts and contributors for both attachment and binding will be addressed. This includes topics such as Freudian theory and individuals like John Bowlby and Mary Ainsworth who are key figures on the topic of attachment. Topics such as the varying perspectives in bonding relationships and the biochemical aspects of bonding will be discussed. This is not an extensive project that will go into great depth over any of these topics in particular, but will merely provide a basis from which the overall research questions may be explored.

In saying this, it is important to keep in mind that the aim of this research was to gain a better understanding of how attachment and bonding are involved specifically in circumstances involving neonatal death in comparison to other pregnancies. Thus, while the focus will not be specifically on any of the following topics, they will aid in the construction of this understanding.

Attachment

Attachment has been defined as a deep and enduring emotional bond that connects one person to another across time and space (McLeod, 2009). While attachment can be formed and developed throughout an individual's lifetime, it is the unique attachment formation that occurs throughout pregnancy leading up to birth as well as during the postnatal period that was of particular interest to this project. A previous research project involving a literature review by Laxton-Kane (2002) also recognized the importance of the prenatal attachment relationship, citing that the attachment relationship established during the prenatal period may have an impact on both the mother and fetus following the pregnancy. The findings from Laxton-Kane's research project, which are discussed at the end of this chapter, are extrapolated to this research project and were taken into consideration within the frame of neonatal death and diagnostic testing. This contributed greatly to the goals of this paper in better understanding this topic.

However, before delving into and exploring the psychological impact of neonatal death on families it is necessary to take a step back and first become acquainted with attachment theory from a more general perspective. In doing so we become acquainted with the topic at hand and begin to build the fundamental vocabulary necessary to

understand the topics being discussed as well as actively participate in the discussion over such topics.

Attachment theory has developed over time primarily as a method of examining interpersonal relationships amongst people in hopes of better understanding an individual's behavior and the motivation behind it. Within the disciplines of psychology and human development the relationship between parent and offspring is viewed as particularly significant in shaping individuals personalities and behaviors and in contributing to later child and family development (Cassidy, 1999; Frosch, 2011). A majority of the research that has been conducted on the topic of attachment has been largely based on a handful of works which together form the foundation of attachment theory (Cassidy, 1999). Among these are the psychodynamic theory developed by Sigmund Freud as well as the Attachment Theory and Strange Situation developed by John Bowlby and Mary Ainsworth. From these theories we gain insight into three different ideas that attempted to explain ways in which young children and infants form attachment relationships and are affected by the behavior of their caregivers.

Freud

The field of psychiatry flourished into the late 1800's, however the focus at the time was often on the physical and anatomical aspects of psychological disease (Krull, 2006). It was not until the twentieth century that Sigmund Freud began to become known for his works studying how the unconscious affects individuals' attachment and behavior and how childhood experiences and dreams can significantly impact individuals later on in life (Krull, 2006). Freud was born on May 6, 1856 and grew up with a number of siblings (Krull, 2006). In 1859, Freud's family moved to Vienna, Austria where he

would spend most of the remainder of his life (Krull, 2006). In 1873, Freud began to study zoology at the University of Vienna but later shifted his focus from this area to medicine (Krull, 2006). Krull notes that as a student Freud was a positivist “a philosophy that defined real knowledge as only what could be perceived by the senses” (p.33). This statement shows that early on in Freud’s life before he developed any of the significant works that he is widely known for today he was already thinking more abstractly and with less constraints than many scientists before him. Following graduation in 1881 with an M.D. Freud continued on to study at the Vienna General Hospital (Krull, 2006). After many more years working at a children’s hospital and also studying the brain Freud took an interest in mental health and sought a treatment other than electric shock therapy (Krull, 2006). From here one sees how Freud started down a path which over time continued to extend and narrow until he developed his own therapy and theory to support it. In 1886 Freud began consultations in Vienna for patients with “nervous diseases” (Krull, 2006). During that time period there was much to be discovered concerning mental illnesses and functioning of the mind. It was from the case of Anna O., a patient of Freud’s mentor Breuer that Freud learned that talking about distressing experiences was a plausible therapy which could serve as the replacement that he had been looking to find for electrotherapy (Krull, 2006). It was from this case that Freud began to develop psychoanalysis (Krull, 2006; Thompson, 1955).

Today Sigmund Freud is well known in the field of psychology because of his work with psychoanalysis and the psychodynamic theory. These theories like the others in the sections which follow acknowledge that there is a relationship which exists between the parents, typically the mother, and the infant. The major questions then was

why does this relationship exist? Is one of the parties benefiting from this relationship and if so how?

The psychodynamic theory is a secondary-drive theory proposing that in the context of parental and child attachment the parental offspring relationship is based on satisfying drives (Cassidy, 1999). For example, the psychoanalytic theory would propose that the relationship between the offspring and mother is largely attributed to the fact that the mother satisfies the child's hunger through feeding (Cassidy, 1999). This seems to be a reasonable hypothesis considering the nature of infancy and how in order to survive infants must have some form of a caregiver to aid them in attaining the things necessary for them to survive until they reach the stage in life in which they can begin to care for themselves. However, Freud's theory also incorporates the ideas of the unconscious, internal motivation and the conflict-resolution system in his analysis of human behavior (Fonagy, 1999). Freud's theory is similar to the attachment theories proposed by others such as John Bowlby in that both originally sought answers to the same questions regarding attachment relationships between children and their parents. They also both examined to some extent the workings of the unconscious and how various types of deprivation early on in childhood affected an individual psychologically (Fonagy, 1999). However, Freud's approach to investigating the psychological affects involved idealism, which Fonagy (1999) states "in which the phenomena described were chiefly seen as products of the mind bearing no actual relationship to reality" (p. 597). This means that in addition to the physical drives explained earlier, Freud also went on to make further claims that there were factors within the child's mind that were important to attachment formation as well.

Thus, while it is easy to see that Freud's theory and the attachment theory proposed by John Bowlby touch on similar points and are closely intertwined, it would be difficult for even the most studied scholar in Freudian theory and attachment to make definitive conclusions linking the two, due to the fact that Freud's work incorporates a number of additional topics which are not always relevant to the topic of attachment (Fonagy, 1999). Significant differences arise between Freud's theories when compared to others due to Freud's concern with free association, the Oedipus complex, as well as his organization of the mind into the id, ego, and superego (Fonagy, 1999).

The therapy that Freud later developed was called psychoanalytic therapy. During psychoanalytic therapy sessions the patient came multiple times per week and laid on a couch, the iconic image of Freudian psychology. The patient was instructed to discuss everything and anything on their mind (Maslow & Mittelmann, 1955; Thompson 1955). During this time the patient participated in what was known as free association, "letting the mind go" (Maslow & Mittelmann, 1955). From the discussion the analyst was able to interpret what was said and upon analyzing what they believed to be the conscious and unconscious drives behind the patient's behavior, place it in a context relating to the Oedipus complex or the ego. The Oedipus complex and the later development of the Electra complex for females are used to connect what is said during therapy to the unconscious connections of either loving one's mother, being jealous of one's father, infantile sexuality or repression (Krull, 2006; Morgenstern, 2003). It is believed that Freud's development of the Oedipus complex stemmed from the loss of his own father in 1897 and his subsequent reflection on his experiences growing up as a child (Krull, 2006).

Freud later revised his ideas of the conscious versus the unconscious by developing a theory which divides the mind into three parts: Id, Ego and Superego (Krull, 2006). The Id is associated with the infancy stage and described as not being able to make simple distinctions such as moral from immoral, people will instead do whatever they need in order to fulfill their desires (Freud, 1949; Krull, 2006). The Ego is the second to develop and involves the use of some logic and understanding (Freud, 1949; Krull, 2006). The Ego is used to control the Id and to make semi-conscious decisions (Krull, 2006). The Super Ego is the last to develop and is the complement to the Id, implementing ethical rules (Jones, 1955; Krull, 2006). Thus the interaction of these three parts is fundamental in the day to day decisions making, thought, and actions of individuals (Krull, 2006).

Some of Freud's works such as his thoughts about human attachment resulting from drives are significant to the questions at hand, as they focus on explaining the attachment between mother and infant. Other theories such as the Oedipus complex and the id, ego, and superego will be less significant to this discussion as they tend to veer away from the reciprocal aspect of the infant-maternal relationship and tend to focus on just the development of the child's mind and the motivation behind their behaviors that occurs at an advanced age beyond which was considered in this study. The reciprocal aspect of the parental- infant relationship as well as the parental figures point of view are the perspectives of interest.

John Bowlby

John Bowlby is another major psychological theorist that followed Freud who also had an interest in the infant-maternal attachment relationship. Some similarities of Bowlby's theories to Freud's theories have been discussed already, but Bowlby's works will be explained further in this section. It is important to keep in mind that Bowlby's theory of attachment is often the theory that comes to mind and is associated with the infant-maternal attachment relationship, thus it is especially significant when considering the overarching themes of the paper.

Edward John Mostyn Bowlby was born in London on February 26, 1907 into a traditional, professional class family (Holmes, 1993). In 1914, at the age of seven Bowlby and his older brother were sent to boarding school as a result of the start of the war (Holmes, 1993). Following the end of the war Bowlby attended Dartmouth as a navel cadet, where he excelled on his examinations but lost interest in the Navy (Holmes, 1993). In 1925 John entered medical school at Trinity College where he once again excelled and received numerous awards culminating in a degree in pre-clinical sciences and psychology (Holmes, 1993). Very similar to Freud's personal biography it seems that Bowlby's journey into the field of psychology was a process that involved many changes of interests over time. After receiving this degree Bowlby began to work at a progressive school for maladjusted children where he gained valuable experiences with children and other adults which would later contribute to his development of the attachment theory (Holmes, 1993). As a doctoral student, prior to his work on the attachment theory, Bowlby was involved in research at the Child Guidance Clinic

studying the development of children's personality during early childhood (Bretherton, 1992).

During this time he was greatly influenced by both Freud's theory of psychoanalysis and his mentor Melanie Klein's object-relations approach to psychoanalysis (Bretherton, 1992; Holmes, 1993). The Kleinian model claimed that the mind is developed from the interaction of personal experience of children over time with the unconscious fantasies that children already have from the infant period (Fonagy, 1999). Despite these influences, Bowlby dismissed many of the fundamental concepts of psychoanalysis, such as the role of the libido, in favor of a psychological approach that emphasized the role of experience in the development of emotion, because "while he believed in the practical efficacy of psychoanalysis, he was always sceptical about its theoretical basis" (Bretherton, 1992; Holmes, 1993, p.19). He also later recognized that Klein's approach to attachment did have an impact on the development of his own work, but at the same time completely rejected the Kleinian approach (Fonagy, 1999).

In 1929, Bowlby began his medical studies to become a child psychologist at the University College Hospital in London, as part of the Institute of Psycho-Analysis (Holmes, 1993). He later trained in adult psychiatry, worked at a children's clinic, and became an Army psychiatrist (Holmes, 1993). Bowlby continued his involvement in the Psychoanalytic Society, in which he was elected training secretary in 1994 (Holmes, 1993). As a member of the society and later on as a member of the Government's Mental Health Standing Committee Bowlby was able to present his ideas to others in the field (Holmes, 1993).

Following the war Bowlby and many of his colleagues began work at the Tavistock clinic (Ainsworth, 2013; Holmes, 1993). His personal research interests at the time included the development of personality and separation in young children (Holmes, 1993). Team members involved in his research which would later lead to the development of the Attachment Theory included James Robertson, Mary Boston and Mary Ainsworth (Bretherton, 1992; Holmes, 1993).

Together James Robertson and Bowlby studied the mother-child relationship and how it is important in the present and future development of the child (Cassidy, 1999). While studying the interactions between mother and child Bowlby noted the various emotions that resulted from the separation of a child from their mother, and how the children often expressed distress (Cassidy, 1999; Kobak 1999). Unsatisfied with previous theories explanations for this behavior Bowlby sought to answer the question of why this reaction may happen by approaching the subject from a wider perspective which included exploring the topic from the angles of cognitive science, ethology, and evolutionary biology for example (Ainsworth, 2013; Cassidy, 1999). Along with the help of Mary Ainsworth, Bowlby deduced that the infant- mother relationship may have arose through natural selection as a biologically based desire for the infant to be close to the mother (Cassidy, 1999). This bears both similarities and differences to the drives theory proposed by Freud. Whereas Freud's drive theory shows an obvious benefit for the infant in the infant-maternal attachment relationship, it does not seem to explain the benefits that the mother figure receives if any exist. On the other hand, Bowlby's theory seems to address this issue by explaining from an evolutionary perspective the closeness developed through a close infant-mother attachment pattern is advantageous as it

conferred protection to the infant, aiding in survival, and also providing a number of additional benefits to the offspring while also allowing the parent to pass on their genes to the next generation and benefit in this way (Cassidy, 1999). Cassidy (1999) noted that in light of the evolutionary framework that “the proclivity to seek proximity is a behavioral adaptation... Within this framework, attachment is considered a normal and healthy characteristic of humans throughout the lifespan, rather than a sign of immaturity that needs to be outgrown” (p. 5). This confirms that attachment occurs throughout life and that the relationship during infancy is indeed important as it affects later personal development and the development of other attachment relationships. Bowlby expanded on this idea in his 1958 and 1960’s publications of *The Nature of the Child’s Tie to His Mother*, in which he concluded that attachment between mother and infant is not driven by feeding as Freud suggested or purely by associations with pleasure, but is instead somewhat an inherent motivation (Cassidy, 1999). However, within Bowlby’s theory of attachment there are a number of other factors at play which he took into close consideration, such as the roles of emotion, cognition, and differences between individuals (Cassidy, 1999). This idea of the infant-mother relationship being able to cause either distress or happiness was also explored and developed by Mary Ainsworth in a theory that is now referred to as the strange situation, which is discussed in the following section of this chapter.

In conclusion, today Bowlby is widely known for his contributions on topics such as the effects of maternal deprivation, the importance of bonding between parents and children, attachment and the need for a secure base and the ability to describe grief in stages (Holmes, 1993). His final conclusions from his research can be found in the

Attachment and Loss trilogy published in 1969, 1972 and 1980. From this research Bowlby concluded that a continuous, close, warm relationship between from a care giver contributes significantly to the development of a mentally healthy infant (Bretherton, 1992).

Mary Ainsworth

Mary Ainsworth was born in Glendale, Ohio on December 1, 1913 (Ainsworth, 2013; Pols, 2001). She grew up in Toronto Canada where she attended college and earned her bachelors (1935), masters (1936) and doctorate (1939) degrees from the University of Toronto (Ainsworth, 2013; Pols, 2001). During her time at the University of Toronto she worked with the Department of Psychology with mentors including Sperrin Chant, Edward Bott and William Blatz, a psychologist who studied Security theory (Ainsworth, 2013; Pols, 2001). Ainsworth (2013) described this theory as one in which it was proposed that individuals are able to explore the unknown world and develop later on in life only after developing a secure relationship with their parents early in infancy and childhood, ideas which were later significant to some of her own work. However, in the Security Attachment theory the security found in childhood through the parents is later transferred through relationships with peers and partners (Ainsworth, 2013).

Mary Ainsworth later lectured at her alma mater in the Psychology department until she was commissioned in the Canadian Women's Army Corps (Ainsworth, 2013; Pols, 2001). Afterwards she returned to Canada where she was an assistant professor (Pols, 2001). In 1950 she moved to London, England where she began working with child psychiatrist John Bowlby (Ainsworth, 2013; Pols, 2001). Ainsworth collaborated

with Bowlby in his research and in many of his papers, but later took up her own research on differences in attachment patterns between young children relative to their parental figures (Bretherton, 1992; Pols, 2001). Her research in Uganda as well as her work with Bowlby led to the creation of the Strange Situation and the classification of attachment relationships during the first year of life into four different categories: securely attached, ambivalently attached, avoidant and disorganized (Ainsworth, 2013). From her experimentations Ainsworth research confirmed that the caregiver's response to the infant is important in determining which category of attachment the child will fall into (Pols, 2001). Ainsworth later continued on to lecture at a number of universities including John Hopkins and the University of Virginia in Charlottesville (Ainsworth, 2013; Pols, 2001). She also received a number of awards including awards for her contributions to science and for her lifelong achievement in the science of psychology (Pols, 2001).

The Strange Situation

Ainsworth conducted the Strange Situation by observing infants and their parents in a controlled laboratory setting that was specifically designed for the experiment (Ainsworth, 2013). Ainsworth visited the homes of infants for four hour sessions at three week intervals (Ainsworth, 2013). During her visits Ainsworth collected information about the infants and parents behaviors in various situations representing the everyday routine (Ainsworth, 2013). Infants were also subjected to small levels of stress when separated from their mothers and the results collected from this experiment were used to look for correlation between the exploratory behaviors exhibited by the infant in relation to the mother's presence or absence (Solomon & George, 1999). Her prior research in

Uganda and her previous work with mentors Bowlby and Blatz aided in her experimental analysis and the discovery that infants use their caregivers as secure bases (Ainsworth, 2013). The infants were categorized into four categories based on their observed behaviors: secure, avoidant, ambivalent and disorganized (Solomon & George, 1999). The descriptions of each type are found in the table below taken from Solomon & George (1999). Each description includes details describing how infants that would fall into each of the four different categories would react when placed in the Strange Situation procedure. This includes reactions to the attachment figures initial departure, behavior during the time when the attachment figure was not present, and the child's reactions when the attachment figure returned.

Group	Brief Description
Secure	Uses mother as a secure base for exploration. Separation: Signs of missing parent, especially during the second separation. Reunion: Actively greets parent with smile, vocalization, or gesture. If upset, signals or seeks contact with parent. Once comforted, returns to exploration.
Avoidant	Explores readily, little display of affect or secure-base behavior. Separation: Responds minimally, little visible distress when left alone. Reunion: Looks away from, actively avoids parent; often focuses on toys. If picked up, may stiffen, lean away. Seeks distance from parent, often interested in toys.
Ambivalent	Visibly distressed upon entering room, often fretful or passive; fails to engage in exploration. Separation: unsettled, distressed. Reunion: May alternate bids for contact with signs of angry rejection, tantrums; or may appear passive or too upset to signal, make contact. Fails to find comfort in parent.
Disorganized	Behavior appears to lack observable goal, intention, or explanation- for example, contradictory sequences or simultaneous behavioral displays; incomplete, interrupted movement; stereotypies; freezing/stilling; direct indications of fear/apprehension of parent; confusion, disorientation. Most characteristic is lack of coherent attachment strategy, despite the fact that the baby may reveal the underlying patterns of organized attachment.

Table 2: Strange Situation Classification Groups (Ainsworth)

Measuring Attachment

Being able to accurately measure or describe the attachment relationship between infant or young child and the parental figure is important because the quality and type of attachment that young children form with the parental figure is often predictive of later life outcomes for the child (Frosch, 2011). Thus, in being able to accurately identify the attachment type one can begin to consider the possible future effects the relationship may have on an individual and perhaps seek intervention if need be. Popular techniques used in measuring security attachment for children are the Strange Situations procedure developed by Mary Ainsworth which has previously been discussed and the Attachment Q-set (Frosch, 2011; Muller, 1992).

The Q-set is a measurement technique which includes a number of descriptions that either a parent or observer sort into groups as either matching the attachment behavior of the child or not (Frosch, 2011). The sorting for the particular child is then compared to the results of a standard which represents the results that a typically child with secure attachment relationships would have (Frosch, 2011). This method differed from the Strange Situation procedure that sorts children's attachment relationships into one of four categories, because the Q-set results form a continuum (Frosch, 2011).

Additionally, there are also various measures which exist to measure prenatal attachment. These include the Maternal-Fetal Attachment Scale (MFAS) (Cranley, 1981), the Maternal Antenatal Emotional Attachment Scale (MAEAS) (Condon, 1993), and the Parent- Infant Attachment Scale (PFAS) (Cranley, 1981) (Laxton-Kane & Slade, 2002). The MFAS measures 24 items, including five subcategories, and covers a handful of different topics which are designed to provide a measurement of prenatal attachment

(Cranley, 1981; Laxton-Kane & Slade, 2002; Phipps & Zinn, 1986). Mothers are able to respond to each question with one of five answers which compose a scale from never to most of the time. The responses are converted to a score, with higher scores suggesting a higher level of attachment on the mother's behalf. This test does provide evidence that prenatal attachment can be measured, however the validity of such measurements is not certain (Muller, 1992). On the other hand, the MAEAS is a two dimensional scale with 19 items which aims to measure both quality and intensity of antenatal emotional attachment (Condon, 1993; Laxton-Kane & Slade, 2002). The PFAS assessment is a 24 item scale with a version for the fathers as well as the mothers (Zeanah, Carr & Wolk, 1990). This test is used to examine the degree to which parents interact and develop feelings toward their unborn children (Zeanah, Carr & Wolk, 1990). In completing this test mothers are again able to respond with one of five choices, and again higher scores suggest a higher level of maternal attachment.

To increase the validity of prenatal attachment testing and measurements, it has been suggested that future studies utilize multiple measures when looking at each specific concept under study (Muller, 1992). To improve the MFAS attachment testing, there is a need for a baseline of measurements that allow results to be compared against. For this baseline to be established future studies will need to capture a representative picture of pregnancies, including women from a variety of age groups, ethnic backgrounds, and stages of pregnancy (Muller, 1992). Longitudinal studies may also provide valuable information as they would allow the continual tracking of maternal fetal attachment tracing from the origins of pregnancy through the postnatal period (Muller, 1992).

Role of Attachment in Pregnancy

Attachment between a mother and baby during pregnancy allows for one of the earliest forms of human intimacy to develop (Condon & Corkindale, 1997). In 2002, Laxton-Kane & Slade conducted a literature review examining a number of previous studies on maternal prenatal attachment, clarifying that although stemming from attachment theory, attachment before and following birth require a conceptual framework that differs to some extent from those established by others such as Bowlby and Ainsworth (Laxton-Kane & Slade, 2002). The term attachment as used in the case of infant and fetal attachment suggests the concept of psychological dependence, “infants are attached to their parents because they are dependent on them” (Habib & Lancaster, 2006). Parents are not dependent on the infants, thus the term attachment may not be appropriate to describe the bond from parent with the infant (Habib & Lancaster, 2006).

Due to the mostly unidirectional relationship between mother and child while the child is in the womb, attachment between a mother and her baby is largely influenced by the mothers own attachment relationships with others and other factors such as the support she is receiving during pregnancy (Condon & Corkindale, 1997; Laxton-Kane & Slade, 2002). Interestingly, studies reviewed by Laxton-Kane and Slade assessed the relationships between prenatal attachment and factors such as pregnancy risk status, gestational age, social support, demographics, anxiety and fetal movement (Laxton-Kane & Slade, 2002). Similar projects conducted by Condon and Corkindale (1997) examined similar factors, including social support, depression and anxiety in mothers during their third trimesters of pregnancy.

In general it has been believed that the level of attachment a mother experiences increases throughout the duration of pregnancy (Allison, Stafford & Anumba, 2011; Laxton-Kane & Slade, 2002). Caccia et al. (1991) found that the prenatal attachment relationship during pregnancy may begin as early as 10 weeks. However, Laxton-Kane (2002) points out, that no matter what time the attachment formation begins, it is contingent upon the mother's recognition that there is another being to be attached to. Following this recognition and as the pregnancy progresses and the baby begins to grow and move, especially in the second trimester, the attachment relationship begins to take place between mother and offspring.

Social support is also a factor that plays a role in attachment formation, even tracing back to when a woman first discovers that they are pregnant. Social structures include those between the mother and partner (Walsh, Hepper & Marshall, 2014; Young 2013), and the other relationships outside of the partner relationship (Condon & Corkindale, 1997). Wayland & Tate (1993) conducted a study examining the perceived relationships between mothers and others, and how those relationships influenced attachment. Of the relationships examined by Wayland & Tate (1993), they found that the relationship (closeness) between a mother and her own mother served as a better predictor of prenatal attachment compared to other relationships the mother had. However, although the data suggested stronger attachment from the influence of the relationship, the relationships examined did not necessarily correlate with an increased quality of attachment (Condon & Corkindale, 1997). Condon & Corkindale (1997) hypothesized and confirmed that women with low attachment to their baby during the third trimester of pregnancy also had low levels of social support outside of the

relationship they had with their partners. Attachment levels were also found to be diminished in the partner relationship when there was domination present (Condon & Corkindale, 1997). Research by Walsh *et al.* (2014) also found an association between the level of maternal-fetal relationship and satisfaction in the parental and partner relationships that a mother had. Augmenting social support for pregnant mothers may provide benefits to pregnancy such as the formation of stronger prenatal attachment (Gaffney, 1988; Walsh *et al.* 2014).

It is important to keep in mind that for many in the population becoming pregnancy at the time that they do, is often unexpected. This may bring about many mixed feelings for the new prospective parent. It is logical that in these situations where the pregnancy is unexpected, that there may be lower levels of attachment if the baby is not wanted by the parent (Condon & Corkindale, 1997; Laxton-Kane & Slade, 2002). Walsh *et al.* (2014), described a theory which touches on this issue. They stated that within adult romantic relationships, individuals exhibit either attachment avoidance or attachment anxiety. These romantic relationships could indirectly predict the maternal-fetal relationship. The first described individuals as being concerned with independence and deactivating the attachment system. This type of attachment was negatively related with the desire of parents to have children before, during, and after pregnancy. The attachment anxiety group which was described as being preoccupied with relationships and hyperactive in the attachment system, was not always negatively correlated with the desire to have children. The relationships determined in this study are shown below.

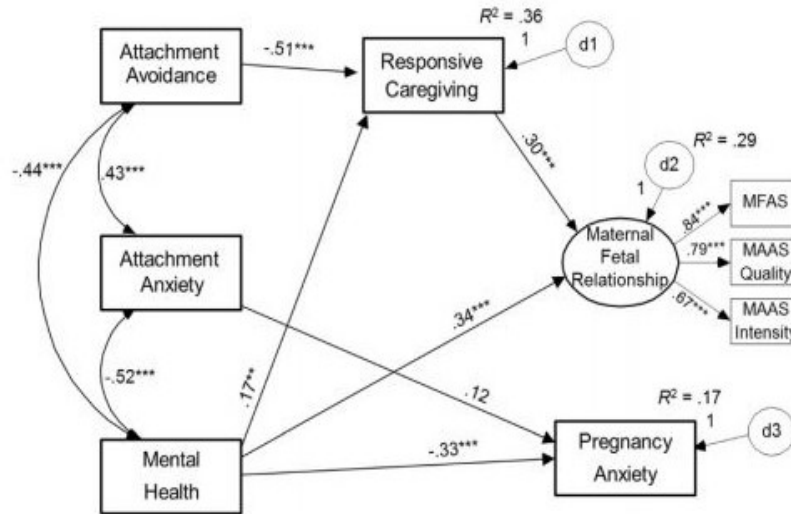


Figure 1: Model depicting significant predictors of pregnancy anxiety and maternal-fetal relationships (Walsh, 2014).

Maternal-Fetal relationship was predicted most by caregiving to the romantic partner and also mental health. Both anxiety and depression are factors which may also have an impact on the ability to form an attachment relationship or the quality of the relationship. They are both also very complex constructs. Depression has been shown to be correlated with higher levels of attachment during the last trimester (Priel & Besser, 1999). However, Condon & Corkindale (1985) reported that only 10-15 percent of women showed a minimal level of maternal- fetal attachment during pregnancy. In other cases, knowledge of a pregnancy although originally not planned may stimulate excitement, or similar emotions, and subsequently positive attachment may begin to occur.

Other social factors such as cultural environment could be thought by the general public to have substantial impacts on attachment formation. A 1993 study by Koniak-Griffin *et al.* found that no such difference in levels existed among different ethnic

groups. However, these findings should not be taken as certain, for there is a lack of research in this area as well.

It is understandable that pregnancies which involved additional levels of risk also likely involved a wider variety of emotional and behavioral responses. Studies have been conducted on a small number of pregnancies with specific complications, such as Chazotte *et al.* (1995) study of gestational diabetes (Lorentz-Kane & Slade, 2002). In that particular study the results concluded that there were no significant differences in attachment between groups with and without the complication. However as Lorentz-Kane states, due to a large lack of published studies concerning pregnancy risks and prenatal attachment it is not possible to make substantial conclusion on this topic.

Condon & Corkindale (1985) reported a steep increase in attachment after the mother feels fetal movement in utero for the first time. This phenomenon of fetal movement is also referred to as quickening. Lumley (1980) also confirmed these findings. In a questionnaire administered to thirty women, twenty eight of the women reported feeling love toward the fetus after movement of the fetus was felt (Bibring, Dwyer, Huntington & Valenstein, 1961; Jessner, Weijert & Foy, 1970; Leifer, 1977; Lumley, 1980; Zeanah, Carr & Wolk, 1990). However, Lumley's study was limited in that it only included a small group of women from industrialized nations, who were well off. Results from multiple studies have shown that quickening along with gestational age have been consistently positively correlated with prenatal attachment (Muller, 1992).

During Condon & Corkindale's (1997) study, they found that factors such as age, socio-economic status, miscarriage, termination of pregnancy, and duration of the partner relationship were not significantly correlated with attachment scores. Significance in the

study was designated with coefficient exceeding .01. Statistical analysis performed on the many questionnaires administered in the study interestingly revealed that antenatal attachment tended to score higher in the first pregnancy (Condon & Corkindale, 1997).

While mothers are often able to form maternal-fetal attachment relationships through quickening and the anticipation of becoming a mother, the experience may differ for men or other caregivers. Due to the physical separation from the pregnancy, fathers and caregivers are not able to obtain the exact same experience in mothers, and thus have to form attachment relationships in other ways. Badenhorst *et al.* (2006), suggests that the lack of physical involvement does not exclude attachment. However, fathers or other caregivers are also able to form this relationship by anticipating taking on the role of a father or parent, and even potentially through other involvements such as attendance at pregnancy appointments and through be present for ultrasounds.

Furthermore, attachment and pregnancy are linked to outcomes later on in pregnancy, postpartum, and later on in childhood and life. Ross (2012) reported that high levels of attachment during pregnancy were associated with a higher level of healthy behaviors by the mother, such as diet and exercise.

Summary

Although only having skimmed the surface when it comes to exploring and understanding the work done by these theorists, the information provided has greatly added to the discussion of attachment that this project sought to carry out. Sigmund Freud, John Bowlby, and Mary Ainsworth were all influential individuals who have contributed significantly to the studies of child development and attachment through their development of Psychoanalysis, Attachment Theory and the Strange Situation,

respectively. While carrying obvious differences, each illustrated the way in which parent's behaviors and attitudes have immediate and long term effects on their children. As a whole these attachment theories provide a Filial Perspective of attachment. One which will be of importance in concerning the difference between attachment and bonding, as well as the Parental Perspective. As Laxton-Kane (2002) points out, in addition to understanding attachment in order to distinguish between attachment and bonding, better knowledge of maternal-fetal attachment is found to be associated with positive outcomes in health and emotionally, then this information can be used to develop interventional strategies to increase attachment and thus positive outcomes for the mother and baby.

Bonding

Throughout the review of attachment theory it was frequently brought up that there is confusion with the word "Attachment" being used synonymously to mean bonding (Walsh, 2014). "Attachment" and "attachment bonding" are two separate topics (Cassidy, 1991). As opposed to attachment which is concerned with the relationship of the infant using the parental figure as a secure base and for evolutionary significant purposes, bonding is understood as an emotional attachment that one person has for another that need not be reciprocated (Cassidy, 1991; Walsh, 2014). In the context of the maternal-fetal relationship, it is said that love is a key factor in bonding (Young, 2013). Unlike many animals who care for whatever offspring is around them, human bonding is specific to a certain person (Feldman, 2015). As Laxton- Kane (2002) points out, over the past 30 years there has been an increased recognition and interest in the fact that this

bonding relationship between mother and baby may in fact begin before birth while the mother is still pregnancy carrying the baby as a fetus (Caccia *et al.*, 1991).

It is noted, however, that the parental offspring relationship proceeds in not one, but both directions (Redshaw & Martin, 2013). Not only is the offspring influenced by the parent, as demonstrated in Freud's, Bowlby's, and Ainsworth's works, but the parents are also influenced and affected by their interaction and experiences with the offspring. Bowlby explored the topic of the caregiving system briefly and stated that while there is a biological urge to protect the offspring, different parents also exhibit differences in their parenting (Cassidy, 1999). The concept of the parent being affected by their baby is described by the Parental Perspective.

The Parental Perspective

As just discussed, in general research concerning the infant-parental attachment relationship has previously focused on the filial perspective of the relationship and fails to provide significant attention regarding how the parents are implicated in attachment relationships with their children. Thus, now that the theories which demonstrate the importance of parental attitudes and behavior in determining infant and child outcomes have been discussed, it is only appropriate to examine the parental perspective of attachment.

As Redshaw discussed, attachment often refers to the relationships that develop between an infant and its caregiver over time in a bidirectional manner, as a result of various social and psychological interactions between the two (2013). However, Redshaw also stated that the relationship that forms following the birth of the infant differs from the relationship that mothers and fathers develop during pregnancy (2013).

The attachment that mothers and fathers build during pregnancy occur instead in a uni-directional manner (Redshaw & Martin, 2013). This interaction is referred to as bonding (Linwood, 2016).

In research similar to that of Mary Ainsworth, there have been studies conducted which resemble the strange situation, but instead focus on the parents reactions to separation from their child. These situations reveal that there is a significant amount of variation in emotional response elicited from the parent as well. When separated from their children parents may experience feelings such as alarm and distress which are replaced with the feeling of relief when reunited with the baby (Bretherton et al. 1989). Bretherton explored these reactions further in a two-phase longitudinal study in which selected mothers completed a variety of questionnaires and participated in a parental attachment interview among the collection of various other data. Feldman (2015), found data collected from fMRI's of parent's brains that there is a "global 'parent caregiving' network", in which parents are shown to respond repeatedly in certain ways to general infant cues such as infant sounds or pictures.

There are many other factors that may also influence parental responses and bonding. Maternal-fetal bonding during pregnancy has often been discussed in relation to perceived risk of the pregnancies by the mother. It is not uncommon for mothers to delay bonding with their growing babies until after the first trimester, or until quickening takes place (Young, 2013). The first trimester is associated with the greatest rate of risk and fetal loss, which makes the desire for delayed bonding understandable. Quickening is one of the first indications for many women that there is a growing and living being

inside of them. They may experience signs of pregnancy before this takes place, such as morning sickness, but quickening often marks a milestone in pregnancy (Ross, 2012).

Maternal-fetal bonding is significant due to its implications in influencing neonatal outcome and postpartum attachment by mothers (Dubber, Reck, Muller & Gawlik, 2015; Young 2013). Maternal attitudes can impact the future growth and development of the baby (Weisman *et al.*, 2010). Confidence is a factor that has been shown to be influential to the bonding process (Young, 2013). On the other hand, depression, anxiety and substance abuse have a negative correlation with bonding between the mother and her baby during pregnancy (Dubber, Reck, Muller & Gawlik, 2015). It is important to consider also that there may be more than one individual interacting significantly and regularly with the baby who may also have influences, whether this is another parent or a different caregiver. Strong co-parent relationships have been shown to contribute positively to infant bonding following birth, allowing the other partner to participate in the bonding process (Young, 2013).

The Biochemical Perspective

Parenting behaviors have been exhibited across many species tracing back throughout evolutionary history. Bonding and Attachment are two elements that are critically involved in parenting. As previously discussed, bonding and attachment are complex topics involving many factors and they often vary depending on the situation. A part from the situational and social aspects of bonding, another aspect of bonding which is important to consider is the biological and chemical perspective. In the context of pregnancy and childbirth it is widely recognized that there are a number of biochemical pathways and hormones actively involved in determining the mother's mood and aiding

in the physical changes that occur during pregnancy and labor. However, this study was interested in examining how these chemicals are relevant to attachment and bonding formation with the offspring. How are the biological and chemical factors of pregnancy and birth implicated in pregnancies with a terminal prenatal diagnosis?

Previous research has been conducted to examine the biochemical aspects of parenting. One of these studies was conducted by Ruth Feldman (2015). Feldman (2015) used research on female rodents that showed the important function of a specific part of the brain, called the medial pre-optic area (MPOA) in the hypothalamus. This region is responsible for the initiation of maternal behaviors and through interactions with the hormones oxytocin and prolactin is said to increase the maternal reward from infant interaction (Feldman, 2015). She also found that the chemical oxytocin is involved in the brain and acts on other areas to increase the mother's motivation to care for their offspring (Feldman, 2015). Neuropeptide oxytocin (OT) increases bonding by reducing negative factors such as stress and anxiety (Young, 2013). In animal models oxytocin increase during birth results in an increase in plasticity of the maternal brain during the postpartum period which allows for shaping by interaction with the infant (Feldman, 2015).

Feldman's (2015) research found that the amygdala, reward circuit and oxytocin also play a significant role in the human parental brain (Young, 2013). The human brain also exhibits plasticity (Feldman, 2015). Oxytocin drives caregiving behavior in mammals and is involved in empathy and social understanding (Feldman, 2015; Young, 2013). It is very important in the multi-level development of neural plasticity which is unique to the formation of the parent-infant bond in humans (Feldman, 2015). The

biochemical process associated with bonding in which bonding creates OT, which then facilitates maternal bonding performance has been described as cyclical (Feldman, Gordon, & Zagoory-Sharon, 2011).

Another research study looked specifically at five human pheromones located in sweat secreted from the para-axillary and nipple-areola regions of women only during pregnancy (Vaglio, Minicozzi, Bonometti, Mello & Chiarelli, 2009). It was hypothesized that these compounds may aid newborns in recognizing their mothers (Vaglio *et al.*, 2009). For example, infants utilize olfactory recognition of breast odors produced by lactating women to orient themselves for breastfeeding, a reaction that differs somewhat from the reactions of infants who were bottle fed (Vaglio *et al.* 2009). During the beginning phase of pregnancy the five compounds were found concentrated mainly in the nipple-areola region. Toward the end of the gestational period the five compounds were found in both the nipple and para-axillary regions. Following birth, the level of compounds was diminished in both body areas. The five compounds did vary in location and by time of pregnancy suggesting different functions of each.

Prenatal anxiety, which may be caused by factors such as prenatal diagnostic testing, can also be linked to a cascade of biochemical effects in the mother and fetus which may lead to poorer outcomes (Allison *et al.*, 2011). In studies involving animals, the stress reaction was shown to downregulate the fetal cortisol barrier enzyme response, exposing the fetus to maternal cortisol (Allison *et al.*, 2011). This exposure may lead to reduced oxygen and nutrients for the fetus which may ultimately lead to type 2 diabetes or obesity later in life as well as other disrupted functions which are normally associated with the frontal lobe (Allison *et al.*, 2011). Stress may also lead to a decrease in uterine

blood flow and oxygen delivery to the fetus through an increased release of noradrenaline or similar catecholamines (Allison *et al.*, 2011).

CHAPTER THREE

Prenatal Diagnoses

The study of attachment during the neonatal period has been further stimulated by the progressive development of technology, such as ultrasound, which make detection and diagnosis of fetal conditions possible during pregnancy (Redshaw & Martin, 2013). Various studies have brought about conflicting conclusions concerning the impact of diagnostic testing in relation to bonding and attachment formation. Dykes and Stjernquist (2001) noted that there was a change in the mother's awareness of the baby following ultrasound. Ultrasound visualization has in previous studies indicated an increased level of concern and emotions by the mother toward the fetus within days of the visualization (Kohn, Nelson, & Weiner, 1980; Milne & Rich, 1981). Bralow (1983) agreed with this, stating that ultrasound should be supported because it may be helpful later on in promoting healthy behaviors for mothers. Whereas Baillie *et al.* (1999) found no reason to believe that there is a correlation between a change in maternal attachment and having a scan (Laxton-Kane & Slade, 2002). In a clinical research study examining chorionic villus sampling in comparison to amniocentesis, it was discussed that although prenatal diagnostic testing does provided a benefit of providing information about higher risk pregnancies, diagnostic techniques may actually serve as factors which elevate stress and anxiety during pregnancy (Spencer & Cox, 1987). In any case, this stress and anxiety may have an effect on maternal-fetal attachment formation (Allison *et al.*, 2011).

Diagnostic testing during pregnancy is multi-faceted. Most pregnancies despite risk status are typically monitored in some fashion. This may include visits to a health

care provider, measurements, ultrasounds etc. However, in a proportion of these pregnancies, there is a subset of pregnancies that may be flagged as high risk. In this subgroup of pregnancies there has likely been an indication that there could be potentially harming factors present for either the mother or the fetus later on during the pregnancy. To confirm this preliminary flagging of these pregnancies, women may be offered one of a variety of additional testing options that have been designed to more specifically look at the proposed indication and clarify whether or not the risk is in fact present. When provided this option for additional testing, the mother may experience a wide array of reactions. For some prospective parents the option to undergo further testing may be reassuring in that they will have a definite answer as to the condition of their pregnancy. For others, the thought of additional testing may bring about anxiety and uncertainty causing them to think more about the possibility of a negative outcome (Allison *et al*, 2011).

Methods

There are four function of prenatal health care: risk assessment, serial surveillance, health education and psychosocial support (Vahratian, Hicken, Schwalberg & Kotelchuck, 2013). In the medical setting, risk assessment and serial surveillance are very important to the direct physical wellbeing of both the mother and the baby. Serial surveillance during pregnancy is used to monitor the health of the mother and the growing fetus in order to catch any health concerns which may arise. Prenatal tests used during pregnancy to monitor the health of the baby and screen for birth defects include amniocentesis, chorionic villus sampling and ultrasound (March of Dimes, 2010).

Amniocentesis is a diagnostic test in which amniotic fluid is taken from the uterus. It is performed during the second trimester, between 15 to 20 weeks of pregnancy, to test for birth defects or genetic abnormalities (Evers-Kiebooms, Swerts & Van Den Berghe, 1988; March of Dimes, 2010). These conditions can be tested by chromosome analysis and other techniques such as measurement of alpha-fetoprotein levels. Results from testing are typically returned between 3.5 to 4 weeks following amniocentesis (Spence & Cox, 1987). Some studies have found this longer waiting period associated with amniocentesis testing to be detrimental to pregnancy due to it prolongation of anxiety during the fifth month of pregnancy, which is the stage of pregnancy which has been thought to be most predictive of any later obstetric complications (Gorsuch & Key, 1974). A study by Evers-Kiebooms (1988) and colleagues which focused on the psychological aspects of the amniocentesis experience on mothers addressed the reasonable assumption that mothers who undergo non-routine examinations during their pregnancies, such as amniocentesis, may be subjected to a variation of emotions not present in mothers who do not undergo such testing due to the additional stress that accompanies the additional testing. Despite such stress, women evaluated the testing process itself positively and most all of the women indicated that they would elect to undergo the procedure again if they were to experience subsequent pregnancies (Dixon, Richards, Reinsch, Edrich, Matson & Jones, 1981). In a follow up included in the 1988 study by Evers-Kiebooms *et al*, the only mothers who did not use amniocentesis monitoring in subsequent pregnancies were mothers who had experience either a miscarriage or stillbirth in a prior pregnancy where amniocentesis testing was used.

In another study, the MFAS scores of women who initially had lower scores on the MFAS assessment, then underwent amniocentesis testing for chromosomal abnormalities showed a dramatic rise in their testing scores (Muller, 1992). However, it was reassuring results from amniocentesis which had this positive affect on the scores obtained (Heidrich & Cranley, 1989; Phipps & Zinn, 1986). In a study conducted by Phipps and Zinn (1986), comparing the psychological response of a group of women undergoing amniocentesis to a control group, found that women who underwent the additional testing appeared to show an increase in attachment toward the fetus compared to the control group who did not undergo the amniocentesis testing. The results from the portion of the Phipps & Zinn (1986) study which involved the testing of maternal-fetal attachment using the MFAS questionnaire are shown below in Figure 3. Each line in the figure represents either the control group or the amniocentesis group. As can be see, both groups show a positive increase in MFAS scores as the pregnancy progressed from time-1 to time-3 during the experiment. Interestingly, Phipps & Zinn concluded from the analyses of the data that the greatest subscales of growth on the MFAS test for both groups was in the subscales of interaction with the fetus and attributing characteristics to the fetus (Phipps & Zinn, 1986). Looking at the figure it is seen that the slope of the line for the amniocentesis group is steeper than that of the control group. This means that the women who underwent amniocentesis experiences a relatively greater increase in attachment scores on the MFAS as compared to the control group. Two hypothesis for this finding is that either mothers who underwent amniocentesis had lowered investment in the pregnancy before testing and results were given, thus inflating the difference, or

that the procedure did in fact aid in maternal-fetal attachment formation (Phipps & Zinn, 1986).

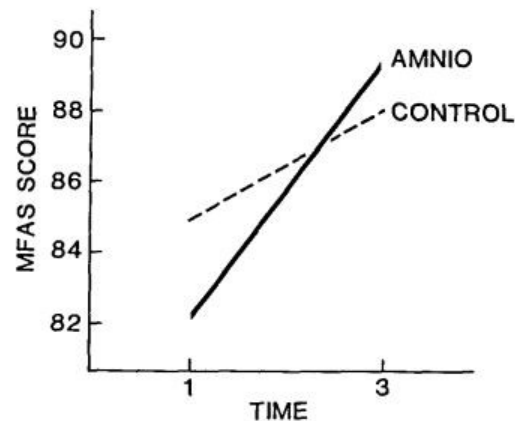


Figure 2: Maternal-Fetal Attachment Scale (MFAS) scores of amniocentesis (AMNIO) and control subjects (Phipps & Zinn, 1986).

Chorionic villus sampling is a test performed on a sample of tissue taken from the placenta to test for genetic conditions. This test is typically performed during the first trimester, between 10 and 12 weeks of pregnancy. Chorionic villus sampling does pose a greater risk of miscarriage as compared to amniocentesis (Evers-Kiebooms, Swerts & Van Der Berghe, 1988). This may result in an increased level of maternal anxiety (Evers-Kiebooms, Swerts & Van Der Berghe, 1988). However, unlike with amniotic testing, the results from chorionic villus sampling are made available more quickly, which may be a benefit to this type of testing, as the extended wait time to receive the results from amniocentesis was a cause of anxiety for many of the expectant mothers (Evers-Kiebooms, Swerts & Van Der Berghe, 1988). Other hypothesized benefits of chorionic villus sampling that were tested in a randomized clinical research study by Spencer and Cox (1987), included a decreased amount of emotional stress because the

CVS testing could take place earlier on in the pregnancy and also that this earlier testing would allow elective termination to occur earlier in the pregnancy as well if desired (Spencer & Cox, 1987). Earlier termination of pregnancy in the first trimester may have allowed women more freedom in the type of termination procedure they chose to undergo. It was hypothesized in the experiment that those three factors may cause a fluctuation in a women's attachment to the fetus (Spencer & Cox, 1987).

Ultrasonography was first developed in the early 1960's for use in visualizing the fetus during pregnancy (Bijma, Van Der Heide & Wildschut, 2008). It was not until around 1977 that moving images of the fetus became available. The development of this technology allowed for the elucidation of fetal anatomy, which furthered the field of obstetrics. Ultrasounds are performed many times throughout the duration of a pregnancy as a part of standard prenatal care in industrialized countries. The test uses sound wave technology to construct an image of the womb and baby within (March of Dimes, 2010). It serves the purposes of both determining the gestational age of the fetus, and in diagnosing fetal abnormalities.

The scan for fetal abnormality occurs around 18 to 20 weeks of gestation and has been used in the detection of congenital abnormalities and birth defects such as spina bifida, anencephaly and those pertaining to the heart (Bijma *et al.*, 2008; March of Dimes, 2010). One of the results of ultrasonography is the earlier knowledge of fetal abnormalities. Approximately 55% of congenital abnormalities are diagnosed prenatally, and ultrasounds are one of the most important tools in making these diagnoses (Bijma *et al.*, 2008). Similarly to the other forms of prenatal testing, results from ultrasound either indicate the presence or absence of an abnormality. Each of these two testing outcomes

leads the prospective parents to experience a different reaction. For parents that receive positive news that there is not an abnormal result, they are often reassured and experience beneficial psychological effects through personalization of the fetus, bonding with the baby and bonding with each other (Bijma *et al.*, 2008). However, parents who receive abnormal results, depending of the severity of the findings, often face decisions regarding how they will continue the rest of the pregnancy. For many who receive these results, the findings can be much unexpected. Options may include standard care, non-aggressive care and termination of pregnancy (Bijma *et al.*, 2008).

Figure 5 below shows the results of a study conducted by Bijman *et al.* (2008) concerning decision making and prenatal diagnosis of fetal abnormality via ultrasonography. The flow chart depicts well the wide variation in outcomes which can arise from pregnancy and birth. Although this figure focuses specifically on congenital abnormalities, the further breakdown providing outcomes and further clarification pertaining to each situation, such as birth outcome, provides a good model which can also be used in understanding other conditions.

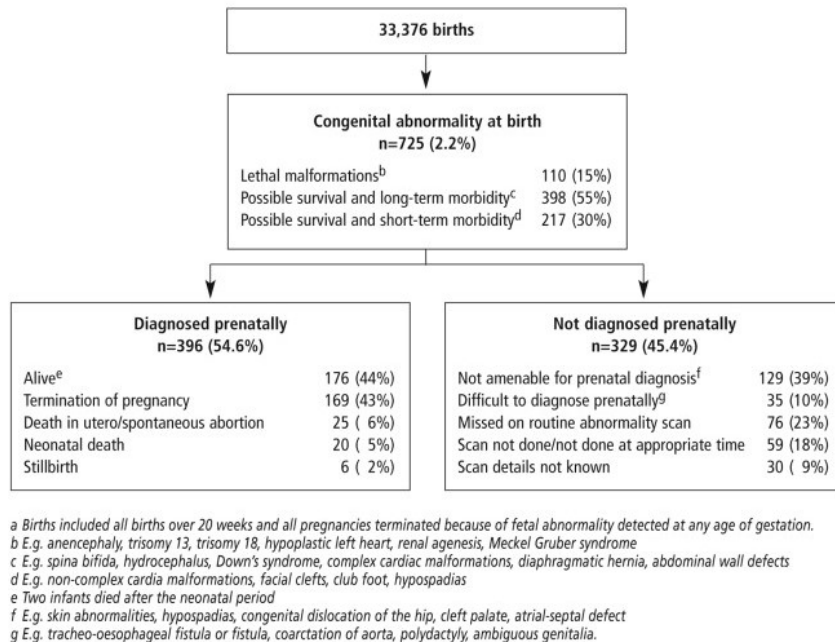


Figure 3: Overview of prenatal detection of congenital abnormality when prenatal screening was offered routinely in an unselected population in Oxford, UK, 1991-1995 (Bijma *et al.*, 2008)

Impact on the Parents

Caccia *et al.* (1991), conducted a study in which they examined bonding in mothers who underwent either chorionic villus sampling or amniocentesis. Numerous results were obtained from this study. Bonding was significantly higher in groups after they received their testing results as opposed to the level of bonding they expressed before receiving the results. The administration of sonography accompanying appointments elicited many emotional responses from the parents, including feelings of closeness to the baby, feeling like more of a parent, and even anxiety about receiving a negative result. The percentage of subjects experiencing each of the above emotions varied. However, it was noted that these reactions were stronger during earlier stages of pregnancy (less than 12 weeks), or at the first sonogram.

A 1979 study by Beeson and Globus published findings that support the notion that women who underwent testing such as amniocentesis, were likely to be reluctant to form an emotional bond or attachment to the baby they carried until the results from the testing were known and indicated that the baby would be carried to term similarly to a typical pregnancy (Evers-Kiebooms, Swerts & Van Der Berghe, 1988; Spencer & Cox, 1987). For patients who underwent chorionic villus sampling this reduction in anxiety occurred as early as 8 weeks prior to that of the women who underwent the amniocentesis (Spencer & Cox, 1987).

However, it is likely that the reason behind the mother having diagnostic testing done may affect the level of anxiety experienced. Indications for testing could include things such as advanced maternal age or a medical history of previous pregnancies that resulted birth defects or disorder such as neural tube defects or Down syndrome. Women who underwent amniocentesis testing during pregnancy reported feelings such as fears for fetal injury or defects due to the increased risk of harm that is implicated with such testing, anxiety about the testing inducing a miscarriage and also a general fear of the unknown outcome of the testing (Evers-Kiebooms, Swerts & Van Der Berghe, 1988). Thus, parents must face the reality of both the outcome of such testing, which may come back as positive for an abnormal pregnancy, and the potential occurrence of a secondary risk or complication such as those aforementioned (Evers-Kiebooms, Swerts & Van Der Berghe, 1988). For some, the possibility of one of these outcomes may bring about the consideration of an elective abortion.

Previous studies indicated that about half of the women who underwent such testing experienced distress over the potential of them having to consider ending their

pregnancy (Finley, Varner, Vinson & Finley, 1977; McGovern, Goldberg & Desnick, 1986). In the 1988 study by Evers-Kiebooms *et al*, 70% of mothers made the provisional decision to electively terminate the pregnancy if an abnormality was found, 8% of the women were undecided, 19% did not consider termination of electing for a pregnancy termination prior to receiving the results and only three of the women from the study, of the 115 that participated made a provisional decision that they would not elect to terminate the pregnancy despite whatever the outcomes from the amniocentesis might later reveal. However, this number may have been low due to a sub group of women who knowingly would not choose to terminate their pregnancies also elected not to undergo amniocentesis testing (Evers-Kiebooms, Swerts & Van Der Berghe, 1988).

In the group of women that received positive results from the testing, about one quarter of them continued to express anxiety and doubt toward their pregnancy and the accuracy of the test (Dixon *et al.*, 1981). About one third of the women subjects in Evers-Kiebooms 1988 study were not reassured about the accuracy of the diagnosis until after the birth of the infant.

In the case of abnormality with any of the testing above, families are faced with a number of emotions and decisions regarding the information that they have received and the continuance of the pregnancy. In terms of emotions, they may feel ambivalent “they are committed to their- desired and intended- pregnancy, while on the other hand, they want to protect their child, themselves and their family from the burden of severe disability” (Bijma *et al.*, 2008). Two options include non-aggressive management and termination of pregnancy (Bijma *et al.*, 2008).

Non-aggressive management of pregnancy is often seen in situations where there is a poor predicted outcome for the baby in which interventions would not be beneficial (Bijma *et al.*, 2008). Thus, any interventions are forgone and the pregnancy continues until there is fetal death, or until birth. Termination of pregnancy involves the early induction of labor and is intended to hasten inevitable fetal death. Both a team of healthcare providers and the parents are often involved in the decisions regarding end of life care in situations involving adverse diagnosis during pregnancy. High rates of pregnancy termination have been associated with factors including low gestational age, involvement of the central nervous system in the diagnosis, chromosomal abnormalities and low maternal educational level (Bijma *et al.*, 2008).

However, termination of pregnancy also occurs in conditions that although considered abnormal, are still compatible with life (Coleman, 2015). 4 % of US abortions occur in pregnancies that were desired (Coleman, 2015). Approximately 45% of abortions are recorded as being conducted on babies with chromosomal anomalies (Coleman, 2015). The time that passes between when the family is made aware of an abnormality and the actual abortion is typically about two weeks (Coleman, 2015). In cases of fetal anomaly diagnosis the termination rate ranges from 58-93%, with advanced maternal age pregnancies disproportionately choosing to terminate (Coleman, 2015).

The termination of pregnancy in cases with diagnosed anomalies (Coleman, 2015) have been described as being similar to other cases of perinatal loss, or that of a spontaneous pregnancy loss, but with the added factor that is associated with making the elective decision to terminate. Arising feelings of guilt and emotions can be traced to biological, moral and social factors (Coleman, 2015). The provision of detailed

information, both positive and negative, can have an impact on the decision to terminate or not. Termination of pregnancy carries the risk of future prolonged mental health issues for parents (Black, 1989; Coleman, 2015; Kersting, Dorsch & Kreulich, 2005). These levels of stress have been reported as being more than ten times that of a normal delivery (Korenromp, Page-Christeiaens, and Van den Bout, 2007).

Interestingly, it has been discussed that women who are made aware of a fetal abnormality by prenatal diagnostic testing, yet decide to continue with the pregnancy, have shown lesser levels of suffering than women who elected to terminate (Coleman, 2015). However, the elective termination groups often constitutes the majority when it comes to the decision between the two options. The option to continue pregnancy brings about benefits in its own way through a variety of means. If a mother was to lose the baby after choosing to continue the pregnancy, her mind set may differ than that of the mother that electively terminated her pregnancy. This is because the mother who did not terminate believes that she has done her best in fulfilling her job carrying the child. The loss is perceived as more natural.

Babies who do survive birth are often admitted to the neonatal intensive care unit (NICU). During the time in the NICU they may be placed on machines and given treatments to try and regain what life the baby has. Studies examining physicians in this department revealed that often the baby may be receiving more treatment than is necessary, prolonging the suffering associated with the inevitable loss of the baby (Cadge & Catlin, 2006).

CHAPTER FOUR

Neonatal Death

As stated earlier, it has been hypothesized that the attachment relationship between mother and baby likely differs in cases where there is potential loss or the pregnancy does end in a loss (Kennel & Klaus, 1982; Laxton-Kane & Slade, 2002; Muller, 1992). According to Muller (1992), risk status of pregnancy is one of three factors that has been consistently correlated as being unrelated to prenatal attachment (Curry, 1987; Kemp & Page, 1987; Mercer, Ferketich, May, De Joseph & Sollid, 1988). However, she suggests that women who are knowingly at risk of having a baby with an abnormality probably experience the pregnancy and interact with their fetus differently than women who know that they do not face similar pregnancy and fetal complications and outcomes (Muller, 1992). This suggests a complex interaction exists within the varying circumstances of neonatal losses. Neonatal death itself is a situational distinguishable from other types of loss. Within the category of neonatal death there are many additional subcategories of reasons and types of specific causes of neonatal death. So, even within the topic of neonatal death, parents who experience losses due to different causes may also be affected and experience their losses differently. The remainder of this chapter is dedicated to examining some of the causes of neonatal death so that one may understand the breadth of the topic that neonatal death is. These are split into two categories representing pregnancy and birth complications as well as birth defects.

Pregnancy and Birth Related Complications

Despite technological advancements in medicine, research, and the continued acquisition of knowledge regarding different biological processes, we are still far from being able to completely predict and prevent many diseases. In terms of pregnancy, there are many factors, both known and yet to be elucidated, which contribute to poor pregnancy and birth outcomes. There are numerous complications that can occur throughout pregnancy from the time of conception continuing through birth. Complications can often be thought of in terms of which conditions originate from the mother or which arise from the fetus. They can also affect either the mother, baby or both individuals.

In terms of the mother, pregnancy itself induces a change in women which can easily place an additional level of both physical and emotion stress on the mother. It is possible for women who were previously in good health prior to pregnancy to develop health issues during pregnancy in response to this stress. Women who had health concerns prior to pregnancy are also more likely to have a high-risk pregnancy. Preexisting factors which may contribute to the development of high risk pregnancy include existing health care conditions (high blood pressure, autoimmune disease, infertility, obesity, HIV/AIDS, etc.), age, lifestyle factors (Alcohol or substance use), and conditions of the pregnancy itself (National Institute of Health, 2013).

Pregnancy Complications

As the label suggests, pregnancy complications are complications that arise specifically during the pregnancy. Major pregnancy complications include preeclampsia, gestational diabetes, and multiple gestations (National Institute of Health, 2013).

Although many women can have healthy pregnancies and children, high blood pressure during pregnancy can pose the risk for future complications such as kidney damage for the mother, low birth weight for baby, or the development of Preeclampsia (National Institute of Health, 2013). Preeclampsia can occur any time after the 20th week of pregnancy and is often associated with the sudden increase of maternal blood pressure. This condition can also have dangerous effects on the liver and brain, and is potentially fatal to the mother and baby. High blood pressure in the mother causes restricted blood flow to the placenta and the baby, leading to growth restriction and risk of preterm labor and birth (National Institute of Health, 2013). The advanced stage, eclampsia, involves seizures and coma in the mother.

Gestational Diabetes is a form of diabetes that develops during pregnancy. About 7 % of women develop gestational diabetes (March of Dimes, 2016). Negative outcomes of this disease include preterm birth, preeclampsia, and high blood pressure. However, the condition can be managed with controlled diet, resulting in healthy pregnancy. Lastly, pregnancies involving more than one fetus, multiple gestation, are at an increased risk of premature birth despite any other conditions which may be present. When the number of babies is greater than or equal to three there is an increased likelihood of cesarean delivery (National Institute of Health, 2013). The increased number of babies in the womb increases the odds that each individual baby will be smaller in size. If premature birth occurs, it is likely that the babies will face additional birth complications such as breathing issues due to the reduced time for development.

Birth Complications

These complications are associated with the events that occur during and shortly following the actual birthing event. Some of these problems may resolve themselves, but others can cause serious health complications for the affected infant (March of Dimes, 2010). The main categories of birth complications are discussed hereafter: complications involving the placenta, umbilical cord and membranes, infections, asphyxia and intrauterine death. This list although extensive is not all inclusive. There are many additional conditions such as intraventricular hemorrhaging and necrotizing enterocolitis which are also serious conditions.

Intraventricular hemorrhage is a condition in which there is a bleed in the brain. Necrotizing Enterocolitis occurs in the baby's intestines 2 to 3 weeks after a premature birth and leads to a number of feeding and digestive problems which can be treated with medicine or surgery, but sometimes leads to neonatal death (March of Dimes, 2010).

Complications Involving the Placenta

During pregnancy, the placenta grows in the uterus and is responsible for supplying the baby with oxygen and food (March of Dimes, 2010). Conditions leading to complications with the placenta affecting pregnancy include placental abruption, placenta previa, placenta accreta, increta and percreta.

In placental abruption, the placenta which typically remains attached to the uterus for the duration of the pregnancy, becomes detached. This disrupts the food and oxygen supply to the baby as well as poses a threat to the mother due to the increased likelihood of bleeding. This occurs in about 1 in 100 pregnant women any time after 20 weeks of

pregnancy, but typically in the third trimester (March of Dimes, 2012). The major risks to the baby due to this condition are premature birth, stillbirth or growth problems. The only treatments for this condition include continued monitoring in more mild cases, or immediate delivery of the baby in more serious cases. The origin of this condition is not well understood although there are a number of assumed risk factors.

Placenta previa occurs when the placenta is very low in the womb and covers all or part of the cervix (March of Dimes, 2012). It occurs in about 1 in 200 pregnancies, but poses the greatest risk when it occurs later in pregnancy. The abnormal position of the placenta can cause bleeding during vaginal birth.

Placenta accreta, increta and percreta are varying levels of severity that occur when the placenta is embedded too deeply into the uterine wall (American Pregnancy Association, 2015). The combined occurrence of these three conditions is 1 in 2,500 pregnancies. The cause is somewhat unknown, but it is believed that prior birth by cesarean may lead to an increased risk in future pregnancies. Risks for the mother include hemorrhaging and damage to internal organs including the uterus. Risks for the baby include premature birth and domino complications.

Umbilical Cord and Membranes

The umbilical cord is used to transport food and oxygen from the mother and placenta to the growing fetus in the womb (March of Dimes, 2010). This function is aided by the presence of two arteries and one vein located within the structure. There are a number of complications that can arise implicating this structure, with outcomes that range from low significance to fetal death (Beall, 2015). They include knots, vasa previa, hematomas, ulcerations and many more deviations. Sometimes the cord may be too long

or too short, twist, and become knotted or compressed. Ultrasound during pregnancy may reveal an abnormality with the cord, however, in other instances conditions may not be known until post-birth when the cord is examined. In general, the cord characteristics such as length and artery composition have been associated with certain disorders. Many of the abnormalities associated with the umbilical cords cause a domino effect which leads to other poor health outcomes and difficulties for the baby involving other biological systems.

Infections

There are a number of infections which present with a possibility of fatal outcomes for the neonate. Sepsis is an example of a blood infection which may lead to neonatal death (March of Dimes, 2010). For premature babies the risk of infection is even greater than the full term infant due to differences in development. Premature babies may be susceptible to lung infections such as pneumonia, or infections such as meningitis which affect the brain and spinal cord (March of Dimes, 2010).

Asphyxia

Asphyxia is the condition in which the baby does not receive enough oxygen before or during birth (March of Dimes, 2010). The lack of oxygen can greatly affect other organs including the brain. If there is infant survival, there may be resultant neurodegenerative diseases, retardation or epilepsy (Golubnitschaja, Yeghiazaryan, Cebioglu, Morelli & Herrera-Marschitz, 2011).

Birth Defects

According to the March of Dimes (2010), birth defects are the result of changes in the shape or function of body parts which develop during pregnancy and are therefore present at birth. Birth defects can be harmful and fatal because the alteration in structure and function can have negative effects on how the body grows and works. The March of Dimes (2010) also reported that birth defects are responsible for 20 percent of neonatal deaths. These congenital abnormalities are leading cause of death in industrialized countries (Bijma *et al.*, 2008).

Heart Defects

The prenatal detection rate for congenital heart defects is approximately 38% (Bijma *et al.*, 2008). Due to the development of various treatments and interventions many infants who are born with heart conditions have a high likelihood of surviving as long as there is an ample amount of time for the infant to receive the afore mentioned treatment (March of Dimes, 2010). Although, for babies with severe defect the likelihood of survival is not as great. The most common heart defects include ventricular septal defect, transposition of the great vessels, coarctation of the aorta, tetralogy of fallot and hypoplastic left heart syndrome. In these conditions the flow of blood may be blocked, it may not travel through the correct pathways, or the structure itself may not be developed well enough to function maturely (Heart Kids, 2014).

Lung Defects

Lung conditions may result from the inability of the lungs to develop fully prior to birth, or from other physical defects (March of Dimes, 2010). Infants who are born with

an inadequate amount of surfactant protein may develop Respiratory Distress Syndrome following birth (March of Dimes, 2010). This condition is especially common in preterm babies, accounting for 825 neonatal deaths a year (March of Dimes, 2010). The baby's lungs lacking surfactant collapse. Development of the surfactant drug by advocacy and research groups has aided in the decrease of infant mortality resulting from underdeveloped lungs and premature births.

Chromosomal Abnormalities

Genetic conditions are also a source of neonatal death. Changes in the genetic sequence which is encoded on the chromosomes can either results from the inheritance of a condition that a parent has, or can arise from a de novo genetic mutation (March of Dimes, 2010). Roughly 1 in 150 babies are born with a chromosomal condition (March of Dimes, 2013). Due to the important role of chromosomes in carrying the genes which encode our entire development, changes in the chromosomes either in structure or number may lead to abnormal development or even death. Genetic conditions include Down syndrome and Turner syndrome among others. These two conditions are compatible with life outside of the uterus, but the baby is often affected with birth defects that may inhibit future abilities, quality of life, and may contribute to a decrease in life expectancy. Despite the ability of these individuals to survive birth and live for an adequate amount of time many parents who learn of these conditions during pregnancy may still decide to terminate the pregnancy. The overall termination rate for Down's syndrome is 92 % (Mansfield, Hopfer, & Marteau, 1999). Severe genetic mutations

which negatively affect major structure necessary for life often lead to miscarriage or even stillbirth.

Brain and Nervous System Defects

A major category of defects that affect the brain are neural tube defects. The prenatal detection rate for neural tube defects is approximately 98% (Bijma *et al.*, 2008). These defects can cause conditions such as anencephaly where part of the baby's brain or skull is missing (March of Dimes, 2010). With conditions such as anencephaly, the baby may die while still in the womb any time after 20 weeks of pregnancy (stillborn), or they may die within days of a live birth (March of Dimes, 2010). The termination rate for anencephaly is approximately 84% (Mansfield, Hopfer & Marteau, 1999).

Still Birth

Autopsy

In instances of neonatal death, the cause is not always known in advance. If the parents wish to look further into what caused the death of their child they can request for a health care provider to perform an autopsy. March of Dimes (2010) reported that in 1 in 3 cases of autopsies providers are able to provide information regarding the death. Additional information may include referral for genetic counseling in future pregnancies, or similar recommendations based on the findings from the autopsy (Costa *et al.*, 2011). This process may not be straightforward though. The decision for parents to choose whether or not they would like to have an autopsy performed while still processing the loss of their child, as well as other factors such as the cost to have the procedure and uncertainty about what results may come back can be tolling on the parents.

In a study reviewing the clinical significance of neonatal autopsy, Costa *et al.* (2011) reported that during the time of data collection, the median age of death for infants entering the neonatal intensive care unit was approximately 10 days. It was also reported that the main causes of death were congenital malformations and deaths associated with prematurity (Costa *et al.*, 2011). Prematurity is defined as birth that occurred prior to 37 weeks gestation (Costa *et al.*, 2011). In 66% of the patients included in the study, there was additional information found pertaining to the cause of death post mortem that was not indicated ante-mortem (Costa *et al.*, 2011). Other researchers such as Tsao *et al.* (2012), who retrospectively analyzed cases of early sudden neonatal and unexpected deaths, have published works in which they strongly advocate for the use of autopsy, especially in the cases of unexpected death.

Impact on the Parents

A number of studies have examined the grief response of parents and families following the loss of their children (Barr, 2012). Speaking about this grief that parents feel, Barr (2012) perfectly worded it as follows: “pregnancy ‘failure’ has been construed to be a narcissistic injury that has the capacity to threaten self- esteem, especially in women, but also in men”. As Barr (2012) discussed in his research, parents who lose a baby due to perinatal death are often prone to feeling of shame and guilt. These feelings can manifest themselves within the individual on a personal level, but also in the relationship between the two individuals who were impacted by the loss. These emotions may arise from socially constructed ideals of gender identity and role expectations concerning reproduction (Barr, 2012).

In the research looking at perinatal death, researchers have often referred to the mother's response when forming generalizations. These studies have found that it is more common for women to possess self-blame following the death of a baby (Barr, 2012).

Additional studies have attempted to address this potential bias by searching the literature in an attempt to classify and better understand the paternal perspective when it comes to the topic of perinatal loss. What many studies found was that fathers saw their social roles during situations of loss to be that of providing support for their partner (Badenhorst *et al.*, 2006). Other studies found similarities between the grief processes experienced by mothers and fathers (DeFrain, Martens, Stork & Stork, 1991; Kimble, 1991), however some argued that the response in fathers may be lesser than that of the mothers (Helmrath & Steinitz, 1978; Hughes & Page-Lieberman, 1989; Theut *et al.*, 1989).

A literature review by Badenhorst *et al.* (2006) described fathers' reactions following the perinatal loss of a baby to include emotions such as shock, anger, emptiness and loneliness as part of the grief process. In this study they did make the clear distinction in the findings that fathers who experienced these types of losses did not express guilt as one of the reactions, and that those fathers also were not more susceptible to substance abuse than men in a control group (Badenhorst *et al.*, 2006). Fathers of perinatal loss have statistically shown to have situational shame, omnipotence guilt and survivor guilt as intrapersonal responses (Barr, 2012). The receptiveness of women to others in interpersonal relationships means that they may be affected more easily by these feelings that men possess (Barr, 2012).

Hypotheses pertaining to the differences in responses between mothers and fathers are vast. Some have stated that the father is expected to take on the role of a social support for the mother during the time period following a loss. Others suggested that because the mother is the one that is physically admitted to the hospital, while the father may accompany, because he is not physically implicated in the pregnancy they may feel as if they have a lesser stake in the grief process (Badenhorst *et al.*, 2006).

CHAPTER FIVE

Discussion and Conclusions

Despite the existence of ambiguity which sometimes exists when it comes to the use of terminology such as attachment versus bonding, it is clear that these topics are of importance to a number of researchers in many fields. In Condon & Corkindale (1997), the term attachment is “used to refer to the emotional tie or bond which normally develops between the pregnant woman and her unborn baby”. This definition is very similar to many that are used in explaining the concept of bonding. The main distinction between the two being that attachment is a bidirectional relationship that occurs out of biological based needs, whereas bonding can be a unidirectional line which links two individuals and is not necessitated by need.

The aims of many of the studies conducted in the areas of attachment and bonding seek to gain information and a better understanding of the phenomenon in question. However, the scope of the research does not simply end with the acquisition of information. Much of the information which is gathered is done so with the intent of processing said information and developing useful methods through which it can be used to influence those affected by certain related issues. As Mary Ainsworth said, there should be “no research without therapy”. Not only is it an issue of ethics to take from human research subjects without regards for a reciprocal benefit, but the conditions being studied prove that there is a demand for these therapies and results to be made. One way in which gathered information had been utilized for these purposes is in the development of perinatal hospice. Perinatal hospice is a type of counseling which exists to help

families who are faced with life-ending decisions in their pregnancies. They offer support from the time of diagnosis which continues past the time of death (Coleman, 2015).

The results of studying maternal-fetal relationships has both theoretical and clinical significance (Condon & Corkindale, 1997). They may help elucidate other attachment relationships which occur later in life such as the maternal-infant relationship and beyond (Condon & Corkindale, 1997; Muller 1992). It may be used to better understand emotional reactions to fetal loss (Condon & Corkindale, 1997). Or to predict infant outcomes or the occurrence of neglect or abuse by a parent (Condon & Corkindale, 1997).

Badenhorst *et al.* (2006) as well as other researchers in the field have cautioned against the use of some interventions in the case of perinatal loss (Walsh, 2014). In the conclusion of their literature review over psychological effects of perinatal death on fathers, they stated “For ‘support’ to be useful, the components need to be clearly described. If we assume that an intervention is good because it feels intuitively right, we risk wasting resources on what may simply be a placebo effect, of devaluing father’s individual experiences, or perhaps even causing additional emotional distress (p255)”. This statement very powerfully describes many complications that exists in understanding this process of neonatal death, attachment and coping. Barr (2012) expressed similar notions when it comes to therapeutic interventions for counseling individuals who have experienced a loss and are dealing with grief and shame. Barr (2012) explained how in order to provide therapy it is often necessary to first identify the

specific nature of the feelings, especially those which may be masked behind verbal or physical substitutions.

Future application of this research can be used in aiding parents facing the situation of a fatal diagnosis or neonatal death find support. This can included providing needed information on how parents can talk about their situations with others, psychosocial support and accurate information regarding what occurred and its implication on future pregnancies (Coleman, 2015). It is important to keep in mind that each individual case of loss is unique to each individual. This ideal should greatly affect the resources that are presented to each family who experiences a neonatal loss. Suffering over the loss of a baby is an experience shared both by parents and the healthcare providers which care for them (Cadge & Catlin, 2006).

In recent decades technological advances in healthcare have contributed to a decrease in perinatal mortality. As Badenhorst *et al.* (2006) discussed, one puzzling consequence of this fall in mortality rates may in fact be that an event, such as neonatal loss, which was once more common and thus more easily accepted into an event which can be unanticipated and surprising. The research examined covering the topic of prenatal diagnostic testing described the fear reaction and concern that parents have when additional testing such as amniocentesis and chorionic villus sampling are indicated. The outcomes of the additional testing are often variable and affect the later reactions of parents. The testing itself was not reported to cause adverse reactions, but it was the results that were most important.

Diagnosis of conditions which may lead to neonatal death can occur, but some instances neonatal death is not predicted by testing before birth, and is instead revealed

by the presence of complications at birth or defects with the new born infant. Even within the subgroup that consists of neonatal deaths, there are an even greater number of sub divisions which are made. The fact that a small group of cells develops to form a complete functioning being within the short span of nine months unfortunately leaves too many opportunities for adverse events to occur. A small alteration in just one part of a system can have effects on the rest of the body, compromising the stability of the pregnancy.

There are many factors which are involved in the process of pregnancy. Not only is it a time of significant physical development for the growing baby, but it is also a time of great change for the parents. The mother also undergoes physical changes that are unable to be experienced outside of pregnancy. Psychological factors must also be taken into consideration as parents and caregivers come to terms with the process that they are going through, and how it will change and impact their futures. As progression of pregnancy continues relationships between parents, as well as between the parents and the growing baby occurs as well. Adverse findings during pregnancy or birth have the potential to disrupt these psychological processes in ways which differ from other psychological responses to loss. Neonatal death can be a difficult situation to understand and cope with as, “Perinatal loss is not a single event, but rather is encompasses the parents’ entire journey from the emotional loss of a new life, the physical separation from the child at the time of death, the social loss of their roles as parents, and their cognitive loss of self-esteem” (Williams, Munson, Zupancic, and Kirkpalani, 2008 p.339).

Although specific in their nature, the questions examined in this research project are not able to easily be provided with answers. Understanding of previous research,

continuation of research in the present and future as well as involvement with individuals, both healthcare providers as well as parents affected by neonatal deaths, is required. This multisystem approach will hopefully bring about further understanding of these topics.

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