PLAGIOCEPHALY IN INFANTS:
AN EXPLORATORY STUDY OF HEALTH CARE PROVIDER’S KNOWLEDGE
AND EXPERIENCES

A graduate thesis submitted in partial fulfillment of the requirements
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Educational Psychology

By

Bethany Morris

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The graduate thesis of Bethany Morris is approved:

____________________________________  __________________
Sloane Lefkowitz Burt, MA  Date

____________________________________  __________________
Joannie Busillo-Aguayo, Ed. D  Date

____________________________________  __________________
Carrie Rothstein-Fisch, Ph.D., Chair  Date

California State University, Northridge
DEDICATION

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ABSTRACT

PLAGIOCEPHALY IN INFANTS:
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By
Bethany Morris
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The condition plagiocephaly, defined as a medical condition occurring in infants that is characterized by the reshaped, flattened, or deformed shape of the skull developed as a result of constant pressure being placed on any one area of the head (Kennedy, Majnemer, Farmer, Barr, & Platt, 2009), was explored using a convenience sample of local health care professionals. Six pediatric medical practitioners and six physical and occupational therapists were interviewed to gain a better understanding of the range of this condition in infancy as well as the common prevention and intervention strategies. A prominent theme that emerged from both the literature and current study’s interviews was the significance of “tummy time” during the first 4-6 months of infants’ lives. While this stood out as a major similarity between the two different groups interviewed, a major difference that emerged was the timing in which infants are treated by the particular health care professionals. Most interesting, the variables of the practitioners’ ages and years of experience in their field seemed to contribute to the sophistication of responses and a focus on infants’ whole development, putting plagiocephaly in a context of the overall development of the baby within the family.
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CHAPTER ONE

INTRODUCTION

“Back for sleep, front for play, and upright for cuddles and hugs”


Hutchison, Stewart, and Mitchell (2007) believe the recommendation above should be endorsed to new mothers as a preventative tool for the physical development of their infants. Although “back to sleep and front for play” might seem simple and straightforward, this recommendation is of critical importance because of its connection to a condition called plagiocephaly. Plagiocephaly is described as a medical condition occurring in infants that is characterized by the reshaped, flattened, or deformed shape of the skull developed as a result of constant pressure being placed on any one area of the head (Kennedy, Majnemer, Farmer, Barr, & Platt, 2009).

This common condition has been referred to by many names, such as benign positional molding, posterior plagiocephaly, occipital plagiocephaly, plagiocephaly without synostosis, and deformational plagiocephaly. Ancient civilizations intentionally deformed skulls by selective positioning and external plates. The term plagiocephaly is a Greek derivative meaning ‘oblique head.’

(Persing, James, Swanson, & Kattwinkel, 2003, p. 199)

Brachycephaly is another term that may be interchangeable with the term plagiocephaly depending on the area of flatness. The difference between the two is that plagiocephaly can be characterized by a flattening on any one side of the head while brachycephaly is identified as a flattening on only the back of the head (Graham, 2006).
A diagnosis of deformational plagiocephaly can be made based on the history and physical examination during infancy. “If the patient had a typical rounded head at birth and after a few weeks or months has parallelogram deformity and occipital flattening, the diagnosis of deformational plagiocephaly should be made” (Persing et al., 2003, p. 200). On the other hand, if the infant displays the characteristics of a deformational head shape at birth, the diagnosis of lambdoid craniosynostosis could be the cause instead. Much like plagiocephaly, lambdoid craniosynostosis is characterized by a flattening of the skull but is a more severe condition associated with a specific shape and type of flattening (Persing et al., 2003). For the purpose of this study, deformational plagiocephaly, also known as positional plagiocephaly (PP), will be the only focus, as lambdoid craniosynostosis is not considered preventable by the environmental conditions after birth.

**Back for Sleep**

The American Academy of Pediatrics launched the Back-to-Sleep campaign in 1994 as a recommendation for parents to place infants on their backs to sleep in order to reduce the risk of Sudden Infant Death Syndrome (SIDS), which is linked to infants sleeping on their stomachs. Following the campaign, infants sleep positioning changed dramatically and the overall SIDS rates decreased by more than 40 percent (Persing et al., 2003). Consequently, the number of infants at risk for motor delays began to increase because parents became concerned with placing infants in the prone (lying face downward) position while awake as well as asleep (Kennedy et al., 2009). Utilizing the supine (lying face upward) position while infants are awake diminishes the opportunity to
develop certain motor skills such as upper body strength associated with reaching gross motor milestones (Persing et al., 2003).

But as the Back-to-Sleep campaign was becoming more widespread, growing numbers of referrals were occurring to craniofacial and neurosurgical centers for PP, a condition linked to infants being placed in the supine position while awake (Kennedy et al., 2009). This could be the result of babies being placed in the supine position for most of their waking time: on the floor on activity mats and gyms that encourage infants to focus on colorful and interesting mobiles hanging above them, or in car seats and strollers where the baby’s head is laying flat against a hard, solid surface. Were these infants getting enough tummy time on the floor?

**Background and Statistics**

The cause of plagiocephaly can be explained through two possible justifications. The first is related to deformities present at birth that “involve uterine constraint, especially in cases of multiple birth infants, and birth injury associated with forceps or vacuum-assisted delivery” (Persing et al., 2003, p. 199); while the other has been scrutinized in recent years because it is related to excessive supine positioning the infant is placed in after birth (Kennedy et al., 2009). Prior to 1992, PP in North America was only reported in one out of 300 births until the establishment of the Back-to-Sleep recommendations (Kennedy et al., 2009). In one medical center there was a “six-fold increase from the years 1992-1994” (Persing et al., 2003, p. 199) in the diagnosis of plagiocephaly. In 1996 a study revealed an increase in the rates of PP incidences from one in 300 to one in 60, while today studies allude to incidence rates as high as 48% in infants considered healthy (Junior League of Erie, 2008).
While an environmental factor such as infant positioning practice is a significant indicator of gross motor delays and PP, various other factors contribute to the increase of infants at risk of developing plagiocephaly as well. Specifically, motor delays and/or motor disabilities are the most common problems detected among infants born premature (born before 37 completed weeks of pregnancy) (Pin, Eldridge & Galea, 2010). In the United States, the premature birth rate has increased by 36% since the 1980s and about 12.8% of babies are born prematurely (March of Dimes, 2009). Despite this increase, a worldwide advancement has shown that the number of premature children achieving typical development has increased within the last two decades (Pin et al., 2010).

However, premature infants are more likely to develop a motor delay compared to infants born full term (born between 37 and 42 weeks of pregnancy) and therefore are often referred for physical therapy to improve development.

When premature infants have such a high likelihood of developing motor delays, the possibility of developing PP then becomes greater as well. For example, if infants are unable to hold their heads up or roll over in a timely manner they may develop PP because of the inability to meet these milestones. In addition, if infants are born prematurely and are not exposed to the prone position there is a greater chance they can form flatness on their heads, which could be especially true when the skulls are even softer than normal due to premature birth age and development (Pin et al., 2010). Even healthy infants have the same possibility of developing PP if not exposed to the prone position during the critical time of developing their large motor muscles and movements (Persing et al., 2003).
Front for Play

What babies are missing while lying on their backs instead of their tummies is upper body and neck strengthening opportunities. It is from the prone position that infants learn to lift their head and upper body up to look around at their environment, which eventually encourages them to scoot and crawl. According to the California Department of Education Infant/Toddler Learning and Development Foundations (2009), between the ages of 4 and 7 months infants should be learning to rock back and forth while on hands and knees, roll over from their stomach to their back, and bear weight on one side while using the other arm to manipulate objects; all of which lead up to the foundation that is the ability to use their arms to pull forward on the floor while on their tummy. However, without adequate floor and tummy time these critical motor milestones could become delayed and even worse, cause the presence of plagiocephaly.

What parents and caregivers have misinterpreted by the Back-to-Sleep campaign is the specifics of when to place infants in the supine position. While placing babies on their backs is appropriate and most safe while asleep, this is not true of the placement they need to be exposed to while awake. Accordingly,

It is essential to place infants on their backs for sleep, except in cases of prematurity, gastroesophageal reflux, or obstructive sleep apnea. However, infants should also be on their stomachs whenever they are awake and under direct adult supervision in order to develop prone their motor skills and to encourage the full range of neck rotation. (Graham, 2006, p. 120)

Graham (2006) further states that the development of brachycephaly or plagiocephaly may indicate, “that parents may not be providing their infants with adequate tummy time”
If infants are not exposed to consistent periods of tummy time they often develop a preference for the supine position and become distressed whenever placed in the prone position. This further prevents parents from exposing their children to tummy time because they do not want to upset their infants. Therefore, the most important tool to use in preventing and intervening plagiocephaly as well as gross motor delays in infants is sufficient and regular exposure to the prone position during play.

**Problem Statement**

With a hope to educate caregivers and professionals, this study will discuss the background of PP as well as the identification of it in medical exams and the treatment of the condition through therapy. A series of questions will be addressed throughout: What is plagiocephaly? Where has the information and research come from? Why is it significant? What are the experiences and advice from health care professionals regarding this issue? How can certain developmental milestones be reached through this practice? How can plagiocephaly be prevented using this practice? What are the connections between this quote and the presence of plagiocephaly? How can this information be made public?

**Purpose of the Research**

In order to better understand the prevalence and significance of plagiocephaly becoming more common among infants, the purpose of this study is focused on the personal experiences and knowledge of key health care professionals. Two groups of informants will provide expertise. The first group includes medical practitioners, those who diagnose PP: pediatricians and pediatric nurse practitioners. The second group includes the therapists who treat the children with PP: physical therapists and
occupational therapists. Through this collective discovery, insights can be projected to early childhood professionals as well as parents and caregivers. All infants, healthy or at risk, should be exposed to optimal gross motor development trajectories because awareness and treatment for PP can be critical.

Significance of the Study

The increased number of incidences in healthy infants who have been diagnosed with PP (48%) since the Back-to-Sleep campaign provides significant implications for further research on this topic. From this research, early childhood educators and professionals can gain awareness of the scope of the issue in order to advocate for healthy physical development for all infants. The early childhood community can then bestow the knowledge to parents and caregivers who can in turn inform others about the best practices for infants’ development. Consequently, the number of plagiocephaly incidences could decrease with more widespread realization of prevention and intervention strategies found from this study.

Key Terms

Specific terms are imperative to define in order to fully understand specific aspects of this study.

- Back-to-Sleep Campaign – a recommendation for parents to place infants on their backs to sleep in order to reduce the risk of Sudden Infant Death Syndrome (SIDS) (American Academy of Pediatrics, 2012).
- Brachycephaly – “The typical brachycephalic head shape is flat in the back and quite wide with peaking of vertex. Sometimes the head is so flattened that it is wider than it is long” (Graham, 2006, p. 119).
• Craniosynostosis – “Like deformational plagiocephaly, lambdoid craniosynostosis produces a flat occiput on one side of the head and prominence on the contralateral side, and deformation may become more severe with time...Radiographs will show obliteration of the lambdoid suture, and computed tomography scans will demonstrate a premature bridging of bone across the lambdoid suture and a constricted posterior cranial fossa ipsilateral to the fused lambdoid suture” (Persing et al., 2003, pp. 199-200).

• Full term – a baby born at or before 37 weeks of pregnancy (Pin et al., 2010, p. 574).

• Plagiocephaly – “positional plagiocephaly refers to infants with altered skull shape, who are older than 6 weeks of age. The cranial sutures are open and normal, and no craniosynostosis is present” (Bialocerkowski, Vladusic, & Wei Ng, 2008, p. 577).

• Premature – a baby born at or before 29 completed weeks of pregnancy (Pin et al., 2010, p. 573).

• Prone – lying face downward (Kennedy et al., 2009).

• Risk factors – characteristics that may cause a person to be considered at risk for adversity or challenges (Masten, Best, & Garmezy, 1990).

• Supine – lying face upward (Kennedy et al., 2009).

• Torticollis – “Positional torticollis is often associated with the plagiocephaly. The head is usually turned so that the chin points to the side opposite to the occipital flattening and the head is tilted to the same side as the flattening” (Kennedy et al., 2009, p. 223).
• Tummy time – “prone positioning of an infant when awake and supervision to encourage development of extensor control of the head and neck” (Jennings, Sarbaugh, & Payne, 2005, p. 4).

**Preview of the Thesis**

The next four chapters include a comprehensive examination of plagiocephaly in infants. Chapter Two will discuss empirical studies and reviews on the topics of plagiocephaly, gross motor delays, prematurity, and developmental preventions, interventions, and management in infancy. Next, Chapter Three will provide a detailed explanation of the development of the study including the participants and the research design. Chapter Four will consist of the findings categorized by prevalent themes found in the interviews and organized by profession (medical or treatment). This will include direct quotes from the interviews recorded. Finally, Chapter Five will describe themes uncovered in the findings. Implications for policy and future research will be suggested. Ongoing questions that remain unanswered will also be posed.
CHAPTER TWO
LITERATURE REVIEW

Introduction

This chapter reviews empirical studies and articles on seven topics related to plagiocephaly. The specific topics include: (a) the prevalence, risk factors and history of plagiocephaly, (b) sleep positioning practices related to head shapes and motor delays, (c) the motor trajectories of infants born premature, (d) developmental delays and motor development of infants with plagiocephaly and brachycephaly, (e) management of plagiocephaly, (f) the prevention of deformational plagiocephaly in infants, and (g) communicating the message about optimal infant positioning.

Prevalence, Risk Factors and Natural History of Plagiocephaly

Positional plagiocephaly, “also referred to as deformational plagiocephaly or non-synostosis plagiocephaly” (Bialocerkowski, Vladusic, & Wei Ng, 2008, p. 577) is a pediatric condition that seems to have increased since the Back-to-Sleep recommendations to place healthy infants to sleep on their backs in 1994. To be specific, “it is characterized by changes in skull shape, resulting from mechanical factors applied in utero, at birth, or postnatally. Infants may have altered skull shape at birth and this is thought to revert to normal in the early postnatal period” (Bialocerkowski et al., 2008, p. 577). Therefore, positional plagiocephaly (PP) is characterized by infants with a misshapen skull who are 6 weeks of age or older (Bialocerkowski et al., 2008).

Because PP was once considered merely a cosmetic disorder, the intervention has been based on repositioning the head to normalize the skull shape. However, recent research suggests that infants with PP may also be accompanied with other
developmental difficulties such as cognitive and psychomotor that could carry over into the primary school years (Bialocerkowski et al., 2008). Therefore, Bialocerkowski et al. (2008) believe “it is important to determine the prevalence and natural history of the condition so that appropriate resources can be allocated for the management of these infants” (p. 577). In addition, it is of equal importance to identify and tackle environmental factors that put infants at risk of PP that can be intervened or prevented to reduce prevalence and alleviate management of the condition (Bialocerkowski et al., 2008).

In order to systematically review the evidence on the prevalence, risk factors, and natural history of PP, Bialocerkowski et al. (2008) “aimed to determine whether there was epidemiological evidence to support an increase in its prevalence during the 1990s, following the introduction of the “Back to Sleep” campaign, compared with historical studies” (pp. 577-78). A second aim of the study included finding evidence that the natural history of PP will correct the head shape over time. Because PP may be considered an environmental, or modifiable, condition, the evidence from this review could also be used to prevent the likelihood of the condition.

**Methods**

The researchers sought published and unpublished epidemiological studies on PP from 13 library and Internet databases “(MEDLINE, CINAHL, Proquest 5000, ISI Current Contents, ISI Web of Science, Expanded Academic ASAP, ScienceDirect, Journals@Ovid, PubMed, Strathclyde, OAIster, Proquest Digital Dissertations, and Australian Digital Theses Program)” (Bialocerkowski et al., 2008, p. 578). Only English-language papers published between January 1985 and October 2007 were used because of
the increase in rates of treatment referrals of infants with PP during that time (Bialocerkowski et al., 2008). The studies produced were independently assessed by two reviewers using the following criteria: “(1) used a quantitative study design with an epidemiological focus (case-control, cohort, cross-sectional survey, case series); (2) investigated the prevalence, risk factors, or the natural history of positional plagiocephaly in infants” (Bialocerkowski et al., 2008, p. 578). Studies that included participants diagnosed with genetic disorders or syndromes such as Down syndrome were excluded. When disagreements arose about the eligibility of a study, an independent experienced researcher was brought in to make the final decision.

All studies included were flagged for potential biases using the University of Sheffield’s Hierarchy of Evidence, which ranges from level 1 evidence such as systematic reviews that could contain the least amount of biases, to level 8 such as anecdotal information that could contain the most amount of biases. To correspond with the aims of the study, evidence was sourced from levels 3 (cohort), 4 (case-control), 5 (cross-sectional surveys), and 6 (case series), respectively. Levels 3 and 4 were considered the most appropriate to support the research at hand because they “can identify causation, can provide evidence regarding prevalence, and natural history, and have fewer potential sources of bias compared with other quantitative methodologies” (Bialocerkowski et al., 2008, p. 578). To evaluate the internal and external validity of the studies, the Critical Review Form – Quantitative studies was used. The close-ended questions on this form provided a score of 1 (completely fulfills the criterion) or 0 (does not fulfill the criterion) with a maximum score of 15 indicating the highest quality (referred to as quality score).
Two reviewers extracted the descriptions of all 18 studies included and then one independent experienced researcher made decisions if disagreements occurred. “Data were synthesized in a narrative format and evidence regarding prevalence, risk factors, and natural history of positional plagiocephaly were interpreted with consideration given to hierarchy of evidence, methodological quality, sample characteristics, and method of diagnosing the condition” (Bialocerkowski et al., 2008, p. 578). Risk factors were identified based on significant indicators related to results and supportive evidence from the studies reviewed.

Results

Prevalence and natural history of PP. Of the three research studies that investigated the prevalence of PP two produced the strongest results, which indicated that plagiocephaly’s “2-year prevalence may be as high as 29.5%; however, prevalence appears to be age-dependent with most cases manifesting in the first months of life [point prevalence at 6-7 weeks = 16-22.1%; at 4 months = 19.7%])” (Bialocerkowski et al., 2008, p. 578) (point prevalence refers to the epidemiological increase of plagiocephaly incidences since the 1990s, in percentage and represented by age group). By 2-years-old the point prevalence could be as low as 3.3%. Within one of the three studies it was inferred that infants did not receive treatment for PP, which therefore provided evidence that the natural state of the skull changed within the first 2 years of life (Bialocerkowski et al., 2008). Two of the three studies provided a quality score of 12 out of 15, indicating very high validity.

Risk factors. With regard to the 18 studies reviewed, 64 potential risk factors were identified. However, the methodological quality of the studies provided an average
score of only 7 out of 15 with a standard deviation of 2.9 and a range of 2-12. In studies that used cohort and case-control designs, methodological quality was significantly higher on average when compared to cross-sectional studies and case-series. “Very few or no study fulfilled the following criteria: no biases present (n=0), used valid outcome measure (n=0), used reliable outcome measures (n=0), acknowledged limitations of the study (n=3), or gained informed consent (n=5)” (Bialocerkowski et al., 2008, p. 578). Of the 64 potential risk factors, four emerged as most significant and confounding: socio-demographic (family structure, parents’ age, ethnicity) and socioeconomic (parents’ educational qualifications, occupation, household income) variables (n=5), obstetric (childbirth) factors (n=13), infant factors (n=14), and infant care factors (n=8).

**Socio-demographic and socioeconomic variables.** Although maternal education levels were often associated with the presence of PP (n=5), this was not supported by the work of the other 13 studies reviewed. “Moreover, maternal education levels could potentially be a confounding factor, as it may influence obstetric, infant, and infant care variables” (Bialocerkowski et al., 2008, p. 580). However, none of the authors discussed implications of confounding variables in their research.

**Obstetric factors.** The most common obstetric factors that emerged related to PP included being first-born or delivered with assistance (using forceps or vacuum extractor). Bialocerkowski et al. (2008) believe these factors could potentially be confounders, yet these associations were not researched within the studies reviewed. Other obstetric factors that emerged were post childbirth education as well as conflicting evidence with regard to premature birth in the development of PP. However, slower to move infants have a greater possibility of developing PP because of the amount of time
spent in the supine position, and gross motor delays is a common characteristics of infants born prematurely. “There was little evidence to suggest that multiple births, being the lower utero twin, vertex delivery, low birth weight, and maternal exposure to caffeine and tobacco were risk factors” (Bialocerkowski et al., 2008, p. 580).

**Infant factors.** One of the most consistently associated factors with the presence of PP included neck problems; however, the definitions were defined inconsistently and evaluated by either parental report or clinical assessments. This created the need for a standardized definition in order to confirm the relationship between neck problems and PP. Male gender, however, consistently appeared as a factor associated with PP. This could be because males tended to have larger heads and were less flexible in their bodies than females. Males also grow more quickly within the first 3 months of life and the strength of the skull could be inadequately able to withstand the pressure of gravity. “There was some evidence to suggest that larger cerebrospinal fluid spaces, slower motor development, infant inactivity, difficult infant temperament, and snoring may be associated with the condition; however, further investigation is warranted” (Bialocerkowski et al., 2008, p. 580).

**Infant care factors.** The most prominent infant care factor associated with PP was found to be increasing exposure to the supine position. Not varying the position of the infant’s head while asleep, feeding positions, not maintaining the varying positioning of the infant’s head, sleeping on very firm mattresses, and being bottle fed may have also contributed to the supine positioning practices used. Maternal education could be a confounding factor with the supine positioning practice because of the sudden infant death syndrome recommendation to place infants in the supine position during sleep.
Lack of knowledge to utilize the prone position during supervised and awake times could be a significant factor.

**Discussion**

With regard to the prevalence, PP seemed to be age-dependent within the first 6 months of life (Bialocerkowski et al., 2008). The point prevalence of PP could be as high as 22.1% in the first months of life, similar to the estimate of 25% prevalence of altered skull shape in healthy infants without a diagnosis of PP. However, because of the historical data ranging from 5% to 48% prevalence at 12 months old, Bialocerkowski et al. (2008) believed it was difficult to draw conclusions regarding the effect of the “Back to Sleep” campaign and the relationship between prevalence and referral rates. It may be simply that increased awareness and early referral for evaluation of infants with skull deformities have been misinterpreted as an increased prevalence.

One study documented a decrease in the prevalence of PP within the first 2 years of life, which appeared to be strong evidence that without treatment, head shape could normalize during childhood (Bialocerkowski et al., 2008). However, taking advantage of some kind of treatment for PP could speed up the reshaping process. “Based on the current evidence, the present authors recommend that infants should experience a variety of positions other than supine, while they are awake and supervised. They should have regular periods of supervised prone play” (Bialocerkowski et al., 2008, p. 585). In addition, alternating the infant’s head position while asleep or changing the position of the bed could alleviate a preference for head turning to one side or the other. Overall, this review provided a thorough investigation into the condition of PP and warranted the need for more exposure to the prone position and head positioning practices in infants. In
the following study, similar recommendations are described while discussing the
connection between infants being born prematurely and the possibility of developing PP.

**Examining Gross Motor Development of Preterm Infants**

**Introduction and Methods**

A longitudinal, cross-sectional study was conducted by van Haastert, de Vries, Helders, and Jongmans (2006) to determine whether infants born premature (before or at 32 weeks gestational age) show different early motor development patterns than infants born full term using the Alberta Infant Motor Scale (AIMS) scores. The AIMS is a norm-referenced, observational, performance-based measure consisting of 58 items designed to evaluate the spontaneous movement range of infants from term birth age through self-supported walking. The performance an infant displays on the AIMS can determine whether he or she is eligible for referral or early intervention.

**Subjects and Procedure**

A total of 800 infants (356 boys, 444 girls) born before or at 32 weeks gestational age (GA) were assessed using the AIMS between 1 and 18 months of age. A pediatric physical therapist/special educator conducted the AIMS assessments around corrected term age (age at which the infants were supposed to be born full term), as well as 6, 12, 15, and 18 months corrected age. The mean AIMS scores of the preterm infants were compared using a one-sample t-test (one-sided) against norm-referenced AIMS values derived from infants born full term. Only Canadian norms were used for the evaluation of this cohort’s test scores. AIMS scores of the preterm infants were also compared using a one-sample t-test to other preterm cohorts. A p value of < .05 was considered statistically significant (van Haastert et al., 2006).
Results

Analysis showed that the mean AIMS scores of the preterm infants were significantly lower than those of the full term infants at every age level (van Haastert et al., 2006). After 12 months of age, the percentage of preterm infants who achieved a full score on the AIMS increased from 1.5% to 78%, demonstrating that even preterm infants can achieve full score at an early age (van Haastert et al., 2006). When compared to previously published studies including preterm infants with similar GA and birth weight, the current study’s cohort scores were either similar or significantly lower at different ages than the similar studies. Overall, this study identified significant differences in early gross motor acquisition of preterm infants when compared to infants born full term, even after correction of prematurity was made in full (van Haastert et al., 2006).

Discussion

According to the researchers, various studies have shown that motor development differs between preterm and full term infants; therefore it is questionable to compare motor development between the two (van Haastert et al., 2006). What van Hasstert et al. (2006) found intriguing was that the current preterm cohort displayed lower mean scores but higher standard deviations beyond 14 months of age. The preterm infants who scored in the bottom 25th percentile tended to fail mostly on two subscales: prone and standing. These items represent activities that require more postural complexity control and it is these infants who scored below the 25th percentile that needed careful attention and probable intervention (van Haastert et al., 2006).

Biological factors including deficient growth, brain maturation and other neurodevelopmental disabilities, low muscle tone and other muscle dysfunctions can
possibly influence the motor development of preterm infants. However, it is changing the environmental and social-emotional factors that may be the best way to influence the acquisition of early motor development in infants. According to van Haastert et al. (2006), “it is often assumed that preterm birth affects child-parent interactions and influences care-giving practices, expectations, and developmental disabilities” (p. 621). For example, it has been found that limited exposure to the prone position in full term infants and high equipment use at home have some influence on the rate at which motor development occurs (van Haastert et al., 2006). This could be similarly true for preterm infants who already have difficulty achieving skills that include muscle and postural control.

While biological factors will inevitably slow the acquisition rate at which infants achieve gross motor milestones, environmental factors such as placing infants in the prone position more often can be controlled. If exposed to the supine position more often than prone, infants born prematurely are more likely to develop positional plagiocephaly because of their lack of gross motor movement abilities. Although the results of this study cannot be generalized to all infants born premature, it is likely that this developmental trajectory is characteristic for this population (van Haastert et al., 2006). In order to further explore the characteristics and common causes of plagiocephaly, the next study provides information regarding sleep-positioning practices in relation to awake positioning and developing PP.
The Supine Sleep Position and Early Motor Milestone Acquisition

Research Question

The recommendation for placing infants to sleep supine has been associated with the change in caregivers’ sleep positioning practice and the age of acquisition that infants achieve motor milestones (Majnemer & Barr, 2007). This cross-sectional, observational study by Majnemer and Barr (2007) aimed to determine whether the supine sleep position was linked to motor skill delays in infants aged 4 and 6 months, and if the delays were associated with decreased exposure to the prone position. The SIDS rates decreased after the recommendation for infants to sleep supine but the research still points to the supine position as a cause for gross motor delays. “Authors have speculated that sleep position is associated with awake position, such that supine sleep-positioned infants would spend extensive periods in supine while awake” (Majnemer & Barr, 2007, p. 370). This may result in infants displaying a lower tolerance for the prone position, yet lack of exposure decreases opportunities to learn antigravity extension skills (Majnemer & Barr, 2007). Studies suggest that gross motor milestones at 4 and 6 months are most affected by the lack of prone exposure.

Subjects

The objectives of this study were to determine whether infants at 4 months and 6 months who slept supine were at risk for gross motor delays and if there was an association between daily exposure to the prone position and upright postures with motor performance (Majnemer & Barr, 2007). One group of 71, 4-month-old infants and a separate group of 50, 6-month-old infants were recruited from a community pediatric clinic in Montreal, Quebec.
Methods

Parents were given a brief questionnaire and a home visit within one week was made by an occupational therapist and a physical therapist to evaluate fine and gross motor skills of the infants. Only infants routinely placed in the supine position to sleep were recruited. Parents were given a diary to complete for three consecutive days during the week after recruitment to capture the infant positioning behaviors while awake and asleep. The physical therapist used the AIMS to measure the infants’ gross motor development in each group and was blinded to all information of the study. The occupational therapist used the Peabody Developmental Motor Scale (PDMS), “a standardized, psychometrically sound norm-referenced measure of gross and fine motor skills that are mastered or emerging” (Majnemer & Barr, 2007, p. 371). The scale was scored on a three-point scale “(absent, emerging, or present) but do not differentiate quality of movements” (Majnemer & Barr, 2007, p. 371). Multiple logistic regression analyses were used to determine whether there was a correlation between positioning practices and achievement of specific motor milestones with a p value of < 0.05 (Majnemer & Barr, 2007).

Results

Results showed that infants in the 4-month-old group were less likely to achieve antigravity extension of the neck and trunk skills when compared to a normative sample (Majnemer & Barr, 2007). The 6-month-old group, on the other hand, had slightly lower AIMS scores than the 4-month-old group and logistic regression analysis showed that awake time was positively associated with the achievement of independent sitting (p =
All infants were placed to sleep in the supine position to sleep consistently by the time of recruitment as confirmed from the parents’ diaries.

Taken from the 52 diaries sent back, an average of 42.6% of the 4-month-old group spent the day awake primarily being held, in supported sitting, or in the supine position (Majnemer & Barr, 2007). These infants were rarely exposed to the prone position, with 32.7% never being placed on their stomach while awake and 75% spending less than 20 minutes per day prone. Diary data was available for 36 of the 50, 6-month-old participants who were reported as being in the supported/unsupported sitting position, being held, or in supine 44% of their time awake (Majnemer & Barr, 2007). The exposure to the prone position was less than 20 minutes per day for 50% of the infants with 27.8% never being exposed to time on their stomachs (Majnemer & Barr, 2007). For both age groups, exposure to the prone position while awake was positively correlated with AIMS scores.

**Discussion**

Recent research has considered an infant’s sleep positioning to be associated with similar awake positioning and that supine sleepers will be delayed in skills such as rolling, tripod sitting, creeping, crawling, and standing (Majnemer & Barr, 2007). This may be associated with lower tolerance to the prone position due to infants’ preferred supine sleep positioning. The results of this study emphasize the importance of environmental contribution to the timing of motor development acquisition. Even five minutes, three or four times per day of prone positioning while awake can greatly benefit an infant’s gross motor acquisition, despite low tolerance. The knowledge that SIDS is not connected to amount of time spent in supine while awake should be made aware to
parents and caregivers to avoid motor delays. The fact that completely healthy infants often develop motor delays during infancy is an astounding realization of the impact environment plays in overall development. It is not considered as likely, however, for the healthy infants in this study to develop a gross motor delay as it is for infants diagnosed with plagiocephaly or brachycephaly as represented in the following study.

Examining Developmental Delays of Infants with Plagiocephaly and Brachycephaly

Research Question

The prevalent popularity of the supine sleeping position for infants to avoid SIDS has increased cases of deformational plagiocephaly and brachycephaly, or positional head deformities (Hutchison, Stewart, & Mitchell, 2009). In this study by Hutchison et al. (2009), infant head shape measurements and neck functions were assessed in a plagiocephaly outpatient clinic. The intention of the study was to review the different types of plagiocephaly and brachycephaly and their severities, and to evaluate the possibility for related developmental delays (Hutchison et al., 2009). Brachycephaly is defined as a flattening at the back of the head, whereas plagiocephaly can be described as flattening on any one side of the head, including the back (Hutchison et al., 2009).

Subjects

From May 2005 until August 2007, 287 infants (197 male, 90 female) ages 16-29 weeks were reviewed in this retrospective study, which only included data recorded at the first clinic visit with the participants. The pediatric outpatient clinic was located in Auckland, New Zealand at Starship Children’s Hospital.
Methods

To gain demographic information, medical history, history of plagiocephaly, and current infant positioning strategies, the parents filled out a questionnaire along with an Ages and Stages Questionnaire (ASQ) Second Edition according to the infant’s age (Hutchison et al., 2009). The neck range of motion (ROM) was assessed while each infant watched a colorful musical toy “taken to each side at eye level, from midline to above each shoulder, and noting if there was any limitation in active ROM” (Hutchison et al., 2009, p. 1495). To determine presence of brachycephaly or plagiocephaly, the cephalic index (CI, the ratio of the maximum head width to the head length) and the oblique cranial length ratio (OCLR, the ratio of the longest to the shortest oblique cranial diameters) was measured (See Figure 2.1). If the CI measured below 93% and the OCLR below 106%, the head shape was considered normal (Hutchison et al., 2009).

**Figure 2.1.** Picture of How to Measure the CI and OCLR. The center of the nose is indicated by the white arrow at the top of the picture; ear positions are indicated by the black arrows at each side. White lines indicate head length and maximum width, dotted black line is ear alignment indicator and black lines indicate oblique cranial lengths. In this example, CI= 96.0 and OCLR= 115.0 (Hutchison et al., 2009, p. 1495).
Results

The CI and OCLR measurements determined that 21% were only brachycephalic, 48% were only plagiocephalic and 31% were both brachycephalic and plagiocephalic. In the first 6 weeks of the infants’ lives, 92% had slept only on their backs with a significant difference between the cases (plagiocephalic, brachycephalic, or both) and noncases (no present head deformity) at 94% versus 84% (Hutchison et al., 2009). The neck muscle dysfunction seemed to dominate the plagiocephalic infants with 72% versus only 26% of the brachycephalic infants being affected and 64% of both plagiocephalic and brachycephalic infants experiencing similarities in neck muscle dysfunction.

In the ASQ completed by the parents, 64% showed no developmental delays while 36% had one or more delays. Forty-one percent of the infants with neck dysfunction had one or more delays whereas 29% of infants with no neck dysfunction had one or more delays. The greatest number of instances with developmental delays was in the gross motor domain with 18% of the infants, followed by 17% in problem solving, 15% in personal–social, 14% in fine motor, and 7% in communication. Neither severity nor type of deformation (i.e. plagiocephaly, brachycephaly or both) was associated with the presence of delays (Hutchison et al., 2009).

After reviewing and comparing the most dominant characteristics, no significant differences were found in neck dysfunction between the males, instrument-delivered infants, or firstborn infants, all prevailing characteristics represented in the participants. Instrument-assisted delivery infants were not significantly different in severity, side of flattening, or age at the time of referral. No difference in developmental delays appeared between such categories either, concluding that head shape deformities in infants may
have similarities between cases but there does not seem to be a vast majority of developmental delays related or causes besides repetitive positioning during sleeping, feeding, or play. New Zealand rarely uses cranial orthotic devices to correct deformational head shapes in infants therefore parents were advised to use alternative positioning strategies to correct the head shape issues (Hutchison et al., 2009).

**Discussion**

Much of the results in this study by Hutchison et al. (2009) do point to a case-to-case basis for infant plagiocephaly and brachycephaly characteristics, severity, and related developmental delays. A repetitive position placement or preference can cause a head shape deformation, or a gross motor delay can cause a head shape deformation. In severe cases, a cranial orthotic device can be used for early intervention and has been known to succeed in the United States. However, to avoid further deformation to the head shape, infants should be placed in the prone position, even if wearing an orthotic helmet. The pressure of gravity on the skull while in the supine position during infancy can create flat spots that may slow the acquisition of gross motor development. The motor development of infants diagnosed with PP is discussed further in the subsequent study.

**Motor Development of Infants with Positional Plagiocephaly**

**Research Question**

In a study by Kennedy, Majnemer, Barr, and Platt (2009), the effects of the supine positioning versus prone positioning was compared between infants diagnosed with positional plagiocephaly (PP) and matched peers without PP. The purpose of the study was to measure and compare the results of motor development tests to determine whether
infant positioning practices affect motor development. Kennedy et al. (2009) hypothesized that the infants with PP would be more exposed to the supine position while asleep and awake in contrast to matched peers without PP. A further hypothesis was to determine if the “preference for prolonged supine positioning would not only be associated with PP but would also be associated with the delay of motor development” (Kennedy et al., 2009, p. 225).

According to the researchers, while more recent research indicates that delayed development and poor head control are associated with plagiocephaly, the majority of the studies reviewed by the researchers did not examine the relationship between motor abilities and positioning strategies while the infant is awake and utilizing gross motor muscles (Kennedy et al., 2009). However, several of those studies have determined that infants who sleep in the supine position had delayed achievement of gross motor skills such as rolling and tripod sitting (Kennedy et al., 2009). “It is unknown whether infants with PP are at enhanced risk for delays in early motor development due to prolonged supine position,” (Kennedy et al., 2009, p. 225) but further research could provide additional evidence of the direct connection between the two.

Subjects

Fifty-four infants between the ages of 3 and 8 months participated in this study including 27 infants per PP group and matched peer group. There were 16 males and 11 females in both the PP group and the matched peer group without PP. Infants with PP were recruited into the study from neurosurgery clinics of the Montreal Children’s Hospital (Kennedy et al., 2009). Each of the 27 PP infants was matched with peers by
age (plus or minus 2 weeks), gender, and race through pediatricians associated with the hospital.

Methods

Motor skill achievement was measured using the AIMS as well as the gross and fine motor subscales of the Peabody Developmental Motor Scales (PDMS) (Kennedy et al., 2009). To measure the time spent in prone and supine positions, a standardized parental diary was kept in which parents were provided with instruction of how to complete the diary. Times calculated in minutes per day and averaged over three days showed the times spent in prone, supine, and other positions according to the parental diary (Kennedy et al., 2009). The AIMS and PDMS were administered by a physical therapist that had experience in administering and scoring both tests. The tests were conducted within each of the infant’s homes during the same week that the parents recorded the positioning for three consecutive days. Data analysis took place through the statistical package SPSS for Windows, version 11 where a was set at p < .05 (Kennedy et al., 2009).

Results

After scoring from the AIMS was analyzed, the mean percentile for infants with PP showed 31.1 plus or minus 21.6, and 42.7 plus or minus 20.2 for comparable infants without PP, an insignificant difference (p = .06) (Kennedy et al., 2009). Both of these scores were below the 50th percentile, as 18.5% of the PP group and 3.7% of the comparison group scored below the 10th percentile on the AIMS (Kennedy et al., 2009). The mean developmental motor quotient (DMQ) from the PDMS was 85.8 plus or minus

28
9.9 for infants with PP and 88.0 plus or minus 11.5 for the compared group, another insignificant finding (p = .38) (Kennedy et al., 2009).

With regard to the amount of time infants spent in each position, no significant difference was found between the two groups (Kennedy et al., 2009). On average, both sets of infants spent less than 30 minutes per day in the prone position while awake according to the times calculated from the parental diaries. In particular, 60% of the infants with PP and 36% in the comparison group spent five minutes or less per day in the prone position while awake (Kennedy et al., 2009). Determined through multiple regression analysis, time spent in prone position was the only factor that influenced the difference in AIMS percentile scores between the two groups (Kennedy et al., 2009). Both groups had similar scores from the motor tests, therefore motor development was found to be associated with the amount of time the infant spent in the prone position while awake in infants with PP and without PP (Kennedy et al., 2009). Infants with PP scored lower in motor development than the matched comparison group without PP if they spent less time in prone position (Kennedy et al., 2009).

Discussion

The American Academy of Pediatrics and the Canadian Pediatric Society have changed recommendations to include the need for increased prone, or “tummy time” when an infant is awake in order to develop prone motor skills such as extended-arm support, four-point crawling, and the transition to the sitting position (Kennedy et al., 2009). Perhaps with more widespread research, the topic of prone positioning versus supine positioning will become of great magnitude for new parents to avoid the growing statistics of PP diagnoses as well as early childhood educators. Such research could
undoubtedly benefit parents with premature infants and healthy infants as the research has implied. The following study discusses the management of plagiocephaly using two different treatment techniques.

**Management of Deformational Plagiocephaly**

**Introduction**

Plagiocephaly has been known to correct with either repositioning techniques and physical therapy or cranial orthotic therapy (helmets) (Graham, Gomez, Halberg, Earl, Kreutzman, Cui, & Guo, 2005). However, no studies have been done to compare the two different treatment techniques “with large enough numbers to provide evidence-based guidelines for treatment” (Graham et al., 2005, p. 258). Graham et al. (2005) compared repositioning with helmet therapy in the management of plagiocephaly in order to demonstrate that both treatments improve the condition when used properly along with physical therapy for the neck.

**Subjects**

Two hundred ninety-eight infants who were consecutively referred and treated for plagiocephaly at the Cedars-Sinai Medical Center participated in this study between January 1, 1994 and December 31, 2001 (Graham et al., 2005). Measurements for cranial diagonal differences (DD) were taken and compared before and after treatment of each infant along with size at birth and after treatment between males and females. Of the infants who participated, 70% were males and 30% were females. The mean age was 5.4 months and the mean length of treatment was 4.3 months (Graham et al., 2005).
“Each measurement was taken three times and averaged by one of two nurse practitioners. There were not significant differences in measurement between practitioners when measuring the same patients” (Graham et al., 2005, p. 259). The researchers’ target DD was identified in 36 healthy infants with an average age of 6.8 months as 0.3 cm (plus or minus 0.1). In other words, 36 healthy infants between the ages of 4 and 12 months with a DD of 0.3 cm was Graham et al.’s (2005) target measurement after treatment for infants with a DD measuring over 0.3 cm.

Methods

The cranial diagonal measurements taken to determine DD were done so using “anthropometric metal cranial calipers (B. Braun Medical Products, Aesculap Division, Tuttingen, Germany) as shown in the diagram” (Graham et al., 2005, p. 259) in Figure 2.2.

Figure 2.2. Picture of Infant with Torticollis-plagiocephaly. “This infant shows all key features of torticollis-plagiocephaly deformation sequence, with cranial measurements depicted on top of his skull, before initiation of helmet therapy at age 5 months” (Graham et al., 2005, p. 259).
Infants older than 6 months old with a DD greater than 1 cm were routinely referred for helmets because “this was the previous standard of care” (Graham et al., 2005, p. 259). For infants who were referred at or before 4 months old, treatment with repositioning was used. For infants between 4 and 6 months old, both repositioning and helmet therapy was offered to the parents to choose. They were then followed at monthly intervals to observe progress and promote compliance (Graham et al., 2005). “All infants with plagiocephaly had some associated torticollis, and they were treated with physical therapy and followed at monthly intervals” (Graham et al., 2005, p. 259). If the infants who initially received physical therapy and repositioning therapy failed to reduce their DD to less than 1.0 cm by 7.4 months old, they were then treated with helmet therapy (Graham et al., 2005). Their data was included in each treatment group for the period of time they spent using each therapy. “Statistical $t$ tests, using the SAS software package, were used to compare the effect of repositioning versus helmet therapy” (Graham et al., 2005, p. 259).

**Results**

The size differences in DD between males and females were determined not to be significant. The 176 infants who were treated with repositioning had a starting mean DD of 1.05 cm at a mean age of 4.8 months and their mean RDD (reduction in diagonal difference) was 0.55 cm (plus or minus 0.33). The 159 infants who were treated with helmets had a starting mean DD of 1.13 cm at a mean age of 6.6 months and their RDD was 0.71 cm (plus or minus 0.36). “The final DD for repositioning was 0.50 cm (plus or minus 0.37), versus 0.42 cm (plus or minus 0.28) for orthotic therapy” (Graham et al., 2005, p. 259). When compared to the target DD (0.30, plus or minus 0.1), the final mean
DD for the helmeted group was at 0.42 cm, not considered significantly different. In contrast, the repositioned group’s final mean DD was 0.50 cm and considered considerably more asymmetric. Overall, the mean percentage decrease in DD measurements for the helmet therapy group was 61%, whereas the repositioning therapy group was at 52%.

For the more severe cases that were referred early, repositioning was first used “followed by helmet therapy if they still had a 1.0 cm DD at an average age of 7.3 months” (Graham et al., 2005, p. 259). These infants reached a final mean DD of 0.40 cm after a mean of 5.1 months of overall therapy (1.94 for repositioning and 3.14 for helmets) (Graham et al., 2005). There were 37 infants who were unsuccessful with repositioning treatment (initial mean DD was 1.46 cm, treatment began at mean age 5.06 months old) who had a mean RDD of 0.56 cm by mean age 7.4 months old. At that time helmet therapy was initiated for 2.7 months before they reached the target DD of 0.40 cm. “Their improvement with repositioning was no different from our repositioning group, and parents were compliant, but the initial degree of plagiocephaly in this group was too severe to correct with repositioning alone” (Graham et al., 2005).

In order to evaluate the effect of age on helmet therapy, Graham et al. (2005) compared the outcomes of 44 infants who began treatment at 8 months old or older with the outcomes of 115 infants who began treatment before 8 months old. “The mean starting age of the younger infants was 5.8 months, with initial DD of 1.14 cm” (Graham et al., 2005, p. 260) and a mean RDD of 0.76 cm (plus or minus 0.36) was identified, resulting in their final mean DD as 0.37 cm (plus or minus 0.22) after treatment for an average of 4.4 months. In contrast, the mean starting age of helmet therapy for the older
infants was 8.6 months, with a mean starting DD of 1.10 cm, while the final mean DD was 0.51 cm (plus or minus 0.28 cm) after an average of 3.73 months of treatment (Graham et al., 2005). Overall, the percentage decrease in DD was significantly less in older infants at 51% when compared to the younger infants at 65%.

**Discussion**

The younger infants who were diagnosed with mild-moderate plagiocephaly were successful in their treatment of repositioning and physical therapy, and the earlier the therapy is introduced, the more successful the treatment will prove to be (Graham et al., 2005). However, Graham et al. (2005) state that there is little evidence that any type of treatment after the age of 12 months will provide any significant improvements. The researchers also stated, “Orthotic treatment does not restrict cranial growth but rather redirects subsequent cranial growth into a symmetric shape” (Graham et al., 2005, p. 261). The recommendations made by Graham et al. (2005) are that pediatricians attempt to identify and diagnose torticollis early and treat it with physical therapy. “In all infants, early encouragement of “tummy time” can help resolve postural torticollis, and early management of head position during sleep can prevent the development of aberrant head shapes” (Graham et al., 2005, p. 262). In addition, early and supervised tummy time promotes gross motor skill development as well as neck range of motion and can correct positional preference (Graham et al., 2005). Following this notion of promoting optimal movement using specific practices, the next study discusses the prevention of deformational plagiocephaly.
Prevention of Deformational Plagiocephaly

Introduction

Cavalier et al. (2011) sought to evaluate the impact of environmental circumstances “implemented at birth to encourage spontaneous and unhindered movement, together with usual supine position recommendation, on the prevalence of DP at 4 months” (p. 537). There have been numerous conditions that are often diagnosed when plagiocephaly is also present (co-morbidity). “It has been suggested that plagiocephalic infants have an elevated risk of auditory processing disorders, visual field abnormalities, and delayed psychomotor development” (Cavalier, Picot, Artiaga, Mazurier, Amilhau, Froye, Captier, & Picaud, 2011, p. 537). With the recommendations of the Back-to-Sleep campaign rising, there seemed to be a rising number of infants with deformational plagiocephaly (DP). However, Cavalier et al. (2011) state that, based on an observational study that indicated no link between the supine position and DP in 7 weeks old infants, exposure to the supine position is only a risk factor to developing DP “when combined with other factors like male sex, positional preference, limitation of active head rotation, low activity level at 4 months and/or negative environmental factors” (p. 537). Furthermore, a second study reviewed by the researchers found that there was not a rise in DP incidence when primarily utilizing the supine position as long as the infants had a setting that permitted “freedom of movement” (Cavalier et al., 2011, p. 537). The authors believed that controlled environmental conditions could help to prevent the skull deformity in early infancy.
Subjects

Between October 1, 2005 and July 30, 2006, 139 newborn healthy infants were included in this study (88 in the Intervention group and 51 in the Control group). The two different groups of infants were comparable on all sociodemographic points except for a male predominance in the Intervention group (n=50, 56.8% versus n=19, 39.6%). The infants were recruited from two cities in France: Sete (Intervention group) and Beziers (Control group), located 50 miles apart in order to avoid contamination bias. The cities were comparable in medical facilities and number of births (Cavalier et al., 2011). Infants were eligible to participate if their parents did not plan to move within 4 months after their birth and if the parents agreed to have their infant followed by a specific physician involved in the study. “Premature infants (<37 gestation weeks), infants from triple pregnancies, and those with orthopedic abnormalities (congenital torticollis, hip dysplasia, etc.), congenital malformation, or hospitalization in the neonatal period were excluded from the study” (Cavalier et al., 2011, p. 538).

Methods/Procedure

After birth, all infants participating in the study received a complete physical examination within the first 3 days of life and the parents were given the usual information about SIDS preventions strategies and car safety. “As usual in France, the parents received an individual health record containing this information” (Cavalier et al., 2011, p. 538). In addition, the parents of the Intervention group (born in Sete) received specific recommendations for their infants’ environment during an interview conducted between the first 1-3 days after birth (Cavalier et al., 2011). They were instructed to sleep their infants on their backs, as recommended by the American Academy of
Pediatrics, while alternating positions of the head during sleep. In addition, while the infants were supervised and awake, the parents were told to provide them with ample time in the prone position as well as limited time in car seats or other seating devices that maintain the supine position. “Complementary advices were provided, based on the concept of unhindered physical movement, and proposed that parents and caretakers create an environment and care practices that promote free and spontaneous movement right from birth” (Cavalier et al., 2011, p. 538) (See Figure 2.3).

The Control group (born in Beziers) also received a standard complete physical examination within the first 72 hours after birth and the parents were encouraged to an observational follow-up. The pediatricians had been previously trained to diagnose DP and used the same guide as the pediatricians in Sete (Cavalier et al., 2011). All infants

![Figure 2.3. Picture of Information Booklet Given to Parents in the Intervention Group (Cavalier et al., 2011, p. 538).](image-url)
from both groups had medical visits at 30 (plus or minus 5) days (M1), 60 (plus or minus 5) days (M2), and 120 (plus or minus 5) days (M4) after birth. The parents chose their infant’s primary pediatrician “who was not the same as the one who conducted the inclusion interview” (Cavalier et al., 2011, p. 538), but all pediatricians had been trained to diagnose DP and were also blinded to the condition.

During the medical visits at birth the infants were screened for “caput succedaneum, cephalohematoma, posterior flattening, positional preference and limited passive neck rotation” (Cavalier et al., 2011, p. 539). Cavalier et al. (2011) defined positional preference as “the condition in which the infant, in supine position, showed head rotation to either the right or left side for approximately three quarters of the time of observation” (p. 539) and the side preference was confirmed by the mother’s report. In order to assess passive head rotation, the pediatricians would stand behind the supine-lying infant, hold the head between the hands, and gently rotate it from side to side; any restriction or tightness in one direction or the other, or both, was documented (Cavalier et al., 2011).

At the follow up visits, the parents filled out a questionnaire about the infant’s environment and the researchers recorded number of hours of sleep (on the back, side, or stomach) and the type of bed used (crib, rigid baby carrier, and bouncer). To record environmental measure, the parents recorded the number of hours their infants spent awake in a playpen, on a play mat, and in a carrier or bouncer, included their infant’s positional preference and type of feeding used (bottle or breast). Using this information, the researchers developed “a mobility score (hours per day in a playpen, on a play mat, and in a carrier or bouncer when awake) and an immobility score (hours per day in the
carrier or bouncer when awake and asleep)” (Cavalier et al., 2011, p. 539). This provided evidence of if the parents were utilizing the environmental steps to truly encourage unhindered physical movement for their infants. A high score of mobility associated with a low score of immobility indicated that the steps had been implemented for the Intervention group (Cavalier et al., 2011). During the clinical examinations at M1, M2, and M4, the aim was to diagnose DP, limitation of passive head rotation, and positional preference.

**Results**

The results showed that the parents of the Intervention group fully complied with the recommendations to provide unhindered physical movement more often to their infants during the first 4 months of life. These infants spent less time in a bouncer and slept supine more often as well as more time on the play mat during awake time than the Control group. The amount of sleep time was the same for both groups. Interestingly, the Intervention group tended to spend less time on their tummy but they also spent significantly less time in a baby carrier or bounder while sleeping (p < 0.05) and when awake (p < 0.05) than the Control group during the third and fourth months of life (Cavalier et al., 2011). The Intervention group also spent significantly more time during the third and fourth months on the play mat while awake (whether it was prone or supine was not specified) (p < 0.05) (Cavalier et al., 2011).

Overall, immobility scores were significantly lower in the Intervention group in the first month, which was associated with higher mobility scores during the third and fourth months, which confirmed that these infants were more mobile during the first 4 months than the Control group (Cavalier et al., 2011). At M4 there were only 115 of the
original 139 who participated and 22 (19%) were diagnosed with DP, but the Intervention group had 2.3 times less risk of developing DP than the Control group “(13% versus 31%, p < 0.001), with a 66% reduction in relative risk” (Cavalier et al., 2011, p. 540). In addition, the infants who displayed no skull deformation at M1 and M2 but were diagnosed with plagiocephaly at M4 were lower in the Intervention group (22% versus 26.1%, p < 0.001) (Cavalier et al., 2011). In order to explain presence of plagiocephaly at M4, three variables were considered: positional preference in the first month, mobility score at the third and fourth months and the immobility score at the third and fourth months (Cavalier et al., 2011).

Discussion

What was surprising in this study was the fact that the Intervention group spent more time supine while awake, but in “unhindered” environments (not in bouncers, carriers, etc.), and they had lower incidences of DP than the Control group.

The Intervention infants were placed in conditions that encouraged unhindered movement 24 h a day and the measures to prevent SIDS were respected, since the proportion of infants positioned on their backs was even higher in the Intervention group than the Controls. (Cavalier et al., 2011, p. 542) While much of the research on plagiocephaly has pointed to the supine position being the main cause of the condition, this study pointed to other environmental variables that hindered the infant’s physical movement that in turn could cause the DP. “In our study, however, the association between this sleep position and DP at 4 months was not significant, confirming recent data in the literature” (Cavalier et al., 2011, p. 542). This study provided a specific example of what could and should be communicated to parents.
in order to promote healthy physical development for newborn infants. A fair assumption could be that what is lacking most in the cases of infants developing of plagiocephaly is parent education. To address this issue, the final study explores effective communication tools to help educate parents about optimal infant positioning.

**Conveying the Message of Optimal Infant Positioning**

**Introduction**

Jennings, Sarbaugh, and Payne (2005) stated that “It is the responsibility of medical and allied health care professionals trained in typical development to help parents understand the importance of varying positions of infants” (p. 4). While the Back-to-Sleep campaign was effective in changing sleep positioning of infants in America since 1994, there has been recent research that indicates that parents are not well educated about the value of the utilizing the prone position for their infants during playtime. Jennings et al. (2005) explored different communication tools health care professionals could use to help promote the importance of regular tummy time during infancy to new parents.

The purpose of the research was to “determine how the medical community could most effectively educate new parents about the importance of placing an infant in a variety of positions, including prone, when awake and supervised” (Jennings et al., 2005, p. 6). The researchers compared the use of video or a colorful brochure when presented to parents during routine information that was given by the family physician to determine which was most influential in choice of play positioning (Jennings et al., 2005). Based on this premise, the researchers made the following assumptions:
(1) All parents would receive verbal instructions about positioning a newborn from their pediatrician; (2) All infants would be placed in supine to sleep; (3) Because of the video or written information presented to the parents, infants would be placed more frequently in prone to play; (4) Infants who slept in supine but played regularly in prone would have more advanced motor milestones (as measured by Peabody Developmental Motor Scales, Second Edition [PDMS-2] at six months of age) than infants who played primarily in supine; (5) Normal motor milestones in six-month-old babies would include the ability to lift and control the head in antigravity flexion and extension. (Jennings et al., 2005, p. 6-7)

**Subjects and Grouping Methods**

With regard to participants, 113 infants total participated in this study. There were two different phases (Phase I, n=62 and Phase II, n=51 recruited) divided into five groups. Groups 1-3 were included in Phase I and then a follow up on all three of these groups were considered Group 4. Phase II consisted of Group 5. Parents were recruited by nurses of three different pediatric physician groups as well as one obstetric group in a Midwestern suburban county (Jennings et al., 2005). Early Intervention (EI) nurses also recruited several parents during Welcome Home visits. Of the original 113 recruited, “Parents of 78 infants complied with the request to bring their baby in for a developmental screening within one week of the six-month birthday” (Jennings et al., 2005, p. 7), making up the final sample (N=78).

The ethnicities of the families were mostly Caucasians (no percentage or number was indicated) with three African American families, one Estonian, and two Hispanic families. Socioeconomic status ranged from single mothers receiving supplementary
assistance to two-parent incomes, while parent education levels varied from non-completion of high school to doctoral degrees. Infants born prematurely were included in the study, with the greatest difference in adjusted age at 5 weeks premature for one baby. When evaluating these infants using the PDMS-2, an adjusted age was used that was calculated by exact age as the testing date “minus the birth date. The adjusted age was the exact age +/- days between due date and birth date” (Jennings et al., 2005, p. 10).

“Groups were categorized by type of positioning information received by the parents. Group 1 was considered the control group” (Jennings et al., 2005, p. 7). These parents (n=13 evaluated) participated in what the researchers considered the original study design in 2001-2002 because they only received information about positioning from their pediatrician’s office. Group 2’s parents (n=21 evaluated) were presented with a developmental video during a Welcome Home visit in 2001-2002 in addition to receiving information about positioning from their pediatrician. “Group 3 parents received a Welcome Home visit but did not watch the developmental video” (Jennings et al., 2005, p. 7), (n=10 evaluated). Group 4 (of the original 44, n=28 re-evaluated) was a follow up for all three groups (Control, Home visit/Video, Home visit only) in the spring of 2003 when the children were 18-months-old. Phase II was then implemented with Group 5 (n=34 evaluated) who received “a family-friendly informational brochure explaining suggestions for varying a new baby’s positions” (Jennings et al., 2005, p. 7). Data from Phase I and Phase II was then compared.

**Procedures**

To gain a baseline about positioning instructions, the researchers gathered surveys from the referral sources (Jennings et al., 2005). “The supine position for sleep was
consistently presented by pediatricians and all nurses” (Jennings et al., 2005, p. 9). Information regarding “tummy time” however, was not presented in a standard format used by these medical professionals. Some physicians reported that they did not communicate prone play to parents, while others suggested 15 minutes per day and others 45 minutes per day. “Most of the Early Intervention nurses distributed the SIDS Alliance brochure that commented on positioning for sleep and play and encouraged some tummy time each day” (Jennings et al., 2005, p. 9). The obstetric nurses indicated that prior to joining the study, they rarely provided parents with information about positioning and none of the professionals from all groups indicated that they offered suggestions for parents to help their infants become comfortable with the prone position or help when the babies would not tolerate the prone time recommended.

After the medical professionals recruited the original sample, the first contact the researchers had with the parents was by phone call at 5 months to set the appointment to assess the motor skills of their infants at 6-months-old. All of the 78 infants whose parents complied for the evaluation were assessed individually within one week of their 6-month birthday in a physical therapy clinic. If the parents could not travel to the clinic, a home visit evaluation was made. The evaluations were completed in one session for all infants except for two who were too fussy to complete it the first time and had to finish it another day.

The infants in Phase I were assessed using only the gross motor subtests of the Peabody Developmental Motor Scale-Second Edition (PDMS-2), while the infants re-evaluated in Group 4 of Phase I and all Phase II infants were assessed using both the gross and fine motor subtests of the PDMS-2. “During all assessments, parents
completed a survey designed to determine regularity of placing the baby to sleep in supine and to play in prone” (Jennings et al., 2005, p. 9). This data was used “to compare the effect of the educational information on the choices made by the parents” (Jennings et al., 2005, p. 9-10) because parents were also asked when they began implementing the suggested material from the brochure in Phase II.

In order to account for any deficits that may have come up during this process, the IRB (Institutional Review Board) who approved the study mandated that the researchers provide specific recommendations. Therefore, Jennings et al. (2005) demonstrated personalized play activities for all parents as well as verbally recommended positioning strategies to move their infants to the next step in development during each screening. “The researchers developed a follow-up report to send to parents and to the family physician summarizing the results of the PDMS-2, and restating the recommendations that had been demonstrated” (Jennings et al., 2005, p. 10).

**Instruments**

To assess the data, the statistical software program, SAS, was used. The videotape that was shown in Phase I was *Amazing Babies: Moving in the First Year* produced by Beverly Stokes. “The portion shown to the mothers included video images of babies from one to four months of age playing in prone and supine” (Jennings et al., 2005, p. 11). The informational brochure given to the parents was titled *Baby Development Information* that was “authored by the primary researchers to be an expedient visual means of communicating optimum positioning choices to parents” (Jennings et al., 2005, p. 11-12). The nurses in the pediatric offices and the EI Director reviewed the brochure before it was given out in Phase II. Topics covered in the
brochure included suggestions for a schedule of daily prone time, the justification for varying positions throughout the day, and helpful hints on how to adjust babies to the prone position when they were not tolerant. Parents received the brochure any time between pre-delivery and 2-months-old with a date recorded by the recruiter of when it was distributed.

Results

Jennings et al. (2005) stated that the central theme of this study was to determine the most effective communication tool to provide parents information about optimal infant positioning. The PDMS-2 scores used to determine the effectiveness of the education was a two-step process: first, to determine how the verbal, video, and/or brochure communication affected the choices the parents made with positioning, and second, to compare the regularity of the positioning choices with the motor skill development of the babies demonstrated from the PDMS-2 scores. Three different relationships within the results then emerged.

The first relationship consisted of comparing how the parents received the information (doctors, nurses, video, and/or brochure) and the answers from the parent surveys describing positioning choices during awake hours. This relationship showed that the percentage of prone positioning practiced by the parents increased with the addition of the Welcome Home visits and peaked when the brochure was given (P = .0001) (Jennings et al., 2005, p. 12). “The effect of the nurse visit was not significantly enhanced by showing a developmental videotape” (Jennings et al., 2005, p. 12).

The second relationship compared the adjusted ages of the children born prematurely and the positioning choices of prone play as co-variables with the gross
motor development scores. The infants in this group who were placed in prone more than once a day had higher average scores on the PDMS-2 than infants who were rarely placed prone (P = .0012) or placed in prone less than once a day (P = .0010). The average motor score of these infants placed in prone only once a day when compared to the infants rarely placed in prone was also significant (P = .0367).

Finally, the third relationship represented the longitudinal aspect of the study, comparing the positioning choices for prone play prior to six months of age with gross motor development at 18 months of age. Using the PDMS-2 scores, the data indicated that there were significant gross motor differences based on the amount of time spent in prone prior to six months. The babies in Phase I who were re-evaluated at 18 months had scores that ranged from 79 to 90. To compare, the average motor score for all infants who spent more than one time in prone per day before the age of six months was 84.9, while the average score for infants who spent less than one time per day in prone was 82.1. This was considered significant (P = .015).

Overall, the babies in Phase II were placed in prone earlier than those in Phase I, if at all. Seventeen of the 34 were placed in prone within the first week after birth in Phase II, while the babies in Phase I “tended to be placed in prone only after being seen by a Welcome Home nurse or the second visit with the doctor at approximately one month of age” (Jennings et al., 2005, p. 13).

Discussion

Despite Phase I infants not being placed in prone as early or as often as infants in Phase II, Jennings et al. (2005) noted a positive trend. Some of the infants in Phase I had poor motor development including limited development, poor antigravity head control in
flexion and supine, and presence of plagiocephaly. One was being treated by a physical therapist for torticollis and most parents in Phase I felt uncomfortable placing their infants in prone. “In fact, some parents actually stated that they feared SIDS if they ever placed the baby on the tummy” (Jennings et al., 2005, p. 14). On the contrary, all of the parents in Phase II who read the brochure were more comfortable about placing their babies in prone on a daily basis and very few had presence of plagiocephaly. These parents also mentioned hearing about “tummy time” from friends, family and magazines.

What became evident to the researchers during Phase I was that the parents were receiving this information on prone placement too late. These parents were not told to place their babies in prone until 2-4 weeks after birth during the Welcome Home nurses visits or at the one-month well child check-up. By the time these parents then implemented tummy time, their infants were not tolerable to the position, which in turn caused the parents to implement it even less. In contrast, the Phase II parents received the brochure as close to birth as possible. “The need for uniform information was also apparent from the inception of this project. No consistent information about ‘tummy time’ was presented by professionals in this study” (Jennings et al., 2005, p. 15).

The benefits of the information on the written brochure provided an integrated method of establishing a tummy time routine with examples such as “one to two minutes after each diaper change or nap, increasing the amount as the baby grew and became stronger” (Jennings et al., 2005, p. 15). In addition, it also offered answers to questions parents had about varying positions including how to avoid plagiocephaly, when to use equipment, and why sleeping supine was important. “The suggestion to incline the baby in prone with a small rolled towel under a baby’s chest may have increased tolerance of
the prone position” (Jennings et al., 2005, p. 15). Interestingly, a different positioning
problem emerged: “flat head backlash” (Jennings et al., 2005, p. 16). After one parent’s
first child developed plagiocephaly from what she believed was over exposure to the
supine position, she forbade anyone from placing her second child in supine. “As
expected, this baby lacked sitting balance, tummy strength, and righting reflexes usually
acquired from supine play” (Jennings et al., 2005, p. 16).

In general, the results of this study point to the significance of early parent
education about optimum positioning for infants and a preference for written material as
an educational tool. The brochure was something the parents could keep at home and
refer back to when they had a new question. The use of specific examples of when to
utilize the prone position as well as ways to help infants tolerate the position would
undoubtedly benefit any new parent. The question that remains unanswered is, why were
the pediatricians and nurse practitioners not routinely offering this information to new
parents? Thus in the current study the notion of prevention, intervention, and family
support regarding plagiocephaly was explored through two lenses: those of medical
practitioners and therapists were interviewed for the current study. In the next chapter,
Chapter Three, the methodology of the study conducted including a description of the
participants and instruments used will be described.
CHAPTER THREE

METHODOLOGY

Introduction

The purpose of this research study is to better understand the causes of and interventions for plagiocephaly from various health care providers’ perspectives including pediatricians, pediatric nurse practitioners, physical therapists, and occupational therapists working in the infant population. Through open-ended interview questions, the hope was to uncover common developmental factors that may be linked to the incidence and presence of plagiocephaly and how health care providers work together with parents and caregivers to prevent and/or correct plagiocephaly.

Participants

The participants of this study were at least 18 years of age or older and currently worked or have had years of experience working as a qualified pediatrician, pediatric nurse practitioner, physical therapist, or occupational therapist working with infants from local health care providers in Ventura County, California. Six participants from each category (pediatricians/nurse practitioners and physical therapists/occupational therapists) who provided consent were “interviewed.”

While the goal was to conduct all live interviews (audio recorded and transcribed), modification to this data collection method was required to accommodate the busy schedules of the professionals. Ultimately only half (n=6) of the participants were interviewed during face-to-face interviews. The other “interviews” consisted of email responses to the questions (n=3) and in three cases one doctor and two nurse practitioners preferred to hand write their responses and mail back to the researcher.
In the case of the six live interviews, one therapist asked not to be audio recorded and in another case, the recording device was not operating properly. In all cases, notes were taken during the interviews and this did not seem to compromise the data collections. However, it should be noted that in the case of the non-transcribed responses (n=2) no quotes were cited in the analysis because these could not be 100% reliable given the inability to check the recordings.

**Pediatrician/Nurse Practitioner Characteristics**

Two of the pediatricians were male and one was female, while all three of the nurse practitioners were female. The ages of the practitioners ranged from 33 to 73 years of age. Years of experience in their current position of employment ranged from 2 ½ years to 33 years. Their overall years of experience in the specialized fields of study ranged from 5 ½ years to 47 years.

**Physical Therapist/Occupational Therapist Characteristics**

The participants who worked as a physical therapist or occupational therapist in the infant population were both male (n=1) and female (n=5). Because the practices of their job descriptions consistently overlapped in nature, “therapist” will be used to describe both the physical and occupational therapist groups. The ages of the therapists ranged from 26 to 72 years of age. Years of experience in their current position of employment ranged from 2 ½ years to 28 years. Their overall years of experience in the specialized fields of study ranged from 2 ½ years to 40 years.

**Recruitment**

The participants were identified through a convenience sample because they were associates or acquaintances of personal contacts of the researcher, and then through a
snowball sample of colleagues identified by participants themselves. After interviewing the first two participants, more contacts were provided for the researcher from these interviewees for a total of 12 subjects who participated in the study (N=12). The participants were contacted via email (n=6) or in person (n=6) to ask for consent. A recruitment letter was used (see Appendix A) when contacting participants through email or in person (hard copy).

First, participants were given a short background questionnaire to be completed at their convenience prior to the interview (see Appendix B). With regard to the interviews that were not conducted face-to-face, the questionnaires were retrieved from the participants (n=2) by the researcher. This questionnaire included demographic information such as gender and age as well as their education and professional background and qualifications related to their health care field. Next, an interview was scheduled with each of the participants at his or her convenience (see Appendix C for interview questions). At the time of each interview (or sent via email/in person in the cases of the non-live interviews) a copy of the Bill of Rights was signed by each participant along with the consent form for the study describing the purpose and time requirements (see Appendices D and E). These forms were retrieved from the participants who did not participate in face-to-face interviews (n=2) by the researcher.

Four live interviews were audio recorded during face-to-face interactions and took approximately 15 to 25 minutes of their time, while two were not recorded due to participant request and the recording device not working properly. All participants received a $10 gift card to The Coffee Bean and Tea Leaf as a sign of appreciation for their contribution to the study.
Procedure

Human Subjects

The protocol for the current study was submitted to the Standing Committee for the Protection of Human Subjects at California State University, Northridge on November 6, 2012. The researcher received notice of committee approval on January 16, 2013 (see Appendix F).

Interview

A convenient time and setting was determined and agreed upon by both the researcher and each participant who agreed to meet for an interview (n=6, 50%). These settings included the doctor’s office, the Barnes and Noble cafe, Starbucks, and two special education schools, Douglas Penfield School and Dorothy Boswell School. At the time of the interviews, the researcher presented each participant with a copy of the Bill of Rights and consent form to sign. A copy of the interview questions was also placed in front of each participant prior to the interview to prepare them for the session. The researcher’s cellular phone was used as the audio recording device and placed on a table in between her and the interviewee. The researcher also hand wrote notes or typed on a laptop while the interview took place. The interview questions were written in an open-ended format in order to gain as much information as possible and to take advantage of asking follow up questions that may have arose during the interview process. Each group (pediatrician/nurse practitioner and physical therapist/occupational therapist) was asked a set of questions with slightly different nuances because of their differing backgrounds (see Appendix C). As mentioned earlier, each interview took approximately 15 to 25 minutes.
All identifiable information that was collected was removed and replaced with a two-digit letter/number code (e.g. P1, P2, P3, or T1, T2, T3) to represent the two different groups of participants (pediatrician/nurse practitioner and physical therapist/occupational therapist) and number of participants in each group. A list linking the code and the participant’s identifiable information was kept separate from the research data. All research data was stored on a laptop computer owned by the researcher that is password protected. The audio recordings were also be stored in a password-protected electronic file, then transcribed and erased at the end of the study. The researcher was the only person to have access to the study records.

**Instruments**

The instruments used in this study included a background questionnaire and a set of five interview questions and sub questions for each group of participants (Appendices B and C).

**Background Questionnaire**

To gain demographic information about each participant, the questionnaire included questions regarding their age range (18-25, 26-32, 33-40, 41-48, 49-56, 57-64, and 65-72) and gender (male or female). The subsequent questions about educational and professional background included: “Please describe your educational background post-high school. Include the college/university, field of study, and year you completed each degree.” “What is the title of your current job description?” “Where are you currently employed?” “How long have you been working in your current position?” “How long have you been working in your specialized field of study?”
Interview Questions – Pediatrician/Nurse Practitioner

In order to uncover common developmental factors that may be linked to the incidence and presence of plagiocephaly, and how health care providers work together with parents and caregivers to prevent and/or correct plagiocephaly, five questions were asked (Appendix C). The questions and sub questions asked when interviewing a pediatrician or pediatric nurse practitioner included: “1. Has plagiocephaly become a more common concern for infants? Why or why not? How much have you noticed an increase in occurrences, if at all, within the last 10 years?” “2. How do you define plagiocephaly? What are common characteristics? What seems to be the cause? When are you likely to first notice it?” “3. At a typical well-baby visit, what would you communicate to parents relating to preventing plagiocephaly? Promoting gross motor development?” “4. At what point do you suggest intervention? What are the most common intervention(s)? How often would you follow up?” “5. When you observe moderate to severe plagiocephaly, are there often other developmental concerns? Which developmental domains have been the most commonly connected when plagiocephaly is present? What strategies do you employ for helping parents understand the condition and the treatment? Do you notice any cultural differences among your patients?” If additional questions arose for the researcher due to the nature of the participant’s answers, they were asked and included in the transcription of the interview in chapter four (see Appendix G for transcribed interview responses).

Interview Questions – Physical Therapist/Occupational Therapist

In order to uncover common developmental factors that may be linked to the incidence and presence of plagiocephaly, and how health care providers work together
with parents and caregivers to prevent and/or correct plagiocephaly, five questions were asked (Appendix C). Due to the differences in background and profession, these questions slightly differed from those asked to pediatricians and nurse practitioners.

The questions and sub questions asked when interviewing a physical therapist or occupational therapist included: “Has plagiocephaly become a more common concern for infants? Why or why not? How much have you noticed an increase in occurrences, if at all, within the last 10 years?” “2. How do you define plagiocephaly? What are common characteristics? What seems to be the cause? When are you likely to first notice it?” “3. What would you communicate to parents relating to preventing plagiocephaly? Promoting gross motor development?” “4. At what point do you typically receive referrals for intervention? How do you typically treat the children for intervention? How do you typically support the family? How often would you follow up?” “5. When you observe moderate to severe plagiocephaly, are there often other developmental concerns? Which developmental domains have been the most commonly connected when plagiocephaly is present? Are there any special cases you might like to share with me to give me a range of the condition? Please do not include any identifying information such as first and last name. Do you find any language/cultural distinctions in the children/families? If so, what are they and how do you work with these differences?” If additional questions arose for the researcher due to the nature of the participant’s answers, they were asked and included in the transcription of the interview in chapter four (see Appendix H for transcribed interview responses).
Data Management

Each audio recording of the interviews were replayed and transcribed by the researcher one by one (see Appendices G and H). Once all of the transcriptions were complete, the researcher found prevalent themes within each of the group’s answers. In Chapter Four, each theme will be described within each group of participants as it relates to the study’s purpose. Chapter Five will then discuss the overall findings and interpretations of the data.
CHAPTER FOUR

RESULTS

Six participants from each category (pediatricians/nurse practitioners and physical therapists/occupational therapists) of professionals who provided consent were “interviewed” for this study (N=12). While the goal was to conduct all live interviews (audio recorded and transcribed), ultimately only half (n=6) of the participants were interviewed during face-to-face interactions. The other “interviews” consisted of email responses to the questions (n=3) and hand written responses (n=3).

Due to the small sample size (N=12) of this study, the data from the four different professions who participated (n=3 pediatricians, n=3 nurse practitioners, n=3 physical therapists, and n=3 occupational therapists) will be presented in two different data sets. First, the medical practitioners’ (pediatricians and nurse practitioners, n=6) data will be reviewed where similarities, differences, and prevalent themes were found from the interview questions including direct quotes. Next, the therapists’ (physical and occupational, n=6) data will be reviewed where similarities, differences, and prevalent themes were found from the interview questions including direct quotes. Similarities and differences between the two group’s responses will be identified during the second data set.

Medical Practitioner Overview

Increase in plagiocephaly incidences. With regard to the first question, “Has plagiocephaly become a more common concern for infants?” the majority of the medical practitioners believed it has (n=4), while one pediatrician reported that he had not been in practice long enough (8 years) since the Back to Sleep campaign to notice a difference,
and one nurse practitioner believed it has become a “norm” for infants. When asked to identify why it has or has not become more of a concern, the majority (n=5) mentioned the Back to Sleep campaign because that has become the recommendation since 1994 for new parents to sleep babies on their backs to prevent SIDS. As a spillover effect, placing babies on their backs had become the practice these practitioners were seeing while infants were awake as well as asleep (n=5). The amount of increase in occurrences of plagiocephaly among patients perceived by the professionals varied in response. One nurse practitioner indicated a 30% increase, while another stated it had increased, “since infants have been placed supine to sleep.” One pediatrician could not say because he had not been in practice for the past 10 years, while another indicated “a great big increase (along with decreased SIDS).”

**Definitions and characteristics.** In contrast, the definitions of plagiocephaly were all very similar, with the terms “misshapen” (n=3) or “flattened” (n=3) used to describe the skull. The consensus of common characteristics included a flattening of the back or sides of the head, and “possible deformity to the opposite sides of the head with possible asymmetry and position of the ears.” Similarly, all practitioners stated that what seemed to be the cause of plagiocephaly was due to positioning. “Mostly position and malpositioning of the head. Baby always on their [sic] backs even while awake and not getting enough time playing and exercising to get full range of motion of the head or neck.” “Not enough time in different positions/tummy time,” and “Inadequate changes in skull position in bed or car seat or swing set.” In addition, the majority stated that they would first notice plagiocephaly in the 2-6 month-old range (n=5), while one nurse practitioner was likely to first notice it around 6-8 months old.
**Communication to parents.** In order to prevent the onset of plagiocephaly and to promote gross motor development, all practitioners stated that they would communicate to parents to place their infants in different positions (other than their backs), specifically on their tummy. One nurse practitioner stated that she would “discuss developmental milestones [with the parents] and that infants need to be prone in order to scoot – leading to crawling,” while one pediatrician suggested that “tummy time when awake (for few minutes at a time for approximately 1 hour/day total time) and playing with baby using objects to each side of baby so as to have baby look/turn head and reach to each side” would be beneficial. Additionally, one pediatrician noted that infants should “sleep on back [sick] (supine)” and be “awake on belly (prone). Lots of being held and lots of play time/being mobilized – off the skull.”

**Interventions.** With regard to the most common interventions used, the proposed repositioning practices would be suggested (n=4) at the first sign of plagiocephaly appearing (n=1) or by 6 months if the condition seemed to be worsening (n=3). If the repositioning interventions did not seem to be improving the condition or if the practitioners suspected more serious conditions such as craniosynostosis or torticollis, helmet therapy (n=4) or physical and occupational therapy (n=4) would be referred for the infants. One nurse practitioner stated that if she had to suggest a helmet for intervention, then “there’s something else going on” and one pediatrician would only suggest a helmet if the parents were really concerned but rarely will he suggest it for his patients. Another pediatrician elaborated that the most common interventions for plagiocephaly would be “helmets if the diagnosis is based on positional plagiocephaly. Physical/Occupational Therapy for torticollis. Cranial X-rays and possible neurosurgery
consult for possible CT scan for concerns with craniosyntosis” and a third simply stated to implement “Back to Sleep; Belly play; play with and hold infant when awake.” At the well-child routine visits the majority of the practitioners would follow up (n=4), while every month or sooner was the other response (n=2).

**Developmental concerns and family support.** In response to other developmental concerns that may be present along with plagiocephaly, most of the practitioners (n=4) often associated it with gross motor delays or problems including “not scooting or crawling...in holding head up sustained, in rolling over” or neck range of motion (ROM) issues that could be related to torticollis, while one nurse practitioner had not personally dealt with very severe cases that involved further issues and another (n=1) was not aware of any. The strategies then most often employed to help parents understand the condition and treatment were mainly educating them about what the benefits were of the interventions and what the consequences could be if treatment was not utilized. One practitioner would “stress the importance of [sic] infant being placed prone when awake, to develop motor skills leading to crawling, stressing that crawling and creeping are related to learning how to read in early school years...” Two practitioners mentioned utilizing handouts or pictures, while two others used demonstration as a tool and one pediatrician said to “keep it simple: Emphasize, [sic] keep the head (especially the face) nicely shaped (pretty/handsome) and make baby stronger and ‘smarter’ through exercise/playing.” Even a little fear was believed to be a good thing, according to one nurse practitioner, “at a certain moderation” because “sometimes they’re [the parents] very laissez faire about it. If they don’t correct it, it could be a permanent problem so it’s something they have to do at an early age. So
sometimes I use a little scare tactics because you have to be realistic. I think people appreciate that. It also depends on the person.”

**Cultural distinctions.** Finally, when asked if they noticed any cultural distinctions or differences among their patients with plagiocephaly, all of the nurse practitioners (n=3) said yes. The emphasis on different cultural practices was expressed by two of the nurse practitioners, one stating that “Hispanic infants are wrapped tightly in shawls, preventing free movement of infant,” while the other stressed the importance of being “very respectful of that...because you don’t want to step on anyone’s toes.” On the contrary, all of the pediatricians (n=3) could not necessarily say there were cultural differences among their patients with plagiocephaly. One of the pediatricians did mention that he had never referred a Hispanic patient to get a helmet but that he saw plagiocephaly across all cultures, and another mentioned “a problem of non-English speakers ‘getting the meaning’ through translations.”

Interestingly, one of the nurse practitioners and one of the pediatricians both mentioned younger parents as being more likely to keep their infants supine (“I have noted that younger parents or first time parents tend to not do as much tummy time when awake. Likely due to lack of knowledge and experience.” Similarly, “younger parents allow infant to be supine so they don’t fuss if placed prone”). In addition, another pediatrician pointed out that “the lowest socioeconomic levels have so many stressors that this seems minor to them, until it appears moderate to severe. Some cultural groups pay little attention to skull shape as important, or even think distortions are not unattractive.”
Physical Therapist and Occupational Therapist Overview

Increase in plagiocephaly incidences. When the physical and occupational therapist participants (N=6) were asked if plagiocephaly has become more of a common concern for infants, the majority of the therapists (n=4) said yes, while the rest said no (n=2). In relation to the medical practitioners, four of the therapists mentioned the Back to Sleep program as the reason that plagiocephaly has increased, while one had not been in practice long enough (2 ½ years) to notice an increase with his patients. Two of the therapists also attributed lack of knowledge or treatment of the condition as a reason it has been seen as an increase over the past 10 years. “...I don’t know that it’s something that’s uniquely new I think that we just for many years it was probably untreated,” while one also stated that it was “due to the increase in premature infants surviving.” All of the therapists mentioned torticollis that often has co-morbidity with plagiocephaly (n=6) and two mentioned noticing a 25% increase (n=2) of torticollis incidences along with plagiocephaly over the past 10 years, while one therapist stated that there had been a “600% increase since it’s gone down 50” but provided no explanation of those statistics. However, a majority (n=4) had not seen a big increase of plagiocephaly in their patients within the past 10 years; one in particular because she has “only been working in the field for about four years.”

Definitions and characteristics. Similar to the medical practitioners, the common definition of plagiocephaly included “misshapen” (n=2) or “flattening” (n=4) of the back or sides of the head/skull. One of the most common stated characteristics was asymmetry (n=4) in the face, ears, or visual field. Interestingly, mention of the midline being shifted (n=1) and therefore distorted was also seen as a possible characteristic,
typically with torticollis and plagiocephaly. “...midline orientation so all of the things that are visual stimuli, all of that kind of things [sic] is affected so you know your perception of things is different.” In addition, neck range of motion (ROM) for plagiocephaly when torticollis was present was also mentioned as a characteristic \( n=1 \) along with “usually delayed motor development, muscle tightness, and/or more prominent use of one side of the body (such as in hemiplegia).”

With regard to the cause of plagiocephaly, two main themes emerged: the presence of torticollis caused the plagiocephaly due to lack of ROM in the neck \( n=5 \) and containment in utero due to lack of room for the baby to continue growing \( n=2 \). There was also mention of the sleep position and fear of SIDS \( n=1 \) as a factor for plagiocephaly forming on its own, regardless of another condition being present in the infant. “…I think there just needs to be a lot of education right when the babies are born because the unfortunate thing is when you’re a new mom, no one wants to hear their babies cry so they spend so much time on their back and they’re not exploring like they normally do...because they’re out on their back...” In addition, “delayed movement, lack of environment to encourage movement” \( n=1 \) was also attributed.

**Communications to parents.** Therapists indicated that plagiocephaly was generally first noticed at 2-3 months of age \( n=5 \), or right after birth \( n=1 \) if the head was starting to flatten. However, the pediatricians were attributed to providing the initial referrals the therapists would receive \( n=4 \), which could put off services and therapy for the infants. In those instances, it could be up to 22 months before the infants are receiving therapy \( n=1 \). Parents were also seen as either proactive \( n=1 \) in finding services for their infants, or neglectful \( n=1 \). In relation to the medical practitioners’
communication to parents about preventing plagiocephaly, however, tummy time emerged as the number one recommendation (n=5), along with repositioning of the head and/or body (n=4) and repositioning of the cribs, changing tables, or breastfeeding sides (n=3). One therapist simply stated that tummy time is “an underused activity.” Similarly, tummy time was viewed as the most valuable recommendation to parents (n=5) to promote gross motor development, along with knowledge of gross motor milestones (n=2) in order for the parents to provide them with opportunities to meet these milestones.

**Referrals and interventions.** Therapists reported receiving referrals for new patients between 4 to 13 months of age. For the therapists who worked for California Children’s Services (CCS) (n=4), the new policy for infants with torticollis was “that the children had to be considered to have a chronic condition, which is treatment for 6 months” in private therapy before they could be referred to CCS therapists. Therefore, they were receiving new patients with this condition later than they used to. In response to the question of how they typically treat the children for intervention, three themes emerged. First, certain stretches were used for torticollis (n=5) in order to provide better neck ROM (range of motion) and to improve strength of muscles (neck, large motor). Second, parent education about relieving the pressure of the head for the side where plagiocephaly was present (n=4) by using positioning practices including tummy time, and toys was mentioned. Finally, orthotic helmets were attributed to treating the plagiocephaly (n=3).

Family support came mainly through teaching (n=6) with handouts, demonstrations and explanations, referrals for helmets, and “positioning devices like
wedges, placement of different things as far as toy placement...” Once or twice a week was the most common frequency (n=5) the therapists would meet with the younger children for treatment, or as frequently as possible depending on the parents’ schedule (n=2) and some may even make home visits (n=1).

**Developmental concerns.** With regard to other developmental concerns that may be connected to plagiocephaly, fine and gross motor as well as visual/perceptual issues (n=4) were stated as the most common. “Motor is definitely [sic] you notice the first, fine motor and gross motor. [With] the typical population, not the severe, the visual issues don’t seem to be an issue. More moderate to severe.” In addition, cerebral palsy may also be connected to plagiocephaly (n=2) along with other muscular and neurological issues. Midline shift (not being able to cross their hands and arms over the midline of their bodies) was also mentioned (n=3) as an issue these children might develop because their bodies orient to one side over the other. Infants born prematurely were also mentioned as a concern (n=1) “due to lack of movement.”

**Special cases.** The special cases shared ranged in diagnoses and experience. One therapist spoke about a child with facial asymmetry and plagiocephaly who ended up having a more severe case including craniosynostosis where his cranial sutures had closed prematurely. She also suspected the child might be on the spectrum for autism (another example of co-morbidity). Another therapist had a child with plagiocephaly and torticollis along with the inability to cross his midline, causing perceptual issues, “…there’s a research therapist who’s specialty is torticollis who has found that these children have learning disabilities, which was a possibility with this kid, he actually did have some challenges in that area…” Because their vision was unique, or distorted from
what was normal, they actually saw differently and had a hard time lining up mathematics problems or reading across the lines of a book. Finally, another therapist saw an infant who had a helmet but the mother felt her daughter’s head was getting worse so after two months she found a new orthotist. This resolved the infant’s plagiocephaly and improved her torticollis and at 18 months of age she no longer needed treatment.

**Cultural distinctions.** In general, a majority of the therapists mentioned working with Spanish speaking or Hispanic clientele (n=5) but none of participants’ answers indicated that there were specific cultural practices that were associated with the presence of plagiocephaly (n=6). “I’ve seen it all across the board in all cultures.” Interestingly, low socioeconomic status was associated more frequently with the condition (n=3). This was also seen in the medical practitioner’s response (n=1). If there were language barriers, however, a translator would be utilized (n=1). Also in comparison to the medical practitioners, a mention of the parents’ age and education (n=1) being a factor, specifically for older parents, was identified. “It just really depends on the age of the parents, regardless of their nationality because I think the older you are, the little more set in your ways but not always and sometimes you’re more educated and it’s a lot easier but I would say a lot of families now that I’m getting who are not Anglo are really a lot more educated with their kids...” In addition, another therapist pointed to families as individuals because “it has to do with who they are; if they are attentive parents, changes happen.” In the final chapter, themes identified from the data will be interpreted and discussed to provide implications for future policy and research.
CHAPTER FIVE

DISCUSSION

The Back-to-Sleep campaign has been associated with a dramatic increase in the diagnosis of positional plagioccephaly (Cavalier et al., 2011; Graham et al., 2005; Hutchison et al., 2009; Kennedy et al., 2009; Persing et al., 2003). “The increasing incidence of deformational plagioccephaly is likely related to the recommendation of the American Academy of Pediatrics (AAP) and others that infants be placed on their backs to sleep” (Persing et al., 2003, p. 199). According to Graham et al. (2005) this recommendation “decreased the prevalence of prone infant sleeping from 70% in 1986 to 10.5% in 1997 and decreased the incidence of SIDS from 2.6 per 1,000 in 1986 to 1.0 per 1,000 in 1998” (p. 258). “However, concurrent with the rise in the supine sleep position has been a reported rise in the prevalence of positional plagioccephaly” (Hutchison et al., 2009, p. 243). While some of the health care professionals interviewed for this study did not personally see an increase, the numbers show a definite connection between sleeping position, decreased SIDS and increased plagioccephaly.

As noted earlier, prior to 1992 (when the Back to Sleep campaign emerged), positional plagioccephaly (PP) in North America was only reported in one out of 300 births until the establishment of the Back-to-Sleep recommendations (Kennedy et al., 2009). In one medical center there was a “six-fold increase from the years 1992-1994” (Persing et al., 2003, p. 199) in the diagnosis of plagioccephaly. In 1996 a study revealed an increase in the rates of PP incidences from one in 300 to one in 60, while today studies allude to incidence rates as high as 48% in infants considered healthy (Junior League of Erie, 2008). In addition, according to Cavalier et al. (2011), “the prevalence of DP
[deformational plagiocephaly] in healthy singletons is 13% at birth, 16-22% at 6 weeks, and 19.7% at 4 months” (p. 537).

With this knowledge of the dramatic increase in the occurrences of plagiocephaly, this thesis explored the causes, diagnosis and treatment of this medical condition in infants. Using a convenience sample, six medical practitioners and six therapists who worked in the infant population were interviewed. From their expertise, common themes emerged regarding prevention and intervention strategies that could be utilized for every infant to avoid the onset of plagiocephaly. In this chapter, themes from the medical practitioners responses as well as the therapist responses will be discussed. The following topics that emerged from the interviews will be discussed first with related information from the literature, and then followed by interpretations, reflections, and questions from the researcher: 1) prone to play and repositioning, 2) the development of the whole child including crawling and brain development, learning disabilities and co-morbidity, and 3) intervention including the use of helmets and parental characteristics that affect intervention. Finally, a section regarding implications for policy and research will discuss the significance of parent education, the role of medical education, the role of infant caregivers, and public awareness of plagiocephaly.

**Prone to Play and Repositioning**

A common theme throughout all of the research and interviews presented has been the significance of exposure to the prone position for all infants to reduce the risk of developing plagiocephaly. The consistent positioning of infants on their backs (supine) has been associated with the delay of motor skills as well as the increase in plagiocephaly. While the Back-to-Sleep movement may have been a contributing factor,
the positions infants are placed in throughout the day while awake seem to have a major role as well. For example, one pediatrician stated the cause of plagiocephaly seemed to be “inadequate changes in skull position in bed or car seat or swing.” Cavalier et al.’s (2011) study on preventative practices to deformational plagiocephaly showed that infants of parents who received additional information on the benefits of free and unhindered movement for their babies spent less time in bouncers, swings, and carriers, which consequently, caused them to become more mobile than the control group of infants at 4-months-old. While infants are lying on their backs under a mobile on the floor to play, sleeping in swings, or are being left in car seats for long periods of time allows constant pressure to be placed on their soft skulls.

**Tummy Time**

Instead, babies should be given opportunities for free movement with an abundance of prone, or tummy time, to promote neck range of motion and upper extremity strengthening, according to the interviewees. This was a major consensus for the common prevention and treatment of plagiocephaly among the practitioners and therapists (N=12). As one therapist simply stated: tummy time is “an underused activity.” Another therapist believed that new mothers do not like to hear their babies cry, therefore “they spend so much time on their back and they’re not exploring like they normally do...because...they don’t like being on their stomach so then moms don’t do it.” One pediatrician suggested “tummy time when awake (for few minutes at a time approximately 1 hour/day total time)” while one nurse practitioner communicated, “to place infant prone when awake, frequently or as long as the infant doesn’t fuss.”
The comments by the practitioners and the therapists (N=12) were reflective of the current literature. As described in Chapter Two, current research suggests prone to play is the most beneficial prevention and intervention strategy to promote gross motor development and avoid plagiocephaly (Bialocerkowski et al., 2008; Cavalier et al., 2011; Graham, 2006; Graham et al., 2005; Hutchison et al., 2009; Jennings et al., 2005; Kennedy et al., 2009; Majnemer & Barr, 2005; Persing et al., 2003, Pin et al., 2010; van Haastert et al., 2006). Gradually increasing the amount of time the infants stay in prone during one timed play activity would encourage longer tolerance of tummy time.

Yet despite the Back-to-Sleep recommendations, one therapist believed that supervised sleep time on the stomach was a good thing. Another therapist mentioned that to help parents and babies feel comfortable with the prone position, “the first way I teach them how to do it is to slouch back in a chair and put them here [on chest] because it’s the same position and so they get used to it.” This could be utilized for napping as well as interacting during play time in order for parents to feel more comfortable and infants to become familiar with time in prone and consequently, the babies can work their upper extremity muscles. Simple examples such as these could be communicated to parents who do not know much about the prone position’s benefits.

Repositioning

Another important variable that emerged regarding the way in which parents are instructed to help their infants with plagiocephaly was repositioning. Eight of the 12 participants interviewed communicated that repositioning of the head or body would be a common prevention and/or intervention strategy to relay to parents. Nonetheless, do parents understand what medical professionals mean when they are told to reposition
their infants? Do the practitioners or therapists provide demonstrations along with explanations? Two therapists and three medical practitioners said that demonstrating was a common strategy used to support the family, explaining “by show and tell with either my own head and neck or the baby’s” or putting “our hands over theirs and show them.” However, these are only practices of a few individuals. When asked the same question, two therapists and one nurse practitioner mentioned that they offered handouts to parents, while the rest of the participants (n=4) used verbal explanation.

What if the parents do not feel comfortable asking for clarification when they do not fully understand the interventions suggested? What does repositioning really mean and how often does the infant need to be repositioned? These are answers that should be provided for the parents if repositioning is to be employed at home. According to Jennings et al.’s (2005) research on the most effective communication tools for parents to understand optimal positioning for their infants, the brochure given to parents as early as possible (pre-birth or during the first month of life) was the most effective teaching tool. It was also found in Cavalier et al.’s (2011) research that the brochure (Figure 2.3) given to the intervention group was more effective in parents practicing optimal positioning to prevent plagiocephaly. In addition, specific toys, devices and stretching practices were mentioned by all of the therapists in this study including wedges, kinesio taping (an elastic tape used to support joints and muscles without affecting circulation often used by athletes), side lying and propping the infants up onto their sides, moving the head/neck to different positions, stretching the neck, and moving cribs, changing tables, and feeding positions to counter the side of the head that is preferred and flat.
This may be practical for therapists to use during therapy but what if parents are not able to acquire these devices or toys? The practices suggested, however, are attainable but require proper explanation and demonstration for parents to understand the benefits. It seems that written information in the form of handouts (as long as they are clear and realistic suggestions) and physical demonstrations may be the most useful for parents to recognize how to apply it at home. But are these the most effective explanations for parents to fully understand the development of the infant as a whole?

The Whole Child

What became evident while reading the medical practitioner interviews was the difference in knowledge and approach to providing the family with advice regarding effective infant care practices. The more experienced “veteran” doctor kept the message simple, encouraging parents to hold, play with, and love the infant. “Lots of being held and lots of play time/being mobilized – off the skull...Play with infant, pick up, talk and sing with infant, read; no TV/video.” There was rarely mention of “repositioning” but rather a focus of the interactions that should ideally come natural to parents and children. This would seem to be most understandable to parents when communicating how to best promote not only physical development but also overall growth in every developmental domain. Hutchison et al.’s (2009) study sought to determine developmental delays that may be associated with the presence of plagiocephaly and brachycephaly particularly because there are often other concerns related to these conditions.

If this is generally the case, medical professionals should be considering the infant’s whole development when making suggestions to the parents. It may be easy to forget when treating an isolated condition that other aspects of development will
ultimately be affected through specific intervention strategies, but this one doctor interviewed in this study proved that keeping it simple and instinctual could be most understandable in helping infants thrive. This is not to say that the other professionals are not as educated or helpful in their prevention advice whatsoever, but rather, is the social-emotional aspect missing from current medical education these days? Is this whole child view something that is learned from decades of experience interacting with families and children? This seems plausible, as another fascinating revelation was discovered when reading another veteran nurse practitioner’s responses – particularly regarding crawling and brain development.

Crawling and Brain Development

What was found to be immensely interesting and educational through one of the nurse’s interviews was a connection between crawling and brain development, specifically reading skills. When asked what strategies are employed for helping parents understand plagiocephaly and the treatment, she responded:

I stress the importance of infant being placed prone when awake, to develop motor skills leading to crawling, stressing that crawling and creeping are related to learning how to read in early school years, many need extra help in school regarding reading.

Upon reading this response further research was done to learn more about this connection. While current research could not be found on the topic, there was not recent research disproving it either. Therefore, it could be that the past investigations on the connection of physical movement and brain development are still recognized as accurate.
According to Corso (1997), a longitudinal study revealed a link between developmental movement levels and academic learning levels in young children.

The relationship between movement education and academic education is based on the assumption that both realms of learning are dependent on the adequate development of the brain and nervous system. The development of the brain and nervous system reaches mature motor patterns through use. Large muscle patterns that we teach in physical education classes help develop the brain and nervous system through the myelination process and by increasing the number of dendrites on the neurons. The logical process to developing the physiology of the brain and nervous system is to start with large muscles (walk, run, throw, etc.), and continually develop and fine tune the small muscles (writing, reading, etc.).

(Corso, 1997, pp. 6-7)

Before children learn to walk and run, they must learn how to crawl and while crawling, both sides of the brain are working together to perform the task. The right hemisphere of the brain controls the left side of the body and the left hemisphere of the brain controls the right side of the body; the sagittal midline divides the body into the right and left sides (Corso, 1997). Therefore, “the two hemispheres of the brain need to communicate to each other to coordinate the mature motor pattern” (Corso, 1997, p. 7) in order for crawling to happen.

Similarly, this same kind of left and right brain communication is needed when learning to read. “In order to read, a person must use the left side of the brain to sound out words and analyze thoughts, he must also use the right side of the brain to remember sight words and visualize what the author is describing” (Corso, 1997, p. 10). This
research has proven that certain kinds of physical activity, such as crawling and walking, help the two sides of the brain work together, and a shocking 75% of students diagnosed with learning difficulties never crawled (Corso, 1997, p. 10).

If parents were aware of this integration between systems of motor and cognitive development, the importance of reaching gross motor milestones would likely be amplified. In this regard, gross motor development begins with exposure to the prone position in order to begin crawling, which could also prevent the development of plagiocephaly. Similar to these two experienced medical practitioners, many of the therapists (n=3) credited possible learning disabilities when torticollis and plagiocephaly are present in infants, demonstrating they understood the full effects the condition could have on the whole child.

**Learning Disabilities**

When asked if there are often other developmental concerns when plagiocephaly is present, three of the therapists specifically mentioned later learning disabilities as a connection. One suggested that, “literature shows that they’re showing learning disabilities later on in life...” In particular, two therapists mentioned vision affecting mathematics and reading skills relating to children with torticollis and plagiocephaly. Another offered,

There’s a research therapist who’s specialty is torticollis whose found that these children have learning disabilities...they do have learning challenges because their vision is unique and so they actually see the world differently; so math is one of the areas they have trouble because if you’re vision isn’t centered, then when you
are writing down things [sic], you don’t line up math appropriately and so that’s a perceptual issue.

Here again, the same was said to be true for reading. As one therapist noted, “Another challenge these children have because they don’t cross midline is that they may not be able to read well because their eyes actually jump all the way over to the end of the page every time and they kind of skip...” words and sentences. Their brains cannot process information when they are required to cross midline using their vision. According to Corso (1997), “each eye has six muscles that need to be exercised to develop motor patterns before visual tracking reaches mature motor patterns” (p. 8). This means that visual tracking occurs when “a child can visually track a sentence from left to right and then left to reset and to track from top to bottom” (Corso, 1997, p. 8).

The mention of inability to cross midline, midline shift (orienting to one side or the other, causing midline to be distorted, or slanted, and not straight), or asymmetry/favoring of one side of the body was prominent in five of the six therapists’ responses. Because plagiocephaly and torticollis may affect one side of the body and cause asymmetry in facial features, the perception for an infant with these conditions would undoubtedly be affected. There was reference from two therapists that they had treated a child with a slight slant in vision perception (usually due to torticollis) that did not feel normal unless they were looking at slant. Bialocerkowski et al. (2008) reiterated that recent research suggests that infants with PP may also be accompanied by other developmental difficulties such as cognitive and psychomotor that could carry over into the primary school years. All of this would likely affect the way children perceive visual cues often caused by a connection of plagiocephaly to a secondary diagnosis.
**Co-morbidity**

Another common theme among the therapists was the notion of co-morbidity, or the presence of a secondary condition that was commonly connected to plagiocephaly and vice versa. The most common condition that the physical and occupational therapists saw along with plagiocephaly was torticollis. According to Öhman, Nilsson, Lagerkvist, and Beckung (2009), infants with torticollis are at a greater risk for developing motor delays including gross and fine motor. One of the therapists stated that physical and occupational therapists do not treat plagiocephaly – rather the therapists commonly focus on treating muscles and ways to alleviate pressure from the head. Torticollis is often the diagnosis therapists treat and plagiocephaly is the secondary condition. However, the therapists reported that the torticollis was what seemed to cause the plagiocephaly due to inability of the infants to move their necks properly. If treated early, however, torticollis along with plagiocephaly could be improved and even completely resolved as mentioned by one therapist. In addition, according to Cavalier et al. (2011), there are numerous conditions that are often diagnosed when plagiocephaly is present including “auditory processing disorders, visual field abnormalities, and delayed psychomotor development (p. 537). That is why early intervention is imperative to avoid onset of these difficulties in children who may be at risk.

**Intervention**

One of the biggest differences between the two health care professional groups’ (practitioners and therapists) experiences was the timing of when they see and treat the children. Because pediatricians are some of the first adults to diagnose infants they have the power to identify any early onset of conditions, including plagiocephaly. Two
months old or even earlier is when plagiocephaly can begin to form if it is not present at birth. Between 2 to 4 months old was the range that all (n=6) medical practitioners mentioned they were likely to first notice plagiocephaly forming. This means that pediatricians and nurse practitioners have the ability to inform parents who may not know the optimal balance of prone and supine positioning, and help them begin the appropriate intervention, whether at home on their own or with a specialist, if needed.

In contrast, the age range of referral to therapists was between 3 months to one year. This represents the range of timing between diagnoses to treatment. The timing for any given child depends on how severe the child’s condition is and if there are further diagnoses of separate conditions (such as torticollis) along with plagiocephaly.

What can be done between the first observations of plagiocephaly to prevent the need for therapy? Perhaps there could be a more thorough or detailed approach to help parents understand the importance of time spent in prone in order to strengthen infants’ muscles. Because if at home intervention or outside therapy is not utilized to treat plagiocephaly and/or a secondary condition, the condition(s) could become more severe. According to one nurse practitioner, plagiocephaly “shouldn’t be a permanent defect” because if the parents are really good at applying intervention strategies at home, it will resolve. This was the same notion stated by Bialocerkowski et al. (2008): “Infants may have altered skull shapes at birth and this is thought to revert to normal in the early postnatal period” (p. 577). If it does not resolve and becomes more severe, intervention beyond that, such as using a helmet to reshape the head, would be needed.
Helmets

A common intervention strategy that was prevalent with the therapists’ interviews was the use of helmets. An orthotist specializes in constructing artificial limbs and orthopedic devices for people with body deformities and disorders (MHA Health Career Center, 2004). This includes helmets for children to reshape their skulls. More than one therapist (n=2) mentioned that children need a “good” orthotist because if the helmet is not made correctly, it will not be effective. There was also mention by one therapist that the development of helmets has brought more attention to the issue of plagiocephaly itself and therefore, it has become more common to see an infant wearing a helmet.

However, it was also noted by one nurse practitioner and one therapist that helmets are only used in severe cases of plagiocephaly and even one pediatrician said that he does not like to refer patients for helmet therapy unless the parents are overly concerned. The same nurse practitioner stated that, in her opinion, if infants have to wear helmets, “there’s something else going on.” In other words, there is a reason they cannot resolve the plagiocephaly without the helmet because there is probably another factor keeping them from reaching gross motor milestones that keeps them on their heads. In the study done by Graham et al. (2005), helmet therapy was found to be slightly more effective with a 61% decrease in diagonal differences of the infants’ heads when compared to repositioning therapy at 52%. This study provides evidence that despite other factors, helmet therapy can be successful in treatment for severe cases of plagiocephaly. Nonetheless, what if these factors are associated with parental characteristics that keep them from understanding or implementing proper infant care practices?
Parent Characteristics that Affect Intervention

Language. While the last question of every interview was about any cultural distinctions that medical practitioners and therapists may see among their patients to determine if plagiocephaly was prevalent among certain cultures, the dominant answer was no. The majority of the participants (n=4) worked with large numbers of Latino families but still stated seeing plagiocephaly across all cultures. What did emerge as significant was the possible language barrier associated with the Spanish-speaking group. Four of the therapists and one pediatrician mentioned that if the parents do not speak English that a lot of information gets lost in translation and that could be why proper practices are not being utilized. A translator would be used (n=1) if needed and hopefully this would be sought out in all incidences. Otherwise, handouts in both English and Spanish (and possibly other languages depending on the geographic area and predominant ethnicity) would be a beneficial solution so this information could be relayed to every new parent. As mentioned before and demonstrated in Cavalier et al. (2011) and Jennings et al.’s (2005) studies, handouts or brochures were effective in educating parents about positioning practices for their infants.

However, the use of brochures in previous studies did not focus on the literacy rate of the home language. Many immigrant families in the Ventura area, where the study was conducted, have had limited access to formal education in their home countries, and thus may not have a literacy level that would match the technical nature of the plagiocephaly condition. Any translated versions of such materials should be field-tested for clarity and comprehension among the target group(s) and then modified accordingly.
**Socio-economic status.** A second parental factor mentioned by three therapists and one pediatrician was low socio-economic status (SES) and its effect on parents’ abilities to acquire resources, therapy/services, or transportation to get their children services. One therapist stated: “It takes a lot out of their day, their time to get here because not everyone has transportation. We have some moms who take three buses to get here and don’t have a lot of funds and sometimes don’t have phones and things like that.” Another therapist brought up the possibility of a mother with low SES not being able to provide her daughter with proper health care or in a timely manner, which could have caused delay in diagnosis and therapy referral. The third therapist simply stated that, “some families cannot commit to therapy due to socio-economic status.” All of these issues would affect the infants’ abilities to receive services and their parents’ abilities to acquire knowledge to help their babies in a timely manner. Furthermore, Graham et al. (2005) noted that the earlier the therapy is introduced, the more successful the treatment will prove to be; therefore, the longer infants are not treated, the worse the condition(s) could become over time.

**Age.** The third theme that emerged regarding parental characteristics was the age of the parents. Two medical practitioners and one therapist believed younger parents tended to place infants in supine more often: “I have noted that younger parents or first time parents tend to not do as much tummy time when awake. Likely due to lack of knowledge and experience.” Similarly, one nurse practitioner saw that “younger parents allow infant to be supine so they don’t fuss if placed prone.” Or as the therapist stated, “I think the older you are, the little more set in your ways...” therefore, the knowledge of more tummy time may not want to be heard if not practiced already. In most cases, fear
seems to be the cause for any parent not wanting to place their babies in prone. This is where one nurse practitioner believed “scare tactics” would be necessary in the form of pictures and stating that plagiocephaly could be a permanent problem if not corrected early in life. “Because sometimes people don’t get it unless it’s shown to them.”

**Education level.** With other cases, however, level of education could be a factor. One therapist in particular stated that she was impressed with the parents she has on her caseload because they are educated and stay on top of services and knowledge, even without having degrees. Where is this information coming from for these parents? Especially with lower income and immigrant families, health literacy is being emphasized. The UCLA Center for Healthier Children, Families, and Communities is an example of initiatives that provide current research, policies, and solutions to families and communities from pediatricians, public health experts, psychologists, economists, lawyers, and policy experts. Tri-Counties Regional Center also provides disability services and resources to children and families with disabilities in San Luis Obispo, Santa Barbara, and Ventura Counties. According to Bialocerkowski et al. (2008), maternal education level did determine or was overtly connected to infant care factors and the presence of plagiocephaly in some studies reviewed by the authors. The question that remains unanswered, then, is how can the information from these resources be made public for every family and community to profit?
Future Implications for Policy and Research

In order for the significance of Prone-to-Play to become eminent, further research needs to be conducted to establish appropriate courses of action. Parents and families, teachers, health care professionals, and taxpayers all play a major role in facilitating the next steps to reducing plagiocephaly in infants. What is the first step to community awareness and how will these groups benefit from this knowledge?

Parent Education

Research has shown that the Back-to-Sleep campaign greatly influenced worldwide infant care practices by reducing the incidences of SIDS and increasing supine sleep position practices (Cavalier et al., 2011; Graham et al., 2005; Hutchison et al., 2009; Kennedy et al., 2009; Persing et al., 2003). With such a huge success in saving infants’ lives from SIDS, how can we now save them from developing plagiocephaly using the same kind of movement? This was reiterated by one of the therapists interviewed:

The neatest thing would be to have a handout to give for new born babies, not to scare them but to show that it’s increased but also that we’ve saved more lives so I think that needs to be addressed to just give them ideas and resources. I think that’s number one is just to get that information out there and nothing better than a pediatrician, that’s in their new baby pamphlet.

Using realistic explanations and appropriate timing of when to present such information, every new parent could become informed on proper infant practices, specifically related to physical development and its connection to overall development.
**Prone to play.** A prominent consensus about the most effective interventions used by the therapists interviewed to treat plagiocephaly was tummy time. This was true for the medical practitioners’ prevention strategies as well. Understanding physiology and anatomy, particularly muscle development and movement, allows both of these groups of professionals to understand how to exercise certain muscles in order to strengthen them. While it may be somewhat intricate for everyone to understand, there could be a way to simplify it in order for new parents to receive this information. This could be the biggest piece of preventative material for infants and their health development. As noted by the research literature presented in this paper, a handout could be most effective. Parents could receive this information from pediatricians before giving birth or shortly thereafter. Although the Back-to-Sleep campaign was enormously successful in reducing SIDS, an equally effective campaign (with brochures, video, popular literature, media) could be launched to demonstrate the importance of “Prone-to-Play.” In addition, education regarding improper activities and equipment to use could also be stressed.

**Equipment use.** While most of the literature did not specifically discuss infants and equipment use, several studies (Bialocerkowski et al., 2008; Cavalier et al., 2011; Majnemer & Barr, 2009) alluded to the fact that less time spent in equipment would greatly benefit gross motor development and decrease plagiocephaly incidences. One pediatrician also directly stated that the cause of plagiocephaly was due to overexposure of time in such equipment. Excessive use of car seats, infant swings, supported sitting devices, and strollers limit the opportunities infants have to strengthen their neck, arm and upper back muscles. If infants sleep on their backs, are transported in car seats, play
on their backs with hanging mobiles, or sit with support in swings or strollers, little time is left for tummy time. However, further research could be done on this issue to validate recommendations for overexposure contributing to motor delays as well as plagiocephaly.

**Engaging infants in play.** What had been stated many times throughout the interviews and the research was that most infants do not seem to enjoy the prone position and prefer to be supine. This could be because being prone requires more work and strain on their developing muscles, so it would be natural for them to dislike it. However, if the parents or caregivers were lying on the floor next to the infant engaging in play, even for 3-5 minutes at a time, the infant might be distracted for those few short minutes before realizing there was any work or strain being done at all. In addition, early exposure to the prone position could create more tolerance, as infants grow older. As one nurse practitioner noted, she encourages “parents to begin placing awake infant prone for minutes increasing length of time by 2 months.” As a Lead Infant Teacher, my experience has shown that infants will tolerate being prone, even if they generally do not enjoy it, if I am on the floor talking to them and engaging them in some sort of activity. If they do become distressed after a few minutes, I do not force them to stay prone and instead offer it again at another time of day (generally when they are in a good mood). Additionally, in Jennings et al.’s (2005) study, parents found the brochure that included strategies for increasing infants’ tolerance to prone time most effective and useful. Why then is this information not included in new parents’ information packets?

**Parent-to-parent.** As mentioned earlier, families of low SES may not have such information readily available to them or know where to obtain such information.
Producing a variety of brochures (see Cavalier et al., 2011 and Jennings et al., 2005) could be developed to appeal to certain populations of parents. The content could vary from the crawling and reading connections to the focus on the prone position for strength training, combined with floor time.

As suggested above, a variety of media, such as websites frequently viewed by parents (e.g. BabyCenter.com) as well as targeted audiences (such as those who watch novellas) could be used to communicate the importance of prone time. Parent-to-parent advice and observing others with their babies is also an important way to “spread the word” about the need for tummy time. However, all Prone-to-Play campaigns would need to begin with the professionals who are generally first to communicate infant practices directly with parents: the medical community.

**The Role of Medical Education**

Before medical practitioners are able to impart knowledge to parents and families, they must complete years of necessary education. However, what is the focus of pediatric medicine in recent years? As mentioned earlier, the most profound and clever responses of how to treat children with plagiocephaly came from the two most experienced medical practitioners. Instead of directing parents to “reposition” their infants (as did the practitioners with less experience in the field, associated with less age), they concentrated on the infant developing as a whole: hold, play with, and sing to infants, provide opportunities to play prone in order to promote future learning abilities. Why did the most the experienced doctor and nurse focus on the whole child’s development but not the younger doctors and nurses? How are medical professionals
trained to integrate care and learning systems within a medical context to emphasize social-emotional aspects of interacting with patients?

Promoting the integration of systems in medical training is important, just as it is to develop a flexible communication pattern with a variety of families. Emphasizing understanding in communicating with parents could help in relaying information in simpler terms as well as in patience for communicating with families of different language backgrounds. It would be fascinating to research the training medical professionals receive in developing relationships with their patients and how they apply it into practice depending on the different families they work with. Does earlier identification happen when medical professionals treat their patients as the whole system (particularly in tune with their patients’ emotions), noticing changes in them so they can then relay proper practices to parents? Additionally, well-trained infant caregivers can also be a first line of defense against plagiocephaly.

**Infant Caregivers**

Although not all infants receive out of home care, many are placed in child care centers with infant/toddler licenses as young as 6 weeks old. Because infant caregivers are in regular contact with families, they could potentially play a major role in not only identifying plagiocephaly but in preventing it by providing more tummy time than the infants may have gotten at home. They also serve as a trusted resource for parents to acquire knowledge and can explain the significance of tummy time in their children’s overall optimal development. In the case of the current thesis, it was the awareness of a child diagnosed with a gross motor delay who wore a helmet that generated interest in this topic in the first place. Through observation and interest in promoting optimal infant
development, caregivers and preschool teachers should continue with professional development and research in order to best support the families in their care. When continued education is a top priority, early childhood educators can advocate for public awareness of many developmental risks, including plagiocephaly.

Public Awareness

Ultimately, multiple groups are stakeholders in reducing the occurrences of plagiocephaly. Infants are powerless in knowing what is best for their development but are the ones most affected by the practices discussed in this paper. Their well-being and healthy development is determined by the knowledge of the parents, doctors, therapists, and caregivers in their lives. Parents and families most often determine the type of care their infants will receive, but how do they become aware of optimal infant practices without public knowledge of the topic? The medical community (doctors and nurses) has the ability to educate new parents but it is not always being done. If they were too busy to provide information to parents whose infants were not already presenting the condition, why would they not want this to be made public? Similarly, the therapeutic community (physical and occupational therapists) could treat fewer children with cases that became severe and could focus on patients with other chronic conditions. Thus, teachers would be well served by having children in their classrooms with typical development and strong motor skills.

Finally, taxpayers should be concerned as they pay for the costly interventions that include preventable conditions (positional plagiocephaly and torticollis) as well as the responsibility for public awareness. The cost of early screenings also means early
interventions being implemented resulting in greater improvement. In order to
effectively apply this knowledge, future research on various types of strategies in
isolation or along with other strategies should be employed to find out what works best in
different communities. From there, actions can be taken to develop a public education
tool to apply to various areas in the community. Perhaps then can the Prone-to-Play
campaign be started that will be as successful as the Back-to-Sleep movement and there
will be a sizeable decrease in infants diagnosed with plagiocephaly.
CHAPTER SIX

AFTERWORD

I first met Giddy when he came into my infant classroom. His mother told me he was diagnosed with a gross motor delay and would begin receiving physical therapy services. Having only worked as the Lead Infant Teacher for less than a year and as my first experience teaching infants and toddlers, I was nervous. I did not know how to care for an infant with special needs.

In addition to his motor delay, he had developed plagiocephaly. His mother was fully aware of his condition and needs so he was fitted for a helmet. This was the first time I had seen an infant wearing one but I was intrigued. All I wanted to do was learn more about how to best support his unique development while he was in my care. I was even surprised to discover when talking with friends who were also preschool teachers that they were seeing more children wearing helmets in their centers. Was this a trend? Why did these babies have flat heads?

Coincidentally, Giddy enrolled in my class at the same time I began my second semester of graduate school while I was taking a course on research principles. When my professor prompted us to think of an observation or experience we wanted to learn more about, I immediately thought of Giddy. I began searching for studies on infants with gross motor delays with a hope to uncover strategies to use in my classroom but came up short. Then I decided to focus on the condition he had developed and the reason he was wearing a helmet. I typed into Google search “flat head in infants” and discovered the proper name: plagiocephaly. From there, the research opened my eyes to the most surprising results; the Back-to-Sleep campaign seemed to be linked to the growing
numbers of plagiocephaly incidences and infants were not receiving enough tummy time.
The focus of the literature review assignment in my research class then became to
promote infant gross motor development for all children, healthy or at risk. The topic
became very near to my heart and the numbers of growing incidences was something I
could not ignore. The next step was figuring out how I could communicate this to
teachers, parents, and the public and thus, the launch of my thesis began.

Reflecting back on how being in graduate school greatly affected my ability to
uncover such in depth research, it could have been vastly different. I might have been
satisfied to look at a few online resources found from a Google search (though my
professor certainly would have balked!) but reading medical journals and other peer
reviewed sources added critical depth in my understanding of the topic of plagiocephaly
and how to care for infants. In addition, I was able to share the literature review with
other graduate level students increasing their awareness and that of the professor – all of
whom had not heard much about this issue before.

Ultimately, the role of early screening within preschool and the role of early
childhood education in general should be emphasized. While Giddy’s mother was
already aware of how he needed to progress, if it were another teacher who did not have
the same opportunities for research and professional development, he may not have had
such success in achieving his goals. I can only hope that most teachers have the same
drive and opportunity that I was given in order to help all children flourish in our care. I
am so proud to say that I was Giddy’s teacher because while I may have assisted in
teaching him and guiding his development, he was truly the one who taught and inspired
me.
REFERENCES


Corso, M. (1997). Children who desperately want to read, but are not working at grade level: Use movement patterns as “windows” to discover why.


APPENDICES

APPENDIX A

Recruitment Letter

Bethany Morris  
293 Tulane Ave.  
Ventura, CA 93003  
bethanymorris05@yahoo.com  
(805) 701-0598

January 29, 2013

Dear Health Care Professionals,

Re: Thesis Research on Plagiocephaly in Infants

I am a graduate student in the Early Childhood Education program at California State University Northridge investigating the topic of plagiocephaly in infants and I need your help. The research includes a short interview (5 questions, 15-20 minutes max) with pediatricians, nurse practitioners, physical therapists, and occupational therapists to explore their personal knowledge and experiences with plagiocephaly in infants.

Interviews will be scheduled at your convenience and the study has the approval of the Standing Committee for the Protection of Human Subjects (our campus IRB). I hope you will be able to help me complete my masters research and to show my sincere appreciation, a $10 gift card to the Coffee Bean and Tea Leaf will be given to each consenting participant.

Thank you so much for your time and consideration, I hope to hear from you soon.

Sincerely,

Bethany Morris

____________________________________________
Carrie Rothstein-Fisch, Ph.D.  
Professor and Thesis Chair
APPENDIX B

Background Questionnaire

Name _____________________________________

1. Gender: (Circle one) Male / Female

2. Age: (Circle one group) 18-25 26-32 33-40 41-48 49-56 57-64 65-72

3. Please describe your educational background post-high school. Include the college/university, field of study, and year you completed each degree.

5. What is the title of your current job description?

6. Where are you currently employed?

7. How long have you been working in your current position?

8. How long have you been working in your specialized field of study?
APPENDIX C

Pediatrician/Nurse Practitioner Interview Questions

1. Has plagiocephaly become a more common concern for infants?
   a. Why or why not?
   b. How much have you noticed an increase in occurrences, if at all, within the last 10 years?
2. How do you define plagiocephaly?
   a. What are common characteristics?
   b. What seems to be the cause?
   c. When are you likely to first notice it?
3. At a typical well-baby visit, what would you communicate to parents relating to preventing plagiocephaly?
   a. Promoting gross motor development?
4. At what point do you suggest intervention?
   a. What are the most common intervention(s)?
   b. How often would you follow up?
5. When you observe moderate to severe plagiocephaly, are there often other developmental concerns?
   a. Which developmental domains have been the most commonly connected when plagiocephaly is present?
   b. What strategies do you employ for helping parents understand the condition and the treatment?
   c. Do you notice any cultural differences among your patients?
Physical Therapist/Occupational Therapist Interview Questions

1. Has plagiocephaly become a more common concern for infants?
   a. Why or why not?
   b. How much have you noticed an increase in occurrences, if at all, within the last 10 years?

2. How do you define plagiocephaly?
   a. What are common characteristics?
   b. What seems to be the cause?
   c. When are you likely to first notice it?

3. What would you communicate to parents relating to preventing plagiocephaly?
   a. Promoting gross motor development?

4. At what point do you typically receive referrals for intervention?
   a. How do you typically treat the children for intervention?
   b. How do you typically support the family?
   c. How often would you follow up?

5. When you observe moderate to severe plagiocephaly, are there often other developmental concerns?
   a. Which developmental domains have been the most commonly connected when plagiocephaly is present?
   b. Are there any special cases you might like to share with me to give me a range of the condition? Please do not include any identifying information such as first and last name.
   c. Do you find any language/cultural distinctions in the children/families? If so, what are they and how do you work with these differences?
APPENDIX D

Bill of Rights

CALIFORNIA STATE UNIVERSITY, NORTHRIDGE
EXPERIMENTAL SUBJECTS
BILL OF RIGHTS

The rights below are the rights of every person who is asked to be in a research study. As an experimental subject I have the following rights:

1) To be told what the study is trying to find out,
2) To be told what will happen to me and whether any of the procedures, drugs, or devices is different from what would be used in standard practice,
3) To be told about the frequent and/or important risks, side effects or discomforts of the things that will happen to me for research purposes,
4) To be told if I can expect any benefit from participating, and, if so, what the benefit might be,
5) To be told the other choices I have and how they may be better or worse than being in the study,
6) To be allowed to ask any questions concerning the study both before agreeing to be involved and during the course of the study,
7) To be told what sort of medical treatment (if needed) is available if any complications arise,
8) To refuse to participate at all or to change my mind about participation after the study is started. This decision will not affect my right to receive the care I would receive if I were not in the study.
9) To receive a copy of the signed and dated consent form.
10) To be free of pressure when considering whether I wish to agree to be in the study.

If I have other questions I should ask the researcher or the research assistant, or contact Research and Sponsored Projects, California State University, Northridge, 18111 Nordhoff Street, Northridge, CA 91330-8232, or phone (818) 677-2901.

X
Signature of Subject
Date
APPENDIX E

Consent to Act As A Human Research Participant

California State University, Northridge

CONSENT TO ACT AS A HUMAN RESEARCH PARTICIPANT
Plagiocephaly in Infants: An Exploratory Study of Health Care Provider’s Knowledge and Experiences

You are being asked to participate in a research study. Participation in this study is completely voluntary. Please read the information below and ask questions about anything that you do not understand before deciding if you want to participate. A researcher listed below will be available to answer your questions.

RESEARCH TEAM

Researcher:
Bethany Morris
Educational Psychology & Counseling
(805) 701-0598
bethanymorris05@yahoo.com

Faculty Advisor:
Carrie Rothstein-Fisch Ph.D., Professor and Coordinator
MA in Early Childhood Education
Educational Psychology & Counseling
18111 Nordhoff St.
Northridge, CA 91330-8265
(818) 677-2529
carrie.rothstein-fisch@csun.edu

PURPOSE OF STUDY
The purpose of this research study is to better understand the causes of and interventions for plagiocephaly (a medical condition occurring in infants that is distinguished by the reshaped, flattened, or deformed appearance of the skull developed as a result of constant pressure being placed on one area of the thin and flexible skull of the infant) from various health care providers’ perspectives.

SUBJECTS

Inclusion Requirements
You are eligible to participate in this study if you are at least 18 years of age or older and work as a pediatrician, nurse practitioner, physical therapist, or occupational therapist in an infant population.

Time Commitment
This study will involve approximately 30 to 60 minutes of your time.

PROCEDURES
You will complete a short background questionnaire including questions that identify demographic information (gender, age) as well as your educational and professional experiences and qualifications (specific training, education and experience in your health
care profession). You will then participate in an interview seeking information about your knowledge of plagiocephaly and practices associated with plagiocephaly in your health care profession. The interview can be conducted face-to-face with audio recording or answered independently and then returned to the researcher electronically or hard copy.

RISKS AND DISCOMFORTS
The possible risks and/or discomforts associated with the procedures described in this study include fatigue or anxiety during the interview process.

BENEFITS
Subject Benefits
The possible benefits you may experience from participating in this study include sharing knowledge and experiences with plagiocephaly that could help in other health care providers’ understanding or further research.

Benefits to Others or Society
The information gathered in the interviews will add to the knowledge base related to plagiocephaly for the early childhood education field. The overall outcome of the study will also help support childcare providers and parents’ knowledge of positive development in infants.

ALTERNATIVES TO PARTICIPATION
The only alternative to participation in this study is not to participate.

COMPENSATION, COSTS AND REIMBURSEMENT
Compensation for Participation
You will receive a $10 gift card to The Coffee Bean and Tea Leaf to thank you for your participation in this study.

WITHDRAWAL OR TERMINATION FROM THE STUDY AND CONSEQUENCES
You are free to withdraw from this study at any time. If you decide to withdraw from this study you should notify the research team immediately. The research team may also end your participation in this study if you do not follow instructions, miss scheduled visits, or if your safety and welfare are at risk.

CONFIDENTIALITY
Subject Identifiable Data
All identifiable information that will be collected about you will be removed and replaced with a code. A list linking the code and your identifiable information will be kept separate from the research data.

Data Storage
All research data will be stored on a laptop computer that is password protected. The audio recordings will also be stored in a password-protected electronic file, then transcribed and erased at the end of the study.
Data Access
The researcher named on the first page of this form will have access to your study records. Any information derived from this research project that personally identifies you will not be voluntarily released or disclosed without your separate consent, except as specifically required by law. Publications and/or presentations that result from this study will not include identifiable information about you.

Data Retention
The researchers intend to keep the research data until the research is published and/or presented and then it will be destroyed.

IF YOU HAVE QUESTIONS
If you have any comments, concerns, or questions regarding the conduct of this research please contact the research team listed on the first page of this form. If you have concerns or complaints about the research study, research team, or questions about your rights as a research participant, please contact Research and Sponsored Projects, 18111 Nordhoff Street, California State University, Northridge, Northridge, CA 91330-8232, or phone 818-677-2901.

VOLUNTARY PARTICIPATION STATEMENT
You should not sign this form unless you have read it and been given a copy of it to keep. Participation in this study is voluntary. You may refuse to answer any question or discontinue your involvement at any time without penalty or loss of benefits to which you might otherwise be entitled. Your decision will not affect your relationship with California State University, Northridge. Your signature below indicates that you have read the information in this consent form and have had a chance to ask any questions that you have about the study.

I agree to participate in the study.

Participant Signature __________________ Date ________________

Printed Name of Participant _________________________________

Researcher Signature __________________ Date ________________

Printed Name of Researcher _________________________________
APPENDIX F

Human Subjects Protocol Approval

Student Researcher
HUMAN SUBJECTS PROTOCOL APPROVAL FORM
CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

1. Title of research: Phagocytosis in Infants: An Exploratory Study of Health Care Provider’s Knowledge and Experiences

2. Principal Investigator: Bethany Morris
Major or Department: Early Childhood Education

3. Home Address: 293 Tulane Ave
Ventura, CA 93003
Mobile phone: (805) 701-0398
Email Address: bethanymorris95@yahoo.com

4. Co-Investigators: 1. Student: ☐ Faculty: ☐
2. Student: ☐ Faculty: ☐

5. Name of Faculty Advisor: Carrie Rothstein-Fisch
Faculty Advisor email address: carrie.rothstein-fisch@csun.edu

6. Projected Dates of Data Collection:
Begin Subject Recruitment/Data Collection: December 2012
End Data Collection: April 2013

7. Course prefix and number for thesis/grad. project: EPC 696
Course title: Directed Graduate Research in Early Childhood Education

8. Check one: ☑ Unfunded ☐ Funded
Name of Funding Source: ______ Date (to be) submitted ______

9. History of Protocol: ☑ New ☐ Continuing (Previous Approval Date ______)

10. Existing Data: Will this study involve the use of existing data or specimens (Data/specimens currently existing at the time you submitted this project)? ☑ No ☐ Yes
If Yes, attach documentation indicating the authorization to access the data if not publicly available and if accessing from an agency outside of CSUN.

11. Subjects to be recruited (Check all that apply)
a. ☑ Adults (18+ years)
b. ☐ Minors specify age: ______
c. ☐ Cognitively or Emotionally Impaired Persons
e. ☐ CSUN Students
f. ☑ Others (describe): Pediatricians, Nurse Practitioners, Physical Therapists and Occupational Therapists
g. ☐ Using existing data

12. Data will include (check all variables that apply): You must specify all of this information in the Project Information form.
a. ☐ names of people
b. ☐ email address
c. ☐ street address
d. ☐ phone numbers
e. ☐ age
f. ☐ gender
g. ☐ ethnicity
h. ☐ marital status
i. ☐ income
j. ☐ social security number
k. ☐ job title
l. ☐ names of employers
m. ☐ types of employers
n. ☐ physical health report

13. Will subjects be identified by a coding system (i.e., other than by name)? ☑ YES ☐ NO

14. Is compensation offered? ☑ YES ☐ NO

15. If yes, describe (e.g., gift cert., cash, research credit): $10 gift card to The Coffee Bean and Tea Leaf

16. Number of Subjects: 10 or fewer

17. Method of recruiting (elaborate in Section 2 of Project Information Form): Through personal contacts of the researcher

CSUN Office of Research and Sponsored Projects
Committee for the Protection of Human Subjects, Revised 10/06

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18. Will there be any deception (that is, not telling subjects exactly what is being tested)? YES ☐ NO ☒ (Provide justification for deception and explain how subjects are debriefed in Section 2 of the Project Information Form)

19. Potential Risk Exposure: ☐ Physical ☐ Psychological ☐ Economic ☐ Legal ☐ Social ☒ Other, specify: possible fatigue during the interview which will be mitigated if the participant requires a break (Elaborate in Section 4 of the Project Information Form)

20. Data Collection Instruments (Check all that apply)
   a. ☐ standardized tests
   b. ☒ questionnaire
   c. ☒ interview
   d. ☐ other (specify)
   
21. Recorded by (Check all that apply)
   a. ☒ written notes
   b. ☒ audio tape
   c. ☒ video tape/film
   d. ☐ photography
   e. ☐ observation

22. Administered by (Check all that apply)
   a. ☐ in person (group setting)
   b. ☐ in person (individual)
   c. ☐ telephone
   d. ☐ text message
   e. ☒ email/website
   f. ☒ mail
   g. ☒ other (specify): hard copy from the participant

23. Findings used for (Check all that apply)
   a. ☒ publication
   b. ☐ evaluation
   c. ☒ needs assessment
   d. ☒ thesis/dissertation
   e. ☒ other (specify): 

24. Are drugs or radioactive materials used in this study? YES ☐ NO ☒ If yes, then list the drugs or radioactive materials used in Section 1 of the Project Information Form and provide a detailed description of each, with justification for its use.

25. Are any medical devices or other equipment to be used in this study? YES ☐ NO ☒ If yes, describe in detail the medical devices or equipment to be used in Section 2 of the Project Information Form.

26. Did you attach a copy of any questionnaire(s), survey instrument(s) and/or interview schedule(s) referred to in this protocol? YES ☒ NO ☐

27. Is a letter of permission for subject recruitment attached (if recruiting from an organization outside of CSUN)? YES ☒ NO ☐

28. SIGNATURES:
   **All Signatures must be obtained prior to submission. Student projects must have faculty advisor’s signature.**
   
   Faculty signature on this Protocol Approval Form indicates that:
   
   - You and your student are familiar with the regulations for human subject research as defined by California State University, Northridge's Standing Advisory Committee for the Protection of Human Subjects (SACPHS) and you and your student intend to follow those regulations when conducting this study. You have reviewed and approved of this Protocol Approval Form and accompanying documentation. You agree to the manner in which human subjects will be involved in this study.

   Signature of Faculty Advisor __________________________________________________________________________ Date 11/5/12

   Student Investigator's Signature ______________________________________________________________________ Date 11/5/12

   Signature for SACPHS and Research Office USE ONLY
   ☐ Noted, exempt ☐ Approved, Minimal Risk ☐ Approved, Greater than Minimal Risk ☐ Approved, Expedited Review

   Chair, SACPHS __________________________________________________________________________ Date 12/4/12

   Expeditied Reviewer(s): __________________________________________________________________________ Date date received

   CSUN Office of Research and Sponsored Projects
   Committee for the Protection of Human Subjects, Revised 10/06
APPENDIX G

Pediatrician/Nurse Practitioner Interview Responses

Pediatrician/Nurse Practitioner Interview Questions – P1

1. Has plagiocephaly become a more common concern for infants? Absolutely.
   a. Why or why not? Because of positioning. That’s really the biggest issue now because we don’t have people lay their babies on their tummies now, which I did, we all did. But now because, I don’t know if it’s a higher incidence of SIDS but a precautionary for SIDS now the big recommendation is that children lay on their back or on their sides, so we are seeing much more of it.
   b. How much have you noticed an increase in occurrences, if at all, within the last 10 years? Maybe a 30% increase

2. How do you define plagiocephaly? What I see is more of just the flattening of the back of the head. And you’ll see it’s almost this sort of drop off.
   Do you see it more at the back or on the side? On the back because people aren’t that good about positioning their kids on the side, they really aren’t.
   a. What are common characteristics? I have primarily seen it on the back of the head.
   b. What seems to be the cause? Refer to question 1.
   c. When are you likely to first notice it? Not so much by the 2 week check up but definitely by the 2 month, you’ll start to see some of it, some of the molding taking place.

3. At a typical well-baby visit, what would you communicate to parents relating to preventing plagiocephaly? Would that be a common thing to tell them? Mmhmm,
and actually a lot of parents come in freaked out about it, like “how come the back of my kid’s head is all flat?” especially if it’s their first baby. So a lot of times the parents are even aware of it. So the biggest thing is positioning. Getting them off their back, get them on their sides, get them positioned up more, but the biggest thing is getting them off their head and not leaving them for long periods of time. At night is fine, but getting them picked up after naps and just changing position.

a. Promoting gross motor development? At 2 months you would probably see it for sure, and at 4 months it would probably be even more prominent because by now there’s more growth and those sutures are starting to close somewhat so I haven’t really seen it affect their gross motor. I think then you would have more of an injury or something going on more than just the structure and soft tissue. If you’re seeing gross motor issues then there’s something else going on with the baby.

4. At what point do you suggest intervention? Usually if the parent is pretty good, or whoever the caregiver is, about repositioning and really working at it, because the baby’s head will mold and unless there’s an issue in the structure themselves, the skeletal sutures, that’s a whole different story. But if it’s really in the soft tissue molding, I tell them that if you’re really diligent about turning them and gentle massage and being really good with that it should correct itself. It shouldn’t be a permanent defect.

So then what about a helmet? When would you suggest that? I’ve never had to do that. I’ve never seen one that severe. If you have to do that, there’s something else going on.

a. What are the most common intervention(s)? Repositioning
b. How often would you follow up? I would probably see them sooner than the two month intervals like we usually do, maybe in 2-3 weeks or maybe even monthly just to kind of see what’s happening because most parents, it really does freak them out.

5. When you observe moderate to severe plagiocephaly, are there often other developmental concerns? I think that if it’s really severe, and in all honesty I have not seen a really severe case, they might have been more minimal to moderate and they have resolved. So I haven’t seen any that had a developmental component that’s contributory.

a. Which developmental domains have been the most commonly connected when plagiocephaly is present? Is there a little CP involved, was there some lack of oxygen and that happens during delivery.

b. What strategies do you employ for helping parents understand the condition and the treatment? Mainly teaching. I think with all parents the main thing is teaching. I think it depends on the culture too, cultures are taught to do certain practices so you have to be very respectful of that too because you don’t want to step on anybody’s toes. And sometimes a little fear is not a bad thing, at a certain moderation. Sometimes you have to say “if you don’t do this, your kid’s going to have this flat head.” And again, sometimes their very lassiez faire about it. If they don’t correct it, it could be a permanent problem so it’s something they have to do at an early age. So sometimes I use a little scare tactics because you have to be realistic. I think people appreciate that. It also depends on the person.
c. Do you notice any cultural differences among your patients? Definitely because we see such a diverse population. You have to sometimes tread lightly because they aren’t going to listen to you if you “poo-poo” what they do so a lot of times you kind of have to take the tactic of “ok I know you have been trying this and that’s great and keep doing that but why don’t you try this and this or include this and this?” And I’m really good at pictures, we’ll get pictures and go “This is what your baby will look like.” Because sometimes people don’t get it unless it’s shown to them.
Pediatrician/Nurse Practitioner Interview Questions – P2

1. Has plagiocephaly become a more common concern for infants? Yes.
   a. Why or why not? Since parents are instructed to place infants on their backs to sleep, infants are often not placed prone when awake.
   b. How much have you noticed an increase in occurrences, if at all, within the last 10 years? Since infants have been placed supine to sleep.

2. How do you define plagiocephaly? Flat occipital, right or left.
   a. What are common characteristics? Difficulty holding head up for period of time when prone.
   b. What seems to be the cause? Not placing infants [prone] prior to two months of age.
   c. When are you likely to first notice it? At two month visit.

3. At a typical well-baby visit, what would you communicate to parents relating to preventing plagiocephaly? To place infant prone when awake, frequently or as long as the infant doesn’t fuss.
   a. Promoting gross motor development? Discuss developmental milestones and that infants need to be prone in order to scoot – leading to crawling.

4. At what point do you suggest intervention? By six months, if infant fusses when placed prone, so parents keep infant supine.
   a. What are the most common intervention(s)? At 2-week visit, I encourage parents to begin placing awake infant prone for minutes increasing length of time by 2 months.
   b. How often would you follow up? [Every] month, then refer to PT for helmet or to early intervention program.
5. When you observe moderate to severe plagiocephaly, are there often other developmental concerns? Yes, delayed motor development – not scooting or crawling.

a. Which developmental domains have been the most commonly connected when plagiocephaly is present? Large motor skills in scooting, in holding up head sustained, in rolling over.

b. What strategies do you employ for helping parents understand the condition and the treatment? I stress the importance of infant being placed prone when awake, to develop motor skills leading to crawling, stressing that crawling and creeping are related to learning how to read in early school years, many need extra help in school regarding reading.

c. Do you notice any cultural differences among your patients? Yes, very much. Hispanic infants are wrapped tightly in shawl, preventing free movement of infant. Younger parents allow infant to be supine so they don’t fuss if placed prone.
Pediatrician/Nurse Practitioner Interview Questions – P3

1. Has plagiocephaly become a more common concern for infants? No.
   a. Why or why not? It is the norm now.
   b. How much have you noticed an increase in occurrences, if at all, within the last 10 years? Yes.

   a. What are common characteristics? Flat posterior occipit.
   b. What seems to be the cause? Sleeping on backs.
   c. When are you likely to first notice it? Around 4-6 months.

3. At a typical well-baby visit, what would you communicate to parents relating to preventing plagiocephaly? Counter positioning.

4. At what point do you suggest intervention? At 6-8 months or if suspect craniosyntosis.
   a. What are the most common intervention(s)? Helmets.
   b. How often would you follow up? At well-child checks.

5. When you observe moderate to severe plagiocephaly, are there often other developmental concerns? Torticollis, craniosyntosis, visual, healing issues.
   a. Which developmental domains have been the most commonly connected when plagiocephaly is present? Unaware of any.
   b. What strategies do you employ for helping parents understand the condition and the treatment? Handouts.
   c. Do you notice any cultural differences among your patients? Yes.
Pediatrician/Nurse Practitioner Interview Questions – P4

1. Has plagiocephaly become a more common concern for infants?
   a. Why or why not? In the most recent years, yes. Possibly secondary to parents not giving babies enough tummy time when awake. We recommend babies sleeping on their back to decrease the risk of SIDS (sudden infant death syndrome) but still encourage playing with baby so as to get good range of motion of the head and neck and tummy time when awake to strengthen the neck and upper torso muscles and also keep the shape of the head from being compressed/flattened.
   b. How much have you noticed an increase in occurrences, if at all, within the last 10 years? I can’t say, since I have not been in practice for the last 10 years.

   a. What are common characteristics? Flattening of the occiput/back or a side of the head with possible deformity to the opposite sides of the head with possible asymmetry and position of the ears.
   b. What seems to be the cause? Mostly position and malpositioning of the head. Baby always on their backs even while awake and not getting enough tummy time playing and exercising to get full range of motion of the head or neck. Less commonly, due to torticollis, a problem with the neck muscles that prevents full range of motion of the head and neck. And rarely, craniosynostosis, premature closure of cranial sutures.
   c. When are you likely to first notice it? Mostly between 2-6 months of age.

3. At a typical well-baby visit, what would you communicate to parents relating to preventing plagiocephaly? Tummy time when awake (for few minutes at a time for
approximately 1 hour/day total time) and playing with baby using objects to each side
of baby as to have baby look/turn head and reach to each side.

a. Promoting gross motor development? As above.

4. At what point do you suggest intervention? If not improved with the above before 6
months of age OR anytime before or after then if suspect torticollis or
craniosynostosis.

a. What are the most common intervention(s)? Helmet therapy if the diagnosis is
   based on positional plagiocephaly. Physical/Occupational Therapy for torticollis.
   Cranial X-rays and possible neurosurgery consult for possible CT scan for
   concerns with craniosynostosis.

b. How often would you follow up? Initially every month if there is concerns
   regarding growth rate of head or any problems with development. If growth and
development are normal and no concerns for torticollis or craniosynostosis, then
   at next well child check (usually within 2 months). Of course, asking parents to
   bring them in sooner if concerns that plagiocephaly is worsening.

5. When you observe moderate to severe plagiocephaly, are there often other
developmental concerns? Yes.

a. Which developmental domains have been the most commonly connected when
   plagiocephaly is present? Gross motor delays.

b. What strategies do you employ for helping parents understand the condition and
   the treatment? Explain by show and tell with either my own head and neck and/or
   the baby’s.
c. Do you notice any cultural differences among your patients? Not necessarily, but I have noted that younger parents or first time parents tend to not do as much tummy time when awake. Likely due to lack of knowledge and experience.
Pediatrician/Nurse Practitioner Interview Questions – P5

1. Has plagiocephaly become a more common concern for infants? Not that he’s seen
   because he has only been practicing for 8 years and in those 8 years he has not seen
   an increase because Back to Sleep has been practiced since he began.
   a. Why or why not?
   b. How much have you noticed an increase in occurrences, if at all, within the last
      10 years? None really.

   a. What are common characteristics? Flattening on the back of the head.
   b. What seems to be the cause? Not enough time in different positions/tummy time.
   c. When are you likely to first notice it? 2-4 months.

3. At a typical well-baby visit, what would you communicate to parents relating to
   preventing plagiocephaly? Not to have their babies in carriers too much, nothing
   restraining.

4. At what point do you suggest intervention? Only if parents are really concerned will
   he suggest a helmet but rarely suggests it.
   a. What are the most common intervention(s)? PT for torticollis/neck issues. Should
      be able to be corrected by itself if parents take advice given.
   b. How often would you follow up? Routine visits – 2 months until 6 months old,
      then every visit.
5. When you observe moderate to severe plagiocephaly, are there often other developmental concerns? Gross motor, neck and range of motion (ROM) problems, torticollis.

a. Which developmental domains have been the most commonly connected when plagiocephaly is present? Gross motor.

b. What strategies do you employ for helping parents understand the condition and the treatment? Verbal and demonstrating of repositioning of the head.

c. Do you notice any cultural differences among your patients?

He has never referred Hispanic patients to get a helmet but sees plagiocephaly across all cultures.
Pediatrician/Nurse Practitioner Interview Questions – P6

1. Has plagiocephaly become a more common concern for infants? Yes.
   a. Why or why not? Back to sleep program saves lives but distorts skulls. About 25 years ago we instituted Back to Sleep at Community Memorial Hospital nursery.
   b. How much have you noticed an increase in occurrences, if at all, within the last 10 years? A great big increase (along with decreased SIDS!)

2. How do you define plagiocephaly? Flattening of a portion of the skull, most often due to position of the head against a bed or car seat or other rest area for the immature skull.
   a. What are common characteristics? Most often occipital or occipito-parietal.
   b. What seems to be the cause? Inadequate changes in skull position in bed or car seat or swing set. Prematurity increases the risk. Neck muscle tightness is uncommon, plus many other triggers.
   c. When are you likely to first notice it? Infancy by 2-3 months old.

3. At a typical well-baby visit, what would you communicate to parents relating to preventing plagiocephaly? Sleep on back (supine), awake on belly (prone). Lots of being held and lots of play time/being mobilized – off the skull. Turn body axis 180 degrees often to prevent infant always looking the same way from crib.
   a. Promoting gross motor development? Play with infant, pick up, talk and sing with infant, read; no TV/video.

4. At what point do you suggest intervention? As soon as plagiocephaly appears.
   a. What are the most common intervention(s)? Back to Sleep; Belly play; Play with and hold infant when awake.
b. How often would you follow up? At regular well-child visits.

5. When you observe moderate to severe plagiocephaly, are there often other developmental concerns? May be; quite variable; the worse the flattening the less belly play was likely done. Belly play encourages motor and sensory development.

a. Which developmental domains have been the most commonly connected when plagiocephaly is present? Gross motor and social delays (not because of plagiocephaly) due to inadequate belly playtime experiences. The plagiocephaly deforms the bones not the brain circuits.

b. What strategies do you employ for helping parents understand the condition and the treatment? Keep it simple: Emphasize keep the head (especially the face) nicely shaped (pretty/handsome) and make baby stronger and “smarter” through exercise/playing.

c. Do you notice any cultural differences among your patients? Hard to tell. Mostly a problem of non-English speakers “getting the meaning” through translations. Also, the lowest socioeconomic levels have so many stressors that this seems minor to them, until it appears moderate or severe. Some cultural groups pay little attention to skull shape as important, or even think distortions are not unattractive.
APPENDIX H

Physical Therapist/Occupational Therapist Interview Responses

Physical Therapist/Occupational Therapist Interview Questions – T1

1. Has plagiocephaly become a more common concern for infants? Yes.
   a. Why or why not? The Back to Sleep program. The reason that I usually see plagiocephaly is because they have another diagnosis, torticollis. I am usually treating the torticollis, not the plagiocephaly.
   b. How much have you noticed an increase in occurrences, if at all, within the last 10 years? On my caseload, a lot more torticollis. I think that’s also because now torticollis qualifies you for the program that I work for and I don’t think it may have before. That’s a tough one because I don’t just see plagiocephaly. I see some kids with plagiocephaly but they’re not on my caseload so probably 25%.

   a. What are common characteristics? One of the sides is flat where it shouldn’t be. Usually it’s one of the back sides and usually it’s associated with torticollis because that’s where they like to lay and one side gets shortened.
   b. What seems to be the cause?
   c. When are you likely to first notice it? The kids are coming in like 3-4 months but usually it’s because they’re not turning their head a certain direction so we’re noticing like a neglect by the parents and the pediatricians [to tell them to reposition their heads].
3. What would you communicate to parents relating to preventing plagiocephaly?

Mostly positioning. Changing the direction of a crib so they have to look a different way [the opposite of the flat side].

a. Promoting gross motor development? Prone to play so always on their tummies, a lot of extension, and then also when you’re laying flat to get them on that side to get their attention, more pressure on the opposite side. And it’s not because you want to flatten that side, it’s because you want to relieve the pressure on the side that’s flat. I would also recommend seeing an orthotist and getting a prescription for a cranial molding. They need a really good orthotist though because I’ve seen some bad ones. [There needs to be a space where the skull is flat so the skull can grow into that space]

4. At what point do you typically receive referrals for intervention? 4-6 months.

a. How do you typically treat the children for intervention? Stretching, strengthening exercises for the lengthening muscle, and that’s assuming that they have torticollis and plagiocephaly and then parent education because a lot of parents are afraid to put them on their tummies at all now. [Once they can roll over they should be able to sleep on their tummies because their startle reflex is worse when they sleep on their backs]

b. How do you typically support the family? Home exercise program, sometimes we even do home visits, set up the crib the way that it needs to be set up, positioning devices like wedges, placement of different things as far as toy placement, and then we do sometimes even consult with orthopedists and pediatricians because we have a clinic and sometimes we even do referrals [Dr.
John Graham], he’s like a plagiocephaly god and he will often do prescriptions for
the helmets.

c. How often would you follow up? I usually see the kids with torticollis and
plagiocephaly until they’re about a year because gross motor wise they’re fine.
Regular visits are once or twice a week, depending on how bad it is, for 30
minutes at a time.

5. When you observe moderate to severe plagiocephaly, are there often other
developmental concerns? I’m always looking for other developmental concerns.
Usually it’s mostly related to if their head is turning a certain way because of the
plagiocephaly then there’s torticollis and their not looking to that side, maybe not
even using that side as well and so we’re looking for asymmetrical use of sides.
Literature shows that they’re showing learning disabilities later on in life but I don’t
see that because that’s not my area of expertise. I only continue to see them after age
3 if they qualify with different diagnosis so a lot of the kids that I have that have
plagiocephaly will be diagnosed with CP, that kind of stuff.

a. Which developmental domains have been the most commonly connected when
plagiocephaly is present?

b. Are there any special cases you might like to share with me to give me a range of
the condition? Please do not include any identifying information such as first and
last name. I had one child who had facial asymmetry, plagiocephaly, he was
actually seen by the cranio-facial team at CHLA because they thought it was kind
of severe but he also had a craniosyntosis where his sutures closed prematurely
and so in that case we thought he was on the spectrum. A lot of co-morbidity with autism, or spectrum disorders.

c. Do you find any language/cultural distinctions in the children/families? If so, what are they and how do you work with these differences?

    Just in general the clientele that I see are Hispanic, mostly Spanish speaking. Plagiocephaly/torticollis has sometimes been related to large children in the womb, I don’t know if maybe I’m making a leap there as far as, you know. But not really, I’ve seen it all across the board in all cultures.
Physical Therapist/Occupational Therapist Interview Questions – T2

1. Has plagiocephaly become a more common concern for infants? I would say yes. As a pediatric therapist, over the years, I have seen it. Heard about it more often with even my own friends who have had babies who have been born with plagiocephaly and then with personal evidence is in the community, a lot of children are wearing helmets now. I feel like that treatment technique, which for a long time was very controversial is actually much more common and I think people are now observing and understanding what that helmet is for because you know someone or know the child who has helmet, and we have had children come in here with torticollis, typically the CCS diagnosis that comes to us with kids that are wearing helmets so they have both diagnoses, the torticollis and the plagiocephaly.

a. Why or why not? Why is that particular birth challenge more evident today? I don’t know if it might not have been around for a very long time but as time has gone on the treatment has become common with the helmets so I don’t know that it’s something that’s uniquely new I think that we just for many years it was probably untreated. So there are probably a lot of people walking around with unusually shaped heads or as the child has grown older, which is why it was a controversy over plagiocephaly for so many years, a lot of physicians didn’t feel that the helmet was necessary, it actually, there heads would change over time given a few techniques. Turn your child to this side, that side, you know with an infant you could actually form their to a certain extent using those techniques rather than using a helmet.
b. How much have you noticed an increase in occurrences, if at all, within the last 10 years? Pretty much all of the children that come to us with torticollis have some form of plagiocephaly, whether they are treated with a helmet or not. So yes, I would say there have been an increased number of kids with that particular diagnosis born in my practice over 25 years, in CCS I see more children with that diagnosis coming to see us but again, they have torticollis as well. So I guess you could say there’s an increase in torticollis as well. That is probably what I would say I have seen and they happen to have the secondary condition.

How much of an increase of torticollis have you seen within the last 10 years? I never used to see kids with torticollis and now I would say we get one at least a year so I would say a 25% increase, something along those lines.

2. How do you define plagiocephaly? There are several different types of misformed heads. There are technical names for those, I’m afraid I don’t have those names. Usually there’s a change in the head zone rounds, either it’s flat in the back or differences from side to side, the head is misshapen on one side more than the other side. I think there are three or four types there are names for but I don’t know those.

a. What are common characteristics? Usually there’s some asymmetry of the facial features as well, maybe a little higher ear, lower ear, that kind of thing. Maybe some difference height in the ears. And certainly there’s going to be tightness in range of motion between one side to the other side if they have that torticollis and you may see that too with just plagiocephaly. Difficulty in range of motion with neck because the baby would not be developing as well on one side as the other side so they would favor one side over the other side.
b. What seems to be the cause? [Of torticollis, it can be congenital, which means present at birth that usually has to do with the bones of the neck being shortened on one side, or it can develop after birth that is soft muscle tissue tightening and the lack of movement in the neck is usually what causes plagiocephaly.]

c. When are you likely to first notice it? Quickly. I think most of the time we would notice it fairly quickly. Unfortunately we don’t always get them real early. Typically we would notice it at our first evaluation if the child had it and we would ask the parent if they were aware, if the pediatrician had discussed it with them, have they suggested any kind of treatment, that kind of thing. If the child has it, we usually discuss it with the family.

What is the general age that you would get a referral for a new patient?

Anywhere from 2 months to 3 years is probably when we initially get referrals for children. It kind of depends because we haven’t been getting many new children.

3. What would you communicate to parents relating to preventing plagiocephaly?

Positioning. Making sure that when you place your infant in bed, in sideline positions that you kind of rotate from one side to the other side. Certainly tummy time is the utmost importance for children to experience. Even the American Pediatrics Association was honest, our whole developmental milestones have changed in infants because they did not get tummy time. Therapists feel very strongly about that, and actually I have found it with my own friends who are raising their children. There is so much fear about SIDS that people have stopped putting their kids on their tummies. So if a child with plagiocephaly has some problems with strength, initially
raising their head off the ground, that parent is going to be more panicked about it.

tummy time

a. Promoting gross motor development? This piece of paper that I have here that
covers developmental milestones, you know gross motor, fine motor. If I were
treating a child I would be teaching a parent depending on what the age of the
child was, developmentally what they should be doing with their child. So of
course initially a child under four months of age, they’re working on rolling and
those kinds of things so it’s encouraging rolling activities and then you move
from, you know, rolling into beginning sitting and/or tummy time when they’re
starting to get some prone positioning and moving into different positions using
their arms and then you kind of go up the developmental scale so depending on
what age they come to us, it’s basically working on those kinds of things from an
OT perspective, this is where we overlap with PTs because with a baby there’s
only so much you can do, there’s only so much fine motor skill they have which
is basically grasp initially and then feeding issues would be the other area that an
OT would be working on. So I suppose I would also be looking at the position the
parent was holding their baby when they were feeding as an OT. So let’s say they
have plagiocephaly and the parent is a right handed person, but unfortunately
that’s not encouraging the opposite position of their head, you know the shape of
their head and I would have to encourage that parent to start thinking about sitting
on the couch supporting their arm and using their other hand for positioning too.

4. At what point do you typically receive referrals for intervention? It used to be we
would get those kids [torticollis] very, very early on. Very recently it has started to
change because I didn’t know that the children had to be considered to have a chronic condition, which is treatment for 6 months. So 6 months is now when we will be getting children but let me preface that: We could be getting children with other disabilities. One of the children that I had on my caseload with plagiocephaly had a muscle disease and so he actually had many deformities throughout the course of his lifetime and he was more under myopathy with just low, low, low tone and so because of his low tone his actual skeletal system wasn’t able to support himself, he actually got significant scoliosis but he always had a misshapen head and he had a large head so he was one of the first kids in CCS here that I saw with the helmet, unfortunately he got brain damage from it. About 18 years ago, he was one of my first kids. [The helmets have not been around very long, 20-25 years and he was one of the first I have seen] And since that time, within that 20 years there’s been ongoing discussion about if they were really helpful or not. We actually had this discussion with an orthotist. Is this something that is really going to work? In actuality this is going to resolve itself. These kids with plagiocephaly, they’re going to resolve. Well that isn’t necessarily true.

a. How do you typically treat the children for intervention? One of the most important things is range of motion in the neck and head and working on neck strength and control. So because children with that challenge often times have some diminished range of motion to one side or the other, front, back, you’re teaching the parent how to provide that range of motion. Usually with a child in lying on their back to begin with, some gentle moving of the head and assisting them doing that several times a day actually and you also might be providing
them with a little bit of shoulder stretching as you’re ranging them so you’re bringing their head over and you’re also giving them a little bit of pull here and of course you want to work on the upper extremities too and make sure that all of the joints are moving as you get range of motion as it is in normal limits. So range of motion is probably the primary area then you start working on some of the things like positioning like we discussed before, making sure that they are giving the child the opportunity to be on their side, especially on the side, if the curve is here, that you want to have them on this side [opposite]. You make sure that they’re trying that and the child can be resistant to that so sometimes it’s the parent sitting with them and actually placing them in that position and seeing if you can increase the amount of time.

b. How do you typically support the family? You start in on the developmental scales. We work on teaching them what the normal progression of development on the scales would be for their child, you know so from the standpoint of the fine motor, there’s the grasp, there’s also the vision and the vision is part of this picture too. We especially find that’s why I said torticollis is one of those tricky ones that vision changes are actually the cause of some of our kids with torticollis. There are actually some visual challenges that children are born with and they can actually develop torticollis because of their vision. Because we have a clinic here, you make sure that all of the things that they need are being done, so they have their vision checked, that they have their hearing checked, and then a nutritionist and all of those things and they’re supported in that way and then therapist’s job is to teach the parents, who might be upset by their child’s challenge, the
developmental scales they need to reach. And sometimes, I don’t know if it’s true of plagiocephaly but it’s true of torticollis, some children favor one hand over another. The hand that is the one that they prefer, so if they’ve got torticollis that’s making them tight in one direction, they may be favoring the hand where their vision is better, so it’s teaching them that they need to also work on that.

c. How often would you follow up? With babies, we tend to see them once or twice a week depending on the parent’s schedule and what they can afford to do. They don’t work very long, you know babies, so 30 minutes or something like that, twice a week would be awesome if they can do it.

5. When you observe moderate to severe plagiocephaly, are there often other developmental concerns? Yes. I would say so, especially in the kids we see here.

a. Which developmental domains have been the most commonly connected when plagiocephaly is present? Fine motor and visual/perceptual skills.

b. Are there any special cases you might like to share with me to give me a range of the condition? Please do not include any identifying information such as first and last name. My favorite patient you mean? He’s graduated already. He actually still has plagiocephaly and is a 3rd grader. He’s in regular education, but he was pretty typical of the kids that we see who have the plagiocephaly/torticollis issues in that he had major fine motor issues which included the ability to cross midline, something that develops in most children, is the ability to move their hand across, pick up something, and take it. Well he was adept at doing whatever he needed to do over here, and whatever he needed to do over here. [And then parents think they’re ambidextrous but it’s not a good thing.] Anyway, we worked a long time
on his perception, his fine motor, strengthening, and on top of that, there’s a research therapist who’s specialty is torticollis whose found that these children have learning disabilities, which was a possibility with this kid, he actually did have some challenges in that area but he’s so smart, he’s been able to overcome most of that but they do have learning challenges because their vision is unique and so they actually see the world differently so math is one of the areas they have trouble because if you’re vision isn’t centered, then when you are writing down things, you don’t line up math appropriately and so that’s a perceptual issue. Another challenge these children have because they don’t cross midline is that they may not be able to read well because their eyes actually jump all the way over to the end of the page every time and they kind of skip so they might have learning challenges so that’s something to think about. This little boy on top of that had ADHD but he graduated and he’s doing beautifully.

c. Do you find any language/cultural distinctions in the children/families? If so, what are they and how do you work with these differences? Yes. Hispanic is the predominant group that I work with. There are a lot of issues that come up, you know, anywhere from putting the baby to bed with a bottle in their mouth, that is so, so typical. You have to know about the cultural differences in order to address them. And then what we try to do is model. You know I know that a lot of our Hispanic/Mexican kids come to school with layers and layers of clothing on, and that’s crazy because it could be hotter than heck but modeling is typically what we want to do, so we try to teach the parents what it is that we do in order to help their child achieve the goals that we want for them, so when they’re young a lot of
that is just handling. You know, whether it be putting them on their tummy and
giving them something visually to look at in front of them, to giving them tools to
put them on their side in bed and show them how to do that, if it’s feeding as I
said before, rather than just one side, do it to the other side. And you know a lot of
it is investigating because there’s so much that goes unsaid with our Spanish
families because they don’t speak the language so as much as we can use an
interpreter we do. So we try to figure out what’s going on. I find in general with
both families that kids do advance in typically the same between the families. I
don’t feel like whatever my Hispanic families are doing versus my Anglo families
is doing is necessarily different; it has to do with who they are, if they are
attentive parents, changes happen.
Physical Therapist/Occupational Therapist Interview Questions – T3

1. Has plagiocephaly become a more common concern for infants? No.
   a. Why or why not? Because we have been exposed to it for a long time. Haven’t seen a lot of torticollis cases lately (7-8 cases in the last 1-2 years)
   b. How much have you noticed an increase in occurrences, if at all, within the last 10 years? Not much of a change but saw some increase due to SIDS and the Back to Sleep campaign because it is not always treated.

   a. What are common characteristics? Torticollis, more flattening on one side, asymmetry of the face/ear placement.
   b. What seems to be the cause? Positioning (in utero or after). Torticollis may be formed after birth. Infants sitting supported.
   c. When are you likely to first notice it? Right after birth, when one side of the head is pushed ahead of the other.

3. What would you communicate to parents relating to preventing plagiocephaly?
   Change positions of the whole body, tummy time on chest. For torticollis, turn cribs to different places, move toys, side lying (prop them against the couch on their side).

4. At what point do you typically receive referrals for intervention? 8-9 months. Infants have to be considered having a “chronic” condition now so they need 6 months of private therapy treatment (infant specialist) before getting OT/PT.
   a. How do you typically treat the children for intervention? Specific toys, gross motor, early infant positioning, kinesio taping, blocking them from turning a
certain way. Often when infants have severe CP, they don’t respond well to
treatment. PT’s and OT’s are often not treating the plagiocephaly – rather
focusing on treating muscles and ways to alleviate pressure from the head.

b. How do you typically support the family? Express concerns with the family,
explaining and demonstrating, showing recommendations for home.

c. How often would you follow up? Once or twice a week for younger children.

5. When you observe moderate to severe plagiocephaly, are there often other
developmental concerns? Yes.

a. Which developmental domains have been the most commonly connected when
plagiocephaly is present? Muscle diseases, neuro or CP, at birth conditions.

b. Are there any special cases you might like to share with me to give me a range of
the condition? Please do not include any identifying information such as first and
last name. One infant had a helmet but the mother felt her head was getting worse
so after two months she found a new orthotist and it resolved her plagiocephaly
and torticollis. At 18 months she didn’t need treatment anymore.

c. Do you find any language/cultural distinctions in the children/families? If so,
what are they and how do you work with these differences? Not really. Some
families cannot commit to therapy due to socio-economic status.
Physical Therapist/Occupational Therapist Interview Questions – T4

1. Has plagiocephaly become a more common concern for infants? Definitely.
   a. Why or why not? I think one of the biggest things is the sleep position, on their back. And just knowledge of not knowing, parents not always knowing that you have to alternate positions and it just so happens that sometimes infants are really, light really influences them as far as how they orient when they’re very young and if they happen to nurse with a light filtering in a certain way and changing table and then if a baby is born with a tightness in their neck on top of it, we call it torticollis, then it’s even more compounded. And so you have one side that’s working stronger than the other and then it just gets exacerbated because it’s already tightening so it’s a compound of things but definitely the sleep position is the number one reason. I mean containment when in utero is also a way they can get plagiocephaly and also we have more of twins or more and we see that because of all the alternatives to contraception that we have now, or not contraception but as far as getting pregnant. We’ve had children who had been a twin and the other one was fine because they just don’t have the space.
   b. How much have you noticed an increase in occurrences, if at all, within the last 10 years? Well I know statistics, but it’s 600% since it’s gone down 50 but we don’t see many kids with plagiocephaly recently, we had kind of a score of them for a while but really cerebral palsy and muscular dystrophy and spina bifida are our three main ones that we see. And they have a lot of other diagnoses as well but they all have to be medically or neurologically based here.
2. How do you define plagiocephaly? It’s a flattening of one side of the head or it can be coned shaped, from the back all the way on the back, and when that happens the child tends to right to that direction and so then torticollis can set in as a result of that. So you have the flattening of the head, so it’s just like if you had a ball and you cut off the one side, you’re going to be lying on that side. And the hard thing is, when the baby is in that sleep position, the head is round back here so they’re going to tend to turn their head to one side because they get tightness coming from this way [horizontal] and as well as this way [vertical]. So there’s more than one range that gets affected. Also, when a child has torticollis it can also affect the hip and visual field because their midline orientation is no longer, this is their midline, if there head’s always like this [slanted], then this is their midline. I work at another site also and I got a child very late with torticollis and he actually his whole face, it looked like it had melted because the gravity pulls on the face whereas when you’re like this [upright] you’re symmetrical but when you’re like this [slanted] your face pulls more on that side. So sometimes they’ll go and do surgery, just cosmetic if it’s so dismorphic.

a. What are common characteristics? First of all, they’re usually delayed in their motor skills because they have this symmetrical, they’re not in symmetry so one side is working better than the other and so even hand use is affected as well but when they’re little it affects their rolling and they tend to use a pattern that our CP kids do is that they extend back to help them roll rather than, you always want when you’re rolling to have a little more flexion to help them roll and you either roll with the top part of your body or the bottom part and it’s interesting when you
have adults do it to see how we do it. So anyway, it definitely affects their motor skills from pretty much the get go. And then obviously midline orientation so all the things that are visual stimuli, all of that kind of things is affected so that you know your perception of things is different. And also, they may tend to only look to this side and not get the whole visual representation going to find a toy or even mother’s face or whatever. Like I said, midline shift, that can really affect them in school and I don’t know it affects a lot of things. Their balance, all of that kind of thing.

b. What seems to be the cause? Well, if it’s in utero, a lot of times that’s a containment issue, they either get wedged in a certain way. Obviously if the baby is impaired like has CP or has some other kind of thing that happened, then they don’t have the movement. And so then they stay in one position, failure to thrive, there’s a bunch of different things that can go on. But probably if the mom is really small and the baby is growing big or if mom has diabetes and so the baby tends to grow bigger, faster, then they don’t have space and so their head is in a certain position. On the outside, if it didn’t happen then, I know it sounds bad but I know that sleep position is really important, I have a friend who lost her baby to SIDS and so I know it’s really, really important but I think we need to explore some and they are coming out with orthotics for the kids when they’re babies so that it actually holds their position when they’re sleeping but I think there just needs to be a lot of education right when the babies are born because the unfortunate thing is when you’re a new mom, no one wants to hear their babies cry so they spend so much time on their back and they’re not exploring like they
normally do in their cribs because they’re out on their back, especially when they’re little, that they don’t like being on their stomach so then moms don’t do it.

c. When are you likely to first notice it? If it didn’t happen in utero, it’s interesting because I treated two of my daughter’s friends and when it seems like milestones should be occurring because it depends if they have a lot of hair, if they have a lot of hair then you can’t see it, but I think the biggest thing is they tend to use one side of their body better than the other and they tend to orient their vision to one side and when the mom’s holding the head I think the mom is one of the first to find it out and a lot of these moms are educated, you know they’ve done a lot of reading because they’re older so they’ve researched and they’ve had their friends who have had versus you know when my generation had children they were younger, [people are having babies] way older now. I think the things is is that there’s more working moms in this generation than the other and so I think there’s a lot of caregivers and stuff like that so which is a dynamic that is difficult for it to be addressed super early because mom’s working and she’s carrying a lot of but most of the moms that I’ve seen here have picked it up. We just happen to have had several of the moms who have had babies with torticollis on my caseload and stuff that have been highly educated and so they’ve come across it more with their colleagues and stuff.

How old would the baby be when you would first notice if forming?
That’s a good question, normally it would form within the first three months of life and because at three months they want if it’s not resolving by positioning changes, then they want to put on a helmet. 3-18 months, it needs to be done
before then. The malleability of the skull is easier to form [within that age range].
It’s up to the doctors discretion because there’s different severities and with some
of them, usually the kids never have a perfect head once they’re done but it’s still
very presentable and they don’t have the anomalies on their face and stuff like
that. And it just depends on the background of the families and stuff like that if
they’ve been educated by their doctors or run across even friends that have had it.
It really depend son a lot of psychosocial backgrounds of the families, even my
families that don’t have a lot of money, they’re really on it. Because they’re good
mothers and they’re with them all the time. And the doctors will pick it up too but
a lot of times it’s the moms.

3. What would you communicate to parents relating to preventing plagiocephaly? What
I do with everybody including friends, I encourage tummy time. It’s huge, that’s the
biggest thing. And also making sure that that if the baby is in a crib, a lot of parents
are having their baby sleep in the bed with them now I’ve seen it a lot with this
generation, and it’s just alternating the head position. Even if you have to turn around
and switch side of the bed, every time you change a diaper do the same thing and it’s
really easy to get in a preference of nursing so it’s important to alternate sides or turn
your chair the opposite direction so the light that is filtering in the room. Another
thing is if the babies are big, it’s harder for them to move because it’s harder to rotate.
But for sure, tummy time and it’s the scariest thing for parents because they’re afraid
they’re going to smother. One of the first things that it’s important is one of the first
reflexes they learn is to root for the breast and that same thing helps them be able to
turn their head so they’re not face down like that. And you know I give them ideas
like with towels that are already wrapped up with masking tape to put underneath here [chest and armpits] to help bring them up so that gravity is not such an enemy because gravity is an enemy they just don’t like that. You know the first way I teach them how to do it is to slouch back in a chair and put them here [on chest] because it’s the same position and so they get used to that on you.


4. At what point do you typically receive referrals for intervention? It’s been different for different kids, it takes a little while sometimes because it depends on how they go through the system but we probably I would say anywhere, from 6 months to a year.

a. How do you typically treat the children for intervention? Parent education’s probably one of the biggest things. We do an evaluation to find out what areas are affected and then we share that with the parents and set up a treatment plan and with a child like that we would definitely, sometimes we would even send them home with just some ideas they can do until we have the clinic visit which is when they come in. Homework? Yeah. And then we come in and start right in with, depending on the age of the child but if the child was young, starting in with tummy time right away. We use a lot of toys and stuff like that in the mirror and if the baby’s really sensitive depending on how young it is we will teach them hands on and we will put our hands over theirs and show them things because you really have to read the baby and I don’t feel bad at all if I have to the mom be the therapist and tell her to do it. You know we’ve had some babies, not with the same diagnosis, cry for 18 months straight. But you still have to get them treated so you know learn to be creative. You definitely want to work on their
developmental milestones but you don’t want to get the parents so locked in that they’re going, “Okay they’re six months old and they’re not sitting.” You need to like just say, we are setting the bar for just this child, where they are and where we’re moving next. So never make them feel that they’re pressured. And then making sure they don’t have any difficulty with the visual field, midline shift, giving them ideas with sleeping positions because side lying is an alternative. Especially in play because a lot of times you think babies have to play but a lot of times they don’t want to be on the tummy so you just depending where you’re at, like if you’re treating on a blanket on the floor near a couch, you just put their back up against the couch so then they don’t roll over so it kind of supports them and then you get down right on the floor with them and you can play and stuff like that so that’s a really neat position. Just a lot of education, positioning is number one and including tummy time and just playing with them and keeping an eye, if you get them young and it’s not resolving their doctor may referral them to someone who works with cranialcephaly and can give them a helmet.

b. How do you typically support the family?

c. How often would you follow up? It depends on the severity and then what the parents can do. If they can only come once a week, with a young child we would like to have them come twice a week and a lot of times we’ll make a home visit and just see and give them some ideas in the home and like I said I try to give them positioning ideas and when you’re a young mom, you’re not going to want to go find your masking tape, find the roll, whatever, so have a cute little basket wrapped up with masking tape and have that available so you can just do it.
5. When you observe moderate to severe plagiocephaly, are there often other developmental concerns? In my case, some of my co-workers have had more severe, I’ve been lucky not to have the severe ones because I’ve got them when they were kind of younger but for the severe ones, definitely would be the midline shift, and bilateral hand scales, if they’re orienting to the right and in bimanual activities they’re not using the left hand as well as they should be, the activities of daily living, because in OT that’s what we do in a rehab center. And also it’s really important in their school work and stuff like that if they’re really a lot of times around the peripheral page, they may not be seeing what’s over here. So you might even make suggestions to the classroom if they’re older and let’s say they have the torticollis as well, because sometimes they’ll actually do a lengthening but that would be in the more pronounced cases, is to adjust the paper to make sure they’re seeing everything. [Instead of orienting their entire body to look at the paper the way they see it straight, move the paper so they can see it fully]. But definitely you would want them to hook up with a specialist hopefully before they get severe because it will affect learning and motor and balance, a lot of things.

a. Which developmental domains have been the most commonly connected when plagiocephaly is present? Motor is definitely you notice the first, fine motor and gross motor. The typical population, not the severe, the visual issues don’t seem to be an issue. More moderate to severe. They also need to check the hip on that side too because sometimes they have problems at the hips and they need to have that checked when it’s been diagnosed.
b. Are there any special cases you might like to share with me to give me a range of the condition? Please do not include any identifying information such as first and last name. The one that I’ve talked about before, it was nice because she was very petite and she wasn’t really super strong at first so we had to work on her general musculature as well and mom was really helpful in the intervention and so that was really wonderful but it was really nice because we definitely developed a really strong bond and she did really well. Originally with handling I would have mom do some of the stuff because she was younger and she just got really comfortable. She was a joy to work with but it was nice having that case because that was one of my first ones and so it was nice seeing how our intervention and how successful it was when you have a new disability you’re working with which is common because at that time we got more plagiocephaly and actually torticollis was really interfering with what they needed to do. It was a new diagnosis, it was crazy. And so we got a lot of kids. But now, not so much now because they have to have other indentifying conditions.

c. Do you find any language/cultural distinctions in the children/families? If so, what are they and how do you work with these differences? All my kids have been Anglo but we’ve had another therapist hers has been, there’s a possibility of those I don’t see, I don’t know if I can answer that questions because I haven’t seen, I mean I have a lot of Hispanic kids in my population that speak Spanish so I expect it if that happens but it tends to, I don’t know why, in the Hispanic population they tend to have more children so there’s more of a chance to have something but they also seem to have natural multiple births and probably just
because the luck of the draw if you’re going to have several kids you might have a
set of twins but like I say, now people are augmenting getting pregnant in
different ways. There are more multiple births now. It just really depends on the
age of the parents, regardless of their nationality because I think the older you are,
the little more set in your ways but not always and sometimes you’re more
educated and it’s a lot easier but I would say a lot of the families now that I’m
getting who are not Anglo are really a lot more educated with their kids regardless
of their college degrees or whatever and I’m pretty impressed by what’s coming
up. It takes a lot out of their day, their time to get here because not everyone has
transportation. We have some moms who take three buses to get here and don’t
have a lot of funds and sometimes don’t have phones and things like that. In this
disability, I wouldn’t be able to address it as much as I would with others.

The neatest thing would be to have a hand out to give for new born babies, not to
scare them but to show that it’s increased but also that we’ve saved more lives so I think
that needs to be addressed to just give them ideas and resources. I think that’s number
one is just to get that information out there and nothing better than a pediatrician, that’s in
their new baby pamphlet.
Physical Therapist/Occupational Therapist Interview Questions – T5

1. Has plagiocephaly become a more common concern for infants? That I’ve seen, no.
   a. Why or why not? Because I haven’t seen an increase in the kids that I see in my caseload, it’s remained pretty constant.
      
      So when you say constant, how often would you see it? I have about 70 kids on my caseload and over the past two and half years, about one or two of them has had it.
   b. How much have you noticed an increase in occurrences, if at all, within the last 10 years? Well I’ve only been doing this for two and half, but over the two and half I haven’t seen an increase.

   a. What are common characteristics? A lot of times you’ll see like a flat spot or you’ll see one cheekbone is more prominent than the other, one ear is more forward or back than the other one, some asymmetries with the face.
   b. What seems to be the cause? My experience, a lot have been, or all of the causes have been to do with torticollis.
   c. When are you likely to first notice it? Usually the first few months you start to notice it.

3. What would you communicate to parents relating to preventing plagiocephaly? More tummy time. It’s an underused activity. Everybody is kind of, you know the whole SIDS thing, they’re very weary of.
a. Promoting gross motor development? The tummy time goes hand in hand with reaching gross motor goals quicker, with decreasing the rate of torticollis, which in turn you don’t see as much plagiocephaly.

4. At what point do you typically receive referrals for intervention? See it’s hard for us because we, there’s a lot of paperwork that needs to be filled out, unfortunately I a lot of times, some of the experiences I’ve had is the parents will go back to their pediatrician with some concerns and the pediatrician a lot of the times will say “You know, just give it some time, it’ll get better,” so that kind of puts off the time even more. A lot of times it’s hard for me, my experience it’s hard to get them in before they’re one. A lot of times I see them after the age of one, 12-13 months, is usually when I start to see them.

a. How do you typically treat the children for intervention? With plagiocephaly, usually they’ll have some type of helmet but the torticollis, more tummy time and then there’s some stretches but what we found works most effectively is if an adult is supervising the baby while it’s sleeping, just put the baby on their tummy and rotate the head in the position that has the tight musculature. I always caution them with, you know, if they’re taking a nap and they’re being supervised by an adult I think it’s good for them to sleep on their stomach. If you’re going to walk out of the room you want to make sure they’re on their back.

b. How do you typically support the family? We give them handouts with different stretches they can do and activities to do but I think really emphasizing the importance of tummy time, just so the parents know how important it is, is the biggest thing. Because you really want the follow through at home.
Do you find that a lot of your parents use the recommendations that you often give? Yes.

Can you tell if they aren’t utilizing them at home? You can. Because it’s not going to get better with, a lot of the times I can only see the kid once or twice a week, a lot of times it doesn’t get better with me seeing them once or twice a week but if there’s good follow through at home, you see a lot of results really quickly. You can tell the parents that are doing it and the parents that are not.

So, what would you say maybe if you could tell parents weren’t utilizing it at home? I usually say something like, “I would expect there to be more progress than there has been and stuff like that, you know kind of let the parents know that I think maybe [they’re not doing what they’re supposed to do].

c. How often would you follow up? I try to see them as frequently as possible because there’s a lot of research coming out that says that once the kid is two years old it’s very, very difficult to get the range back, and I’m talking about torticollis, if they’re kind of stuck in this position for too long, their eyes kind of orient to this is normal so when they do get the neck range of motion back and they are able to get their head to a neutral position, the eyes still tell the head, this is normal, not this [straight up and down]. So it’s really, really important to see these kids before, the earlier the better.

5. When you observe moderate to severe plagiocephaly, are there often other developmental concerns? Yeah. Sometimes crawling is difficult. Sometimes there’ll be other tightness that goes hand in hand with the sternocleidomastoid tightness and the whole, I don’t deal much with vision but I know that has a lot to do with how
they’re oriented, if they’re oriented with their head kind of [slanted], that [they’re going to see everything differently].

a. Which developmental domains have been the most commonly connected when plagiocephaly is present? I would think maybe bring the midline together, but I think definitely gross motor skills are affected. But fine motor I guess could be affected also, with just what I see, I know that when I treat the kids there’s gross motor.

b. Are there any special cases you might like to share with me to give me a range of the condition? Please do not include any identifying information such as first and last name. I had one kid that she [her mother] kept taking her daughter back to the and the doctor kept telling her, “Oh it’ll resolve itself, it’ll resolve itself,” and she finally went to go to a different doctor and this doctor wrote a referral for CCS so by the time we got her she was like 22 months, and she had a very like thick mass, she had torticollis, and she came in wearing a helmet, that was the first thing they had treated and she had already oriented to, this is normal for me so she would just stand there kind of like this at you but she had full range of motion like she could turn her head both ways and side tilt all the way but this is just how she felt normal [head at a slant].

Are you still working with her? No, once range of motion is restored to full, that’s kind of when we discharge because there’s not much more that we’re allowed to work on with them.

c. Do you find any language/cultural distinctions in the children/families? If so, what are they and how do you work with these differences? No. Well, I don’t
find any but the family who kept going back to the doctor, I don’t know if her
doctor didn’t have a lot of exposure to it but she was a Spanish speaking only
mom, I can’t remember the doctor that she was with so maybe there could have
been something lost in translation also but it was a Spanish speaking mom who
had the daughter that took so long to get her into the system so I guess there could
be some. She would go to the clinicas which is for people that don’t, for lower
income people, it might take longer to get in there to make an appointment, I’m
not sure I don’t have that much experience. She didn’t have real easy access to a
doctor that could also be a factor.
1. Has plagiocephaly become a more common concern for infants? Yes.
   a. Why or why not?
      Due to the increase in premature infants surviving and the back to sleep movement.
   b. How much have you noticed an increase in occurrences, if at all, within the last 10 years?
      I have only been working in the field for about four years.

2. How do you define plagiocephaly?
   The flattened skull
   a. What are common characteristics?
      Usually the delayed motor development, muscle tightness, and or more prominent use of one side of the body (such as in hemiplegia)
   b. What seems to be the cause?
      Delayed movement, lack of environment to encourage movement. It is often accompanied by torticollis.
   c. When are you likely to first notice it?
      Around three months is the earliest I will usually see patients with it.

3. What would you communicate to parents relating to preventing plagiocephaly?
   a. Promoting gross motor development?
      For me positioning is huge until the gross motor can develop. Turning them often onto both sides, using pillows or blankets in the way I show them to hold the positioning if necessary.
Lots of tummy time, on mom or dad if that’s the only tolerable way.

Stretching of the neck muscles.

Encouraging head turning with toy tracking.

Holding the baby in different ways to encourage different head turning and neck strengthening,

4. At what point do you typically receive referrals for intervention?

Around 3-4 months for extreme cases and when other concerning factors are involved
a. How do you typically treat the children for intervention?
   Positioning, parent education, stretching and strengthening
b. How do you typically support the family?
   Education, as much information as I can give them, and understanding
c. How often would you follow up?
   Depending on severity I would see the child once to twice a week until there are no further concerns.

5. When you observe moderate to severe plagiocephaly, are there often other developmental concerns?

Yes. Often delayed motor development, favoring of one side, tightness, low vision or decreased vision in one eye. Its often a concern in premature infants due to lack of movement
a. Which developmental domains have been the most commonly connected when plagiocephaly is present?
   Gross motor development.
b. Are there any special cases you might like to share with me to give me a range of the condition? Please do not include any identifying information such as first and last name.

c. Do you find any language/cultural distinctions in the children/families? If so, what are they and how do you work with these differences?

I have not