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The Experiences of Late Adolescent and Young Adult Females with Sports-Related Concussions

Ann Snyder

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This dissertation, THE EXPERIENCES OF LATE ADOLESCENT AND YOUNG ADULT FEMALES WITH SPORTS-RELATED CONCUSSIONS, by ANN SNYDER, was prepared under the direction of the candidate's dissertation committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Nursing in the Byrdine F. Lewis College of Nursing and Health Professions, Georgia State University.

Regena Spratling, PhD, RN, CPNP
Committee Chairperson

Susan J. Kelley, PhD, RN, FAAN
Committee Member

Shelley Linens, PhD, ATC

Date

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Dawn Aycock, PhD, RN, ANP-BC, FAHA
Doctoral Program Director
Byrdine F. Lewis School of Nursing and Health Professions

Regena Spratling, PhD, RN, CPNP
Associate Dean and Chief Academic Officer for Nursing
Byrdine F. Lewis School of Nursing and Health Professions

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Ann Snyder
2365 Castleberry Village Drive
Cumming, GA 30040

The director of this dissertation is:

Regena Spratling, PhD, RN, CPNP
Associate Dean for Nursing
Byrdine F. Lewis College of Nursing and Health Professions
Georgia State University
P.O. Box 4019
Atlanta, GA 30302-4019

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VITA

Ann Snyder

ADDRESS: 3265 Castleberry Village Drive, Cumming, GA 30040

EDUCATION:

Ph.D.	2019	Georgia State University, Atlanta, GA
M.S.	2004	Georgia State University, Atlanta, GA
B.S.N.	1984	LaSalle University, Philadelphia, PA
RN Diploma	1980	Chestnut Hill Hospital School of Nursing, Philadelphia, PA

PROFESSIONAL EXPERIENCE:

2011–present	Assistant Professor, University of North Georgia
2009–2013	Pediatric Nurse Practitioner, Pediatric Emergency Medical Associates
2005–2010	Pediatric Nurse Practitioner, Children’s Anesthesia Services, Children’s Healthcare of Atlanta
2005	Pediatric Nurse Practitioner, Gwinnett Regional Youth Detention Center, Lawrenceville, GA
1999–2005	Emergency Room Nurse, Children’s Emergency Center Gwinnett Medical Center, Lawrenceville, GA
1996–1999	Critical Care Nurse, Scottish Rite Children’s Medical Center, Atlanta, GA
1991–1996	Certified School Nurse, Glassboro High School, NJ
1980–1992	Staff Nurse, Critical Care and Cardiac Rehabilitation, Jeanes Hospital, Philadelphia, PA Princeton Medical Center, Princeton, NJ

PROFESSIONAL ORGANIZATIONS AND CERTIFICATIONS:

2004–present	Sigma Theta Tau International Honor Society of Nursing
2004–present	National Association of Pediatric Nurse Practitioners
2013–present	Southern Nursing Research Society

AWARDS:

2016	College of Health Sciences and Professions, Intramural Faculty Research Award, University of North Georgia
2015	Kaiser Doctoral Student Award, Georgia State University

ABSTRACT

THE EXPERIENCES OF LATE ADOLESCENT AND YOUNG ADULT FEMALES WITH SPORTS-RELATED CONCUSSIONS

by

ANN SNYDER

Concussions are a common injury for participants in recreational and organized sports activities and are a major public health issue. Females are more likely than males to suffer concussions in gender-comparable sports, and their symptoms may be more severe and longer lasting than in males. Although adolescent and young adult females with sports-related concussions (SRC) may require more treatment interventions than males, we know little about their experiences and the best approaches for their care. Therefore, the purpose of this study was to explore the experiences of late adolescent and young adult females with one or more SRC. Interpretive phenomenology provided a framework to describe and interpret the experiences of 15 late adolescent and young adult females with a history of SRC. Participants ranged in age from 18 to 24 years. An audiotaped semistructured interview was conducted with each participant. Five themes and one pattern emerged during analysis of data from the interviews. The themes were “Telling myself I’m fine,” “So much pain,” “I’m out of the loop,” “I didn’t feel like myself,” and “People don’t understand.” This study explored the day-to-day experiences of late adolescent and young adult women with SRC. These young women did not initially realize the severity of their injury, particularly if they had not suffered a previous concussion. Pain, particularly headache pain, affected their daily life. Sensitivity to light and sound increased headache pain and restricted activities for the young women during

recovery. Missing school, sports activities, and social activities contributed to feelings of isolation. The inability to use technology caused the young women to feel disconnected from their peers. Participants felt that they were different from their normal selves during their recovery. Although they understood that their symptoms were not clearly visible to others, the young women were frustrated by the lack of concussion knowledge among their peers. This study contributes to the body of knowledge by helping nurses and other healthcare providers to understand the needs of young women with SRC so that better care can be provided. Recommendations for nursing practice, education, and research were identified in this study.

THE EXPERIENCES OF LATE ADOLESCENT AND YOUNG ADULT FEMALES
WITH SPORTS-RELATED CONCUSSIONS

by

ANN SNYDER

A DISSERTATION

Presented in Partial Fulfillment of Requirements for the
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Atlanta, Georgia

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LIST OF ABBREVIATIONS

AI	Athletic identity
CDC	Centers for Disease Control and Prevention
CTE	Chronic traumatic encephalopathy
HRQOL	Health-related quality of life
IRB	Institutional Review Board
SRC	Sports-related concussion
TBI	Traumatic brain injury

CHAPTER I

INTRODUCTION

Adolescence is a period of transition from childhood to adulthood. It is a time of rapid physical, cognitive, and psychosocial growth and development (American Academy of Pediatrics, 2015). Young adulthood is a period from the conclusion of adolescence into the initial period of adulthood. It is a time when the individual explores more independent roles and life possibilities (Arnett, 2015). Participation in sports has increased among female adolescents and young adults in recent years, resulting in an increase in concussion rates in this population. Female adolescent athletes in high school sports recently set an all-time high of 3.2 million sports participants per school year (National Federation of State High School Associations, 2014). Although most concussions occur in football players, female adolescent athletes have higher rates of sports-related concussions (SRC) than do male adolescent athletes in gender-comparable sports (Rosenthal, Foraker, Collins, & Comstock, 2014). In addition, female collegiate athletes have been found to have higher concussion rates in baseball, softball, basketball, ice hockey, and soccer than their male counterparts (Covassin, Moran, & Elbin, 2016).

Concussion is a form of traumatic brain injury (TBI). Of the approximately 2.5 million emergency department visits for TBIs per year, 75% are concussions (Centers for Disease Control and Prevention [CDC], 2014b). TBI-related emergency department visits by females increased by 49% between 2007 and 2010 (CDC, 2014a). Female adolescent and young adult athletes report more concussions, more severe concussion

symptoms, and longer recovery times than males do (Colvin et al., 2009; Covassin, Elbin, Harris, Parker, & Kontos, 2012). The reasons for concussion differences between the sexes are not fully understood. There is little research on concussion in female athletes and few published studies on the lived experience of concussion in female athletes. Therefore, the purpose of this study was to explore the experiences of late adolescent and young adult females with a history of one or more SRC.

Background

Concussion is defined as “a complex pathophysiologic process affecting the brain, induced by biomechanical forces caused either by a direct blow to the head, face, neck, or elsewhere on the body with an ‘impulsive’ force transmitted to the head” (McCroory et al., 2013, p. 250). The symptoms of concussion fall into four domains: physical, cognitive, emotional, and sleep-related (CDC, 2015c). Headache is the most common symptom reported by both male and female high school athletes with concussions, followed by dizziness and difficulty concentrating (Frommer et al., 2011; Marar, McIlvain, Fields, & Comstock, 2012).

Concussions are predominantly functional or microstructural injuries to neuronal tissue, resulting in no structural defects seen on computerized tomography or traditional magnetic resonance imaging scans (Giza & Hovda, 2014; McCroory et al., 2013). Rapid acceleration, deceleration, and rotational forces cause neurons, glial cells, and blood vessels in the brain to stretch, resulting in an altered permeability that initiates a complex cascade of neurometabolic events (Signoretti, Lazzarino, Tavazzi, & Vagnazzi, 2011). Concussion symptoms are believed to be due to these cellular imbalances. Animal studies indicate that the adolescent brain is particularly vulnerable to repeat injury during this period of neurometabolic imbalance after a concussion (Giza & Hovda, 2001).

Over 300,000 high school SRC were reported in the 2013–2014 school year, according to the National High School Sports-Related Injury Surveillance (Comstock, Collins, & Currie, 2014). The High School Reporting Information Online is the internet-based data collection tool used in the National High School Sports-Related Injury Surveillance Study; it is currently the only surveillance study of injuries in a national sample of high school athletes (Comstock et al., 2014). Data from the High School Reporting Information Online reveal that female high school athlete concussion rates for softball, basketball, soccer, and volleyball increased from 2005 to 2012 (Rosenthal et al., 2014). Among high school soccer players in 2012, female athletes had concussion rates that were almost double those of male high school soccer players (Rosenthal et al., 2014). The National Collegiate Athletic Association’s (2019) Injury Surveillance Program is the internet-based data collection tool designed to track and analyze medical illnesses and injuries resulting from sports participation among male and female collegiate athletes. In gender-comparable sports, female collegiate athletes have been found to have overall concussion rates that are 40% higher than male athlete rates, with female concussion rates increasing since the Injury Surveillance Program began to collect injury data on females in 2004 (Covassin et al., 2016; Kerr et al., 2017).

Differences in Concussion Symptoms by Age and Sex

An individual’s age and sex have both been found to play a role in number of symptoms, severity of symptoms, and length of time for recovery after a concussive injury. Concussion symptoms usually resolve in less than 10 days, but can last longer in up to 20% of adolescent cases (McCrorry et al., 2013). Adolescent athletes have more problems with memory and reaction time than do young adult athletes after concussion (Baillargeon, Lassonde, Leclerc, & Ellemberg, 2012; Zuckerman et al., 2012). The

reasons that adolescents have more protracted recovery from concussion than adults are not fully understood, but immature central nervous systems, thinner cranial bones, and larger subarachnoid spaces, along with differences in cerebral blood flow have been suggested (Karlin, 2011).

Female adolescent athletes report a higher total number of concussion symptoms and rate their symptoms as more severe than their male counterparts (Colvin et al. 2009; Lovell et al., 2006; McCrory et al., 2013). Although both males and females report headache as the primary concussion symptom, female high school athletes report drowsiness and sensitivity to noise more often than male high school athletes do (Frommer, et al., 2011). Concussion symptoms also tend to last longer in female adolescent athletes in comparison to male adolescent athletes (Colvin et al., 2009). Female high school and college athletes are more than twice as likely as males to report migraine-like symptoms after concussion, and these symptoms have been found to be predictive of delayed recovery (Mihalik et al., 2013). In postconcussion testing, female high school and college athletes with concussions displayed slower reaction times and greater total symptoms than concussed males, and were twice as likely as males to exhibit cognitive impairments (Broshek et al., 2005).

Female college athletes also report a significantly higher number of baseline (preseason, preconcussion) symptoms, such as headache and fatigue, than do male college athletes (Covassin et al., 2006). Similar baseline differences were identified in concussed high school and college athletes in comparison to healthy controls when studies were conducted to establish normative values for concussion symptom scales (Lovell et al., 2006). Differences in neck muscle strength as well as monthly fluctuation of female hormones have been proposed as possible explanations for the differences in

concussions between males and females (Covassin & Elbin, 2005; Gutierrez, Conte, & Lightbourne, 2014; Mihalik et al., 2013). The limited number of studies focusing specifically on female adolescent athletes with concussions indicates the need for research into the symptoms experienced by these athletes and the reasons behind sex differences in concussions.

Affect of Concussions in Female Athletes

Psychological and psychosocial aspects of SRC can be disabling and have long-term effects on risk, recovery, return-to-sports, and quality of life for athletes (Wiese-Bjornstal, White, Russell, & Smith, 2015). High school female athletes with concussions tend to have more treatment interventions than men do and are more likely to require academic accommodations to allow a gradual return to school after a concussion (Kostyun & Hafeez, 2014). Persistence of symptoms such as headache, sleep disturbances, and intolerance to light and sound have been found to decrease health-related quality of life (HRQOL) in females, and those with more severe symptoms early in the postconcussion period have more problems with HRQOL (Stein et al., 2015; Valovich McLeod, Bay, & Snyder, 2010). Adolescents with SRC report sleep disturbance, frustration, forgetfulness, and fatigue symptoms occurring during a follow-up period rather than initially after the injury (Eisenberg, Meehan, & Mannix, 2014). In a qualitative study, Andre-Morin, Caron, and Bloom (2017) explored the experiences of five female college athletes with SRC and found that symptom resolution time varied widely, and most of the participants reported physical and social difficulties when they returned to normal academic and daily activities. Persistent postconcussion symptoms can keep high school and collegiate athletes out of school as well as sports, and have an

effect on their quality of life. These studies illustrate the need to gain an understanding of how concussion symptoms affect a female athlete's academic, social, and athletic life.

Within the sports concussion literature, there is evidence that females in high school and collegiate samples report more baseline concussion symptoms as well as more postconcussion symptoms than males do (Colvin et al., 2009; Covassin et al., 2006; Lovell et al., 2006; McCrory et al., 2013). In addition, researchers have found adolescent and young adult females are more likely than males with SRC to report migraine-like headaches and are more likely than their male counterparts to require education accommodations due to cognitive postconcussion impairments (Frommer et al., 2011; Mihalik et al., 2013). The role of neck muscle strength and female hormone fluctuation in females have been proposed as possible gender differences related to the pathophysiology of SRC in females compared to males (Covassin & Elbin, 2005; Gutierrez et al., 2014; Mihalik et al., 2013). Although persistent postconcussion symptoms have been found to affect HRQOL, this variable has not been studied in adolescent and young adult females with SRC in comparison to males with SRC (Valovich McLeod et al., 2010; Voormolen et al., 2018).

Concussion awareness and surveillance of SRC have increased in recent years, but the majority of published data on SRC has been conducted with male high school and collegiate athlete samples. There is a need for research on concussions in female athletes in order to develop gender-specific resources, protocols, and support for these athletes. Therefore, a qualitative study of the lived experience of late adolescent and young adult females who have experienced SRC was conducted to explore their unique symptoms and concussion-related experiences.

Significance to Nursing

Female late adolescent and young adult athletes with SRC are more likely than their male counterparts are to have a longer recovery time after SRC, which translates into longer periods to return to school and sports. Nurses working with females with SRC, whether in the school setting, primary care, or acute care setting, need to understand the experiences of this population. Understanding the experiences of a patient represents the human side of nursing and gives nurses valuable insights into what a phenomenon (such as SRC) means in the lived experience of the individual (McConnell-Henry, Chapman, & Francis, 2009).

SRC can be conceptualized as an illness. Understanding the meaning of living with an illness can relieve an individual's sense of alienation that often accompanies illness (Benner & Wrubel, 1989). Symptoms and experiences related through the spoken word can be laden with meaning for the individuals in a phenomenological study. Knowledge gained from the study can be used to develop education and interventions tailored to late adolescent and young adult females with SRC.

Statement of Purpose

The purpose of this study was to explore the experiences of late adolescent and young adult females with a history of one or more SRC. This study will help nurses and other healthcare professionals working with females with SRC to understand what they experience in their daily lives with SRC. The overall aim of the study was to gain an understanding of how female late adolescent and young adult athletes with SRC experience their world. Specific aims of the study were to gain an understanding of their perceptions of (a) the day-to-day life of a female late adolescent or young adult athlete with SRC; (b) how female late adolescent and young adult athletes with SRC experience

changes in their school, athletic, and social lives; (c) how female late adolescent and young adult athletes with SRC perceive their educational, athletic, and social future; and (d) how nurses may help.

Theoretical Context

An interpretive phenomenological approach was selected to interpret the meanings of the experiences of late adolescent and young adult females with SRC. The term phenomenology is based on its Greek origin (phenomenon) and means, “that which shows itself in itself” (Heidegger, 1962, p. 51). Phenomenology is a philosophical path to the study of experience (Smith, Flowers, & Larkin, 2009). This approach gives a voice to the lived experience of individuals, and can identify concepts that need to be researched further and for phenomena that are not well understood.

Edmund Husserl is considered the father of the phenomenology movement in the early 20th century (Cohen & Omery, 1994). His phenomenology was a response to frustration with what he saw as “an incapacity and unwillingness of science to face problems of value and meaning because of its confinement to mere positive facts” (Spiegelberg, 1982, p. 75). Husserl sought to develop a philosophy that would connect science to deep human concerns. He believed that life-world is what individuals experience pre-reflectively, without interpretations (Dowling, 2007).

Martin Heidegger, a student of Husserl, sought to go beyond the description of human experience in order to understand experiences through interpretation (Cohen & Omery, 1994). He moved into interpretive phenomenology, referred to as hermeneutic phenomenology (Heidegger, 1962). Hermeneutics is the theory and practice of interpretation. The term is derived from the name of the Greek god *Hermes*, who was responsible for “communicating messages from Zeus and other gods to ordinary mortals”

(van Manen, 1990, p. 179). For Heidegger, hermeneutics involves going beyond description of a phenomenon and tries to uncover meaning through interpretation. Heidegger focused on ontological questions of the nature of *Being*, while Husserl focused on epistemological questions of the nature of knowing (Annells, 1996; Heidegger, 1962; Koch, 1995). For Heidegger, the meaning of Being was more important than Being itself (Spiegelberg, 1982).

Qualitative research is a process of understanding based on methodological traditions of inquiry that explore a social or human problem (Creswell, 1998). The aim of qualitative research is to “understand, describe, and explain beliefs, behaviors, and meaning within the contexts in which they normally occur” (Wu & Volker, 2009, p. 2721). The development of scientific knowledge begins with observations that lay the theoretical foundation and determine the conceptual parameters of a discipline before quantitative methods can be used to test and refine a growing body of knowledge (Morse, 1994). The naturalistic paradigm of qualitative research differs from quantitative paradigms in that reality is really a “set of mental constructions” made by humans (Lincoln & Guba, 1985, p. 295). This paradigm allows inquiry into a person’s experience of health, rather than his or her health itself (Risjord, 2010).

Qualitative methods are useful when the focus of research is on a topic that is poorly understood and about which little is known. For the problem of SRC in late adolescent and young adult females, researchers are just beginning to appreciate the differences in incidence, symptoms, and outcomes in comparison to their male counterparts. Interventions such as concussion education, as well as concussion identification and management protocols, have been developed based primarily on data collected from collegiate and professional male athletes. The nature of the research

question and the fact that the phenomenon of SRC needs to be explored from the females' viewpoint supports the need for a qualitative approach. Concepts cannot be easily identified and theories are not available to explain the phenomenon in the population of interest (Creswell, 1998), again supporting the need for a qualitative study. A review of the literature revealed a scant amount of qualitative data exploring the experiences of female collegiate athletes with SRC. Currently no published qualitative studies on the experiences of females who suffered SRC while participating in high school or recreational sports exist.

A critical assumption of Heidegger's phenomenological perspective is its emphasis on language in the text, which informs experience, and does not exist apart from thought or perception (Munhall, 2007). Heidegger (1962) argued that humans are, at all times, submerged in their world, which he referred to as *Being-in-the-world*, or *Dasein*. In the context of the current study, being-in-the-world refers to the female adolescent athlete with SRC as situated within that world. The researcher's task is to interpret from the text what it means to be a female athlete with SRC. The concepts related to this phenomenon include thrownness, temporality, spaciality, and disposition.

Thrownness. Thrownness is a characteristic of Dasein (Being-in-the-world), referring to human beings finding themselves *thrown* (Heidegger, 1962). This applies not just to birth, but also to "human beings being diverted by the world of their present, tied to their past, and reaching into the future, where they find themselves thrown" (Cohen & Omery, 1994, p. 145). In the study, *thrownness* applies to female late adolescent and young adult athletes with SRC being thrown into a state of being-in-the-world that is foreign to them.

Temporality. Heidegger emphasized the notion of temporality, viewed as connectedness rather than linear time (Annells, 1996). Temporality is more than a linear succession of moments; it involves “the qualitative lived experience of time” (Benner, Tanner, & Chesla, 2009, p. 315). Temporal dimensions of past, present, and future constitute individuals’ perception of where they are heading in their life (van Manen, 1990). Temporality, or time, is a frame of reference for an individual’s Being-in-the-world (Spiegelberg, 1982). For female late adolescent and young adult athletes with SRC, temporality applies not to a specific date or time, but how this time stands out or is important to the individual’s Being-in-the-world, or how the female athlete with SRC is experiencing her world since the time of her concussive injury.

Spaciality. Spaciality refers to lived space, or felt space, and is largely preverbal; we do not ordinarily think about it (van Manen, 1990). Heidegger (1962) referred to space as how it feels to be in a space. For female late adolescent and young adult athletes with SRC, researchers are interested in how the feeling of being in a particular space influences the experience of SRC. Space and time are part of the context influencing the meaning of an event, and if they were different, so would the experience be different.

Disposition. Disposition refers to the mood, or starting point, in which the experience is lived, and takes into account ideas preconceived in relation to experiences of Being-in-the-world (McConnell-Henry et al., 2009). For female late adolescent and young adult athletes with SRC, this would encompass the mood and feelings about the lived experience of SRC.

Researcher Assumptions

It is presumed that a researcher comes to the human sciences with prior interests, or a worldview. A paradigm, or worldview, is a way of “thinking about and making

sense of the complexities of the real world” (Patton, 2002, p. 69); a basic set of beliefs or assumptions that guide the researcher’s inquiry. Researchers need to be aware of their own assumptions or previous understandings of a familiar phenomenon in order to avoid projecting our own beliefs into the interpretation of the phenomenon being considered for the research project. Heidegger believed that presuppositions are not to be eliminated or suspended, but are what constitute the possibility of meaning (Ray, 1994). Heidegger (1962) referred to prior understanding as fore-structure. The researcher in a naturalistic inquiry is an instrument and interacts with the participant, with each influencing the other (Lincoln & Guba, 1985). Awareness of my assumptions as a nurse caring for female athletes with SRC is necessary to allow my interpretation of meanings in the spoken word of the participants in this study. My researcher assumptions are the following:

1. Female late adolescent and young adult athletes with SRC are a subset of individuals with concussions.
2. Female late adolescent and young adult athletes with SRC may have unique experiences that differ from the experiences of male adolescent athletes with SRC.
3. Female late adolescent and young adult athletes with SRC are cast into a world that changes their sense of how they fit into the world around them.
4. Female late adolescent and young adult athletes with SRC are experts in their experience with this phenomenon.
5. Female late adolescent and young adult athletes with SRC have unique developmental needs and concerns.

6. Nursing care for female late adolescent and young adult athletes with SRC includes concern for their physical, psychological, developmental, and social well-being.

Summary

Female late adolescent and young adult athletes with SRC are the population that is best able to report the lived experience of this phenomenon. Researchers are just beginning to appreciate the differences in incidence, symptoms, and outcomes in female athletes with SRC compared to male athletes with SRC. To date, interventions such as concussion education, as well as concussion identification and management protocols, have been developed based primarily on data collected from collegiate and professional male athletes. The nature of the research question and the fact that the topic needs to be explored from the female late adolescent and young adult athlete's viewpoint supports the need for a qualitative approach. Interpretive phenomenology allowed female late adolescent and young adult athletes with SRC to tell the story of their experiences in their own words. Understanding the day-to-day experiences of female late adolescent and young adult athletes with SRC will add to the knowledge of SRC concepts specific to this population.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter comprises a review of the literature on concussions and more specifically, concussions in female late adolescent and young adult athletes. Until recently, research on the public health problem of SRC has focused primarily on male professional and college athletes. In recent years, the focus has expanded to include female college athletes, as well as male and female high school athletes. Studies involving female adolescent and young adult athletes with concussions have primarily focused on incidence, severity, and duration to recovery. The literature review reveals very little published qualitative data on the experiences of female athletes with concussion. The review was conducted using several databases, including CINAHL, PubMed, Medline, PsychInfo, and SPORTDiscus. Key words used in the searches included *concussion, sports-related-concussion, female athlete, adolescence, development, identity, concussion symptoms, high school athlete, collegiate athlete, lived experience, qualitative, and phenomenology.*

The literature on adolescent and young adult development provided a foundation for understanding the context within which the female athlete experiences a concussive injury. The literature on concussion in adolescent and young adult athletes as well as female athletes in particular is presented. What is known about differences in concussion symptoms, duration of symptoms, and recovery from SRC between male and female athletes is discussed. Literature pertaining to sports-related injuries and athletes in

general is presented, with a discussion of how the findings point out what is known and not known about female adolescent and young adult athletes with concussions. Finally, the need for knowledge about the day-to-day experiences of female athletes with concussion is presented.

Adolescence and Young Adulthood

Adolescence refers to the period of human growth and development that occurs between childhood and adulthood. This period represents a time of physical maturation, as well as cognitive and psychosocial development. The American Academy of Pediatrics (2015) used three age levels to define adolescence: (a) early adolescence, ages 11 to 14 years; (b) mid-adolescence, ages 15 to 17 years; and (c) late adolescence, ages 18 to 21 years. Females typically reach skeletal maturity by age 14 to 15 years, but cognitive and psychosocial development continues into late adolescence (Chulani & Gordon, 2014; Newton, 1995).

Adulthood generally refers to the period that follows adolescence, when most individuals move from dependence on parents or guardians to independence. There is no clear consensus on an age range to define young adulthood. Since the middle of the last century, demographic changes in the average age of marriage and completion of education have risen, making the late teens and early twenties less of a transition to adulthood and more of a distinct period of time (Arnett, 2000). Arnett (2000) proposed that the period from 18 to 25 years of age is neither adolescence nor young adulthood, but is distinctly *emerging adulthood*. Studies have shown that the brain is not fully developed before the early twenties and known health disparity exists in the 18- to 25-year-old group; therefore, both the Institute of Medicine (2014) and the Society for

Adolescent Health and Medicine define young adulthood as the time from age 18 up to the 26th birthday (Walker-Harding, Christie, Joffe, Lau, & Neinstein, 2017).

The everyday experiences of the female adolescent or young adult athlete is part of her cognitive and psychosocial development. These experiences take place in the physical and social settings in which the young woman lives. Currently, how SRC affects the life of the female adolescent or young adult athlete and how this injury interacts with development is not known.

Identity Development

Erik Erikson (1968) proposed a theory of psychosocial development consisting of eight stages, with each stage involving a specific task or crisis that must be resolved prior to moving forward in development. Identity formation is the task of adolescence.

Adolescents in this stage begin to form a basic identity, which they re-form throughout their lives. Erikson described an optimal sense of identity as “psychosocial well-being” and an inner assuredness or sense of “knowing where one is going” (Erikson, 1968, p. 165). Intimacy versus isolation is the task of early adulthood in Erikson’s psychosocial theory. During this period, individuals who have formed an identity focus on forming intimate relationships and commitments with others. As a developmental theorist, Erickson did not conduct empirical research, but his theory served as a starting point for inquiry into adolescent identity formation (Kroger, 2004).

James Marcia (1966), a development psychologist, is credited with providing a foundation for empirical investigation of identity formation (Adams, 1993). Believing that the adolescent stage consists of the degree to which one has explored and committed to an identity in various life domains, Marcia developed an ego status identity model for assessing dimensions of Erikson’s (1968) identity formation theory. He proposed four

identity statuses: (a) diffusion, (b) foreclosure, (c) moratorium, and (d) achievement (Kroger, Martinussen, & Marcia, 2010). These identity statuses are observable phenomena linked to processes of ego growth described by Erikson (Kroger et al., 2010). Individuals who make commitments to roles, but also accept revision of their ideals and plans, are more likely to see their future as something to be shaped rather than predetermined (Marcia, 2011). Marcia's identity status model is credited with generating numerous published studies on the identity formation process (Kroger, 2004).

Adolescents and young adults, through identity formation, learn how they fit in the rest of society. After the initial identity is formed, life cycle events will result in an identity re-formation process (Erikson, 1968; Kroger et al., 2010; Stephen, Fraser, & Marcia, 1992). This establishment of a self-identity prepares the adolescent and young adult to fulfill adult societal roles and expectations (Chulani & Gordon, 2014). Although identity is thought to change through the lifespan, adolescence is the first time individuals have the cognitive capacity to process information in more complex ways (Siegel, 2013). The inner sense of "who we are and who we can become" changes as adolescents learn to process abstract information (Siegel, 2013, p. 76). In this way, one's sense of identity shifts and evolves throughout adolescence and young adulthood, requiring both cognitive and affective development (Wiley & Berman, 2013). Cognitive skills, such as the ability to reason logically and think abstractly, improve considerably during adolescence and into young adulthood as psychosocial development progresses (Spear, 2010).

Psychologists have suggested that individuals also go through a series of cognitive stages in addition to psychosocial stages. Jean Piaget (1954) considered it a major accomplishment of adolescence to move from a stage of thinking based on tangible stimuli to a cognitive stage based on abstract and hypothetical thinking. The adolescent

moves from the stage of *concrete operations* to *formal operations* as they “develop the capacity to reason in terms of hypotheses and not simply in terms of objects and their manipulation” (Piaget, 1972, p. 42). In this stage of formal operations, the adolescent also starts to conceptualize his or her own thoughts while conceptualizing the thoughts of others for the first time (Elkind, 1967). This development of higher-order thinking allows adolescents and young adults to consider future possibilities, assess alternatives, and pursue personal goals in line with their self-identity (Chulani & Gordon, 2014).

A behavioral pattern commonly seen in adolescents is the increase in time spent in social interaction with peers (Erikson, 1968; Spear, 2010). For female adolescent and young adult athletes, time spent with teammates, or sport-peers, can represent a substantial amount of time during the sport season. For these athletes, sport-peers play a role in psychosocial development. MacPherson, Kerr, and Stirling (2015) explored the personal identity stories of eight female adolescent athletes and found that participants reported sport-peers influencing their emotional development through supportive behaviors, such as providing encouragement and facilitating positive body image. Although this study did not examine how sports injuries affect self-identity or relationships with sport-peers, it suggested that sport-peers may play an important role in emotional development. The role of sport-peers in the everyday life of a female adolescent and young adult athlete with SRC has currently not been explored. Exploring the experiences of young women with SRC could provide information about how psychosocial development is affected by concussions in these athletes.

Self-identity is widely viewed as multidimensional, including domains valued by an individual as important attributes to their identity (Brewer, Van Raalte, & Linder, 1993). A female adolescent or young adult, for example, may identify herself as student,

athlete, female, member of a particular ethnic or racial group, or by various other characteristics. When an adolescent is unable to master the task of identity formation, confusion about one's role in adulthood can occur (Erikson, 1968; Marcia, 1966). For female adolescents and young adults with SRC, the role of various characteristics encompassing self-identity and how SRC might affect the athlete's view of herself has not yet been explored.

Athletic Identity

In their seminal work, Brewer et al. (1993) defined athletic identity (AI) as the degree to which an individual identifies with the athletic role. AI is part of one's total self-identity. The concept of AI has been used extensively in research with male athletes, but there is still a lack of data on AI in female adolescent and young adult athletes. A strong identification with the athlete role can result in positive or negative outcomes. The literature on the role of AI in self-identity is discussed in terms of how life events (such as injury or retirement from sport) can affect those who attribute a large portion of their self-identity to their role as an athlete.

A strong AI can have positive effect on self-identity in adolescent and adult sport participants and can lead individuals to a variety of sports-related career goals (Lamont-Mills & Christensen, 2006; Shapiro & Martin, 2010). On the other hand, when identification with the athlete role becomes the *sole* source of an individual's self-identity, negative consequences can occur, including playing through pain and injuries (Schnell, Mayer, Diehl, Zipfel, & Thiel, 2014; Stadden, 2007). Studies with male and female college athletes show that those with higher AI are more likely to play through pain and avoid reporting injuries, whether they are participating in intramural sports or varsity sports (Stadden, 2007; Weinberg, Vernau, & Horn, 2013). These studies suggest that

athletes might consider their athletic self-identity a major part of their total self-identity regardless of the level of sport in which they participate.

The concept of AI has been identified as an emergent theme in analysis of data in a small number of qualitative studies. For example, researchers have found that retired adolescent and young adult female gymnasts identify strongly with the athlete role (Warriner & Lavalley, 2008). Participants in their phenomenological study reported identity confusion related to retirement from gymnastic competition. Participants spoke of spending so much of their childhood and adolescence in training that they were “uncertain of who they were outside gymnastics” (Warriner & Lavalley, 2008, p. 307). In another phenomenological study, a strong identification with the athlete role was associated with difficulty accepting retirement from professional ice hockey due to repeated concussions (Caron, Bloom, Johnston, & Sabiston, 2013). The study, which included five adult male professional athletes, is the only phenomenological study found in the literature dealing with professional athletes’ experiences after concussion. Athletes spoke repeatedly of losing their identity as hockey players (Caron et al., 2013). The findings from these studies indicate that retirement from sports (whether as an adolescent or professional adult athlete) can affect self-identity well beyond the years one actively participates in team sports.

Among the limited number of published studies dealing with AI in female athletes, none was found examining AI in female adolescent or young adult athletes with SRC. Although the role of AI has been investigated in male and female athletes, most published studies involve college or professional athletes and/or small samples of female athletes in a limited number of sports. The studies indicate that AI might play a role in how a female adolescent or young adult athlete with SRC sees herself as an individual

and as part of society, as well as how she deals with her injury. Whether a stronger identification with the athlete role is associated with difficulty, adjusting to injury in female athletes with SRC is unknown. Examining the experiences of female adolescent and young adult athletes with SRC through phenomenological analysis allows themes to emerge based on phenomena expressed in the female adolescent athletes' own words.

Late adolescence and young adulthood is a time of rapid change in physical, cognitive, and psychosocial development. The development of a multifaceted self-identity in conjunction with psychosocial and cognitive maturity during this time may be affected by injury such as SRC in a female athlete. The effects of SRC on these aspects of development are unclear, but may be similar to the psychosocial and cognitive effects of injury in professional athletes.

Pathophysiology of Concussions

Concussions are injuries to neural tissue, resulting in no structural defects seen on computerized tomography or traditional magnetic resonance imagery scans (Giza & Hovda, 2014; McCrory et al., 2013). Rapid acceleration, deceleration, and rotational forces cause neurons, glial cells, and blood vessels in the brain to stretch, resulting in an altered membrane permeability that initiates a complex cascade of neurometabolic events (Signoretti et al., 2011). In animal models, the initial insult triggers a pathologic release of excitatory amino acid transmitters, such as glutamine and aspartate, leading to cell wall permeability changes and an imbalance of intracellular sodium, potassium, calcium and magnesium (Giza & Hovda, 2001). In order to maintain cellular membrane homeostasis, glucose metabolism increases in a setting of decreased cerebral blood flow, resulting in a cellular energy crisis (Giza & Hovda, 2014). Findings in animal studies indicate that a more diffuse and prolonged cerebral swelling occurs in adolescents

compared to adults, resulting in a period of hypometabolic vulnerability, during which a second concussion can lead to cell death (Field, Collins, Lovell, & Maroon, 2003; Giza & Hovda, 2001; Signoretti et al., 2011). Both physical activity and cognitive activity during this recovery period become sources of additional neurometabolic demand and stress on the brain (Grady, Master, & Gioia, 2012; Sady, Vaughan, & Gioia, 2011).

Despite what is known about the neurometabolic trauma of concussions, there is no specific diagnostic test available for widespread use. Newer research is looking at serum biomarkers and functional brain scan techniques as promising diagnostic tools in concussion diagnosis. Although links between concussion symptoms and pathophysiological changes have not yet been proven, recent findings suggest an association between symptoms and serum biomarkers (Asken et al., 2018; Giza & Hovda, 2014). Proteins released from brain cells due to changes in cell membrane permeability have been found in the blood of professional boxers and ice hockey players after concussive injuries, and are being considered as promising biomarkers in SRC research (Seifert & Shipman, 2015; Shahim et al., 2014). A study looking at serum biomarkers in a small sample of adolescents with concussion found correlation between biomarkers and symptoms, with no statistically significant differences identified between males and females (Mannix, Eisenberg, Berry, Meehan, & Hayes, 2014).

Advances in imaging research also suggest a link between concussion symptoms and abnormalities on functional imaging scans, potentially allowing researchers to monitor postconcussion pathophysiology noninvasively in humans (Giza & Hovda, 2014). Physical changes not evident on traditional scans are now detectable through advanced imaging such as diffusion tensor imaging, a type of functional magnetic resonance imaging that is particularly sensitive to changes in the microstructure of frontal white

matter, providing a measure of the structural integrity of white matter in the brain (Virji-Babul et al., 2013). A small number of studies using functional imaging in adolescents and young adults with concussions have reported both evidence of structural white matter changes and changes in cerebral blood flow up to 30 days after injury (Maugans, Farley, Altaye, Leach, & Cecil, 2012; Virji-Babul et al., 2013). Differences between male and female adolescents in these studies were not addressed.

Differences in neck muscle strength and fluctuating hormones have been proposed as possible explanations for the differences in concussions between males and females. Female athletes, who generally have weaker neck muscles than male athletes, are known to suffer greater head acceleration after an impact, resulting in greater risk for concussive injury (Covassin & Elbin, 2005; Gutierrez et al., 2014). Although there is less data on neck strength in female adolescent athletes compared to female adult athletes, both groups have less isometric neck strength than their male counterparts (Gutierrez et al. 2014; Tierney et al., 2005).

Female hormone fluctuation during the menstrual cycle has been suggested as a possible predictor of concussion outcomes. Suppression of the pituitary gland after brain injuries has been found to result in decreased progesterone levels (Agha & Thompson, 2006; Ripley et al., 2008). Wunderle, Hoeger, Wasserman, and Bazarian (2014) found that concussions occurring during a menstrual phase when progesterone levels were high resulted in prolonged concussion symptoms. Participants whose progesterone level decreased the most after a concussion had more symptoms and a longer recovery. This preliminary study, which followed participants for one month after injury, highlighted the need for further research exploring factors specific to concussions in females.

Concussion is an injury that results in cellular metabolic changes in the brain, resulting in a vulnerable state in which physical and cognitive activity places an increased neurometabolic demand on the brain. New developments in research on serum biomarkers and advanced functional brain imaging techniques hold promise. Neck muscle strength and hormonal fluctuation are two areas recently identified as contributing to the differences in the pathophysiology of concussion between males and females.

Concussion Symptoms

The symptoms of concussion fall into four domains: physical, cognitive, emotional, and sleep-related (CDC, 2015c). Common concussion signs and symptoms for each category are listed in Table 1. Female adolescent and young adult athletes with concussion can present with a variety of symptoms, and symptoms of concussion mimic many other conditions.

Table 1

Symptoms of Concussion

Physical	Cognitive	Emotional	Sleep-related
Headache	Difficulty thinking	Irritability	Sleeping more than
Vision problems	clearly	Sadness	usual
Nausea/vomiting	Feeling slowed down	Feeling more emotional	Sleeping less than usual
Dizziness	Difficulty concentrating	Nervousness or anxiety	Trouble falling asleep
Sensitivity to light	Difficulty remembering		
Sensitivity to noise			
Balance problems			
Fatigue			
Numbness/tingling			

Note. Adapted from CDC (2015c)

Assessment of Concussion Symptoms

Concussion symptom evaluation is an important part of a multifaceted, individualized approach to concussion diagnosis and management (Lovell et al., 2006;

McCrory et al., 2018). The clinical presentation of a concussion varies among individuals and between injuries in one individual, meaning that no two concussions will present the same way (Broglia et al., 2014). Because there is no specific test for concussion, diagnosis and management involves assessment of subjective symptoms, physical signs, cognitive function, and neurobehavioral features (McCrory et al., 2018). Loss of consciousness, once believed to be common with a concussion, occurs in less than 10% of cases, and is less likely to occur in adolescents than in adults (Field et al., 2003; McCrory et al., 2018). Because not all subjective symptoms of concussion are easily visible as signs, concussions can be easily overlooked by others if not reported by the athlete.

Symptoms are used as criteria for decisions about return-to-play and return to other activities, such as school attendance (CDC, 2016). Standardized protocols exist for return to physical activity after concussion, with a focus on physical rest before a graduated and supervised return-to-play (CDC, 2016; McCrory et al., 2018). Several instruments exist specifically to assess concussion symptoms. The PostConcussion Symptom Scale is a commonly used 22-item self-report measure that records concussion symptom severity using a 7-point Likert scale (Lovell & Collins, 1998; Lovell et al., 2006). The PostConcussion Symptom Scale is part of the Immediate Postconcussion Assessment and Cognitive Test (Lovell et al., 2006), a brief computer-administered test battery measuring self-reported symptoms and cognitive functioning, and is widely used for baseline testing of athletes by professional sports organizations, schools, athletic clubs and organizations, and healthcare providers (McCrory et al., 2018; Schatz, Elbin, Anderson, Savage, & Covassin, 2017).

Baseline Symptoms

Many symptoms of concussions (such as headache) can be confused with symptoms of other illnesses. For this reason, subjective symptoms reported before a concussion occurs can result in baseline symptom reports that vary among individuals. Baseline testing refers to preseason testing conducted by a healthcare professional to assess for the presence of concussion symptoms, as well as assessment of an athlete's balance and cognitive function (CDC, 2015a). Results from baseline tests can be compared to a similar exam conducted by a healthcare professional during the sport season if an athlete has a suspected concussion.

Females are up to 43% more likely than males to report baseline symptoms on preseason concussion testing (Brown, Elsass, Miller, Reed, & Reneker, 2015; Covassin et al., 2006; Eisenberg, Andrea, Meehan, & Mannix, 2013; Kontos et al., 2012; Lovell et al., 2006). Although it has been proposed that normal hormonal changes associated with the menstrual cycle could be responsible for females reporting more baseline symptoms, menstrual phase data is not included in baseline concussion testing or postconcussion assessments (Brown et al., 2015).

A recent study of male and female patients in a pediatric concussion clinic found that female athletes reported more concussion symptoms than males, but both sexes returned to their baseline symptom level within a period that was not statistically different (Ono et al., 2016). This study illustrates the importance of having baseline concussion test results available for comparison of postconcussion symptoms for both males and females. Comparing postconcussion test scores of an individual to their own baseline test scores from before the concussion is considered best practice (CDC, 2015a; McCrory et al., 2018; Sports Concussion Institute, 2012). Currently, baseline concussion

testing is recommended for athletes in contact and collision sports (Broglia et al., 2014; CDC, 2015a). Concussion symptoms in the domains of physical, cognitive, emotional, and sleep-related are discussed in the following sections. The current literature pertaining to differences in postconcussion symptoms between male and female athletes is also discussed.

Physical Symptoms

The physical symptoms of concussions include headache, vision problems, nausea and/or vomiting, dizziness, sensitivity to light, sensitivity to noise, balance problems, fatigue, and numbness and/or tingling sensations (CDC, 2015c). Headache is the most common physical symptom reported after a concussion by male and female high school and college athletes (Covassin et al., 2006; Frommer et al., 2011; Kuczynski, Crawford, Bodell, Dewey, & Barlow, 2013; Marar et al., 2012). Females with SRC are more likely than males to report persistent headaches up to three months after a concussion (Blume et al., 2012; Colvin et al., 2009).

Migraine headaches affect more females of reproductive age than males and migraines are associated with menstruation in some females (Buse et al., 2013; Crawford et al., 2009). Whether this is one reason for female athletes reporting more baseline concussion symptoms is not known. Migraine-like symptoms (such as photophobia, nausea, vomiting, and headache) are more than twice as likely after concussions in female high school and college athletes than in males, and these symptoms have been found to be predictive of delayed recovery (Kamins & Charles, 2018; Mihalik et al., 2013). Migraine-like symptoms after SRC have also been linked to neurocognitive difficulties. In studies of male adolescent athletes, football players presenting with headaches, nausea, and sensitivity to light and noise after concussion performed worse on

neurocognitive testing than those without headaches for up to 14 days after a concussion (Iverson et al., 2004; Kontos et al., 2012; Lau, Kontos, Collins, Mucha, & Lovell, 2011). However, the role of migraine headache in concussion symptom burden is not fully understood (Covassin, Crutcher, & Belanger, 2014).

The persistence of headaches after concussions, whether associated with migraine symptoms or not, has been found to decrease HRQOL in adolescents and adults (Cover, Roiger, & Zwart, 2018; Valovich McLeod et al., 2010; Voormolen et al., 2018). A study surveying male and female adolescents with SRC found that participants cited headache symptoms and the loss of ability to participate in their daily activities as the worst things about having a concussion (Stein et al., 2015). In a qualitative study of the lived experience of male and female adolescents with migraines, adolescents described the negative effect of migraine headaches on their daily lives (Helvig & Minick, 2013). Participants reported psychological and social isolation brought on by the disabling physical symptoms they experienced with their headaches (Helvig & Minick, 2013). Because headache is the most frequently reported symptom in female high school and college athletes after SRC, Helvig and Minick's (2013) findings suggested that female athletes with SRC might experience psychological and social isolation during recovery.

Dizziness is the second most common symptom reported among high school and college athletes with SRC (Valovich McLeod & Hale, 2015). Dizziness and headaches after concussion are both associated with prolonged recovery (> 3 weeks) in male adolescent football players (Kontos et al., 2012; Lau et al., 2011). Corwin et al. (2014) studied children and adolescents referred to a pediatric concussion clinic and found that 66% of patients reported dizziness. Those reporting dizziness after concussion were more likely than were those without dizziness to experience prolonged symptoms and to

need prescribed school accommodations (Corwin et al., 2014). Differences in symptoms between sexes were not addressed in this report.

Hearing and vision problems can occur after concussion. Sensitivity to noise is a postconcussion symptom that has received little attention, although females report more sensitivity to noise than males (Frommer et al., 2011). Landon, Shepherd, Stuart, Theadon, and Freundlich (2012) studied the lived experience of noise sensitivity in adults who suffered a TBI. Participants spoke of experiencing everyday noises, such as music and voices, as “amplified and distorted” to the extent that physical discomfort and trouble concentrating resulted (Landon et al., 2012, p. 397). In female adolescent and young adult athletes with SRC, similar sensory experiences might exist and interfere with everyday life.

Vision problems, such as photophobia and difficulty with accommodation and convergence, can occur after concussions. Master et al. (2016) found that 69% of adolescents treated in pediatric concussion clinic had vision problems for up to three months after injury. Photophobia, or light sensitivity, has been found to occur in many adolescent and adult patients after concussion and can decrease HRQOL (Clark, Hasselfeld, Bigsby, & Divine, 2017). Vision problems can contribute to headaches and can result in difficulty with schoolwork; thereby, requiring school accommodations during recovery from concussions.

Cognitive Symptoms

The cognitive, also referred to as neurocognitive, symptoms of concussions include difficulty thinking clearly, feeling slowed down, difficulty concentrating, and difficulty remembering (CDC, 2015c). These symptoms might not be recognizable by adolescent athletes until a cognitive stressor, such as schoolwork, makes deficits in

attention or memory more noticeable (Grady, 2010). Just as physical activity is known to increase symptoms of concussions, cognitive exertion can also result in exacerbation of symptoms (McCrory et al., 2018; Sady et al., 2011). For this reason, cognitive rest is often recommended as part of a concussion treatment plan (Halstead, Devore, Carl, Lee, & Logan, 2013). Postconcussion neurocognitive testing in adolescents and young adults has demonstrated deficits when physical and mental activities are restarted before concussion symptoms are resolved (Brown et al., 2014).

Female high school athletes have been found to perform worse on verbal and visual memory tests seven days postconcussion than female college athletes (Covassin et al., 2012). Both female high school and college athletes have been found to need more treatment interventions than males and are more likely to require academic accommodations and a gradual return to school after SRC (Kostyun & Hafeez, 2014; Sicard, Moore, & Ellemberg, 2018). For female adolescent and young adult athletes who are student cognitive activities may include schoolwork, reading, watching television, using a computer, cell phone or other handheld electronic device, and playing video games (Brown et al., 2014; Grady et al., 2012; Halstead, McAvoy et al., 2013).

Emotional Symptoms

Emotional symptoms of concussions include anxiety, irritability, sadness, and feeling more emotional (CDC, 2015c). These symptoms have been found to develop one to two weeks after concussion in adolescents, rather than immediately after the injury (Eisenberg et al., 2014; McCrory, 2013). Symptoms of depression reported at baseline are associated with both an increase in depression symptoms postconcussion and a longer time to recovery in adolescent and college athletes of both sexes (Corwin et al., 2014; Kontos et al., 2012; Yang, Peek-Asa, Covassin, & Torner, 2015). Adolescents with a

history of depression are also more likely to have neurocognitive symptoms after a concussion (Kontos et al., 2012; Wiese-Bjornstal et al., 2015). Depression in both females and males in high school and college after SRC has been found to increase as neurocognitive deficits increase (Kontos et al., 2012).

There is also evidence indicating that athletes with a history of concussion have a greater chance of being diagnosed with depression after recovery from SRC. Depression has been identified as a possible long-term consequence of concussions in former professional football athletes. Retired professional football players with history of previous concussions were found to be three times more likely to be diagnosed with depression (Kerr, Marshall, Harding, & Guskiewicz, 2012). Chrisman and Richardson (2014) found that male and female adolescents with a diagnosis of depression had a three times greater risk of diagnosis of depression if they had a history of concussion. No difference between males and females were found. In a study of college athletes with concussion, an increase in depression symptoms after concussion was found in males and females whether they had depression symptoms at baseline or not (Rabinowitz, Li, & Levin, 2014). Caron et al. (2013) found that retired professional ice hockey players with a history of repeated SRC reported long-term struggles with emotional symptoms, such as depression. These emotional symptoms affected not only their professional life but also their personal relationships and quality of life.

These studies suggest that there is a risk for depression after SRC in both males and females, whether depression symptoms are self-reported on baseline concussion testing or not. Although most female adolescent and young adult athletes with concussions are not professional athletes, the effect concussions might have on their view of their sports career, academic career, and personal relationships has not been studied.

Sleep-Related Symptoms

Sleep-related symptoms of concussions include sleeping more or less than usual and having trouble falling asleep (CDC, 2015c). The most commonly reported sleep-related symptoms after a concussion are excessive daytime sleepiness and trouble falling asleep, but the literature on sleep-related symptoms after concussion is limited (Jaffee, Winter, Jones, & Ling, 2015). Sleep disturbance following concussion may be associated with alterations in circadian rhythm resulting in a mismatch between the biological sleep-wake cycle and desired sleep schedule of an individual (Jaffee et al., 2015). Sleeping more than usual is more common after concussion in adolescents than in adults (Kostyun, Milewski, & Hafeez, 2015; Schmidt & Van der Linden, 2015).

In a study of male and female adolescent athletes, those who reported sleeping more than normal after SRC performed worse on neurocognitive testing and reported a greater number of concussion symptoms (Schmidt & Van der Linden, 2015). Gosselin et al. (2009), in a study of seven male and three female professional and college athletes with concussion, also found that sleeping less than usual was not common after concussion, but daytime sleepiness was common. These studies illustrate the scarcity of information on sleep as a postconcussion symptom, with none specifically addressing sleep symptoms in females after SRC. Exploring the experiences of female adolescent and young adult athletes with SRC allowed them to describe what their experiences were with sleep and/or sleepiness, while allowing them to express how sleep-related concussion symptoms affected their daily lives.

Summary of Concussion Symptoms

Baseline testing is available for a preseason inventory of concussion symptoms and neurocognitive function to provide for comparison if SRC occurs in adolescent and

young adult female athletes. Females report more baseline symptoms (such as headache) than males, but also report more symptoms after SRC. The rationale for female athletes reporting more baseline and postconcussion symptoms than their male counterparts is not well understood, and there is a limited amount of data on proposed explanations for sex differences. The physical symptoms of concussions often occur in combination with cognitive, emotional, and sleep-related symptoms, and no two concussions are the same. The current data on females with SRC has not addressed the female adolescent and young adult age groups specifically. Studies including high school and college athletes or pediatric patients include the adolescent age group, but also include children under age 13 years and young adults. Current research has identified differences in baseline and postconcussion symptoms between males and females, but has not focused specifically on the female adolescent and young adult athletes' experiences with concussion.

Long-Term Consequences of Concussions

Concussion symptoms usually resolve in less than 10 days, but can last longer in up to 20% of cases (McCrory et al., 2018). A history of a previous concussion can increase an individual's risk of suffering a repeat concussive injury, as well as increasing recovery time after the repeat injury. Adolescents with two or more prior concussions have been found to take more than twice as long to become symptom free as those with fewer than two concussions (Corwin et al., 2014). In a study of former college football players, a history of multiple SRC was found to be associated with adverse physical and mental health outcomes (Kerr, Thomas, Simon, McCrea, & Guskiewicz, 2018). There are no similar studies of female college athletes in the literature. Postconcussion syndrome, second impact syndrome, and chronic traumatic encephalopathy (CTE) are uncommon but serious, and sometimes fatal complications of repetitive concussions.

These complications are presented and available literature related to cases in females is reviewed.

Postconcussion syndrome involves the presence of at least three of 10 concussion symptoms from the four domains (physical, cognitive, emotional, and behavioral) occurring for three months or longer after a concussion, and occurs in up to 29% of adolescents who suffer a concussive injury (Babcock et al., 2013; Barlow et al., 2010). Eisenberg et al. (2013) found that 18% of females age 11 to 22 years reported persistent symptoms at 90 days postconcussion compared to 12% of males. This finding was not statistically significant in data analysis, but a secondary analysis of the data revealed that the symptoms most likely to persist to 90 days were irritability, sleep disturbance, frustration, and poor concentration (Eisenberg et al., 2014).

In rare and very severe cases, second impact syndrome can occur with even a minor second concussive injury, causing catecholamine release and rapid vascular engorgement in the brain that can lead to brainstem failure and death (Cantu, 1998, 2016). Second impact syndrome has been described in a small number of adolescent and young adult male athletes who experienced initial concussion symptoms and died after a relatively minor second head injury (Wetjen, Pichelman, & Atkinson, 2010). There are no documented cases of second impact syndrome in females in the literature.

Complications of SRC, particularly in former professional athletes, have received considerable media attention in recent years. CTE, a rare progressive neurodegenerative condition characterized by changes in personality, cognition, and physical functioning, has been linked to suicide in former male professional football players, ice hockey players, boxers, and military veterans (Cantu, 1998; Iverson et al., 2004; Wortzel, Brenner & Arciniegas, 2013). Although CTE in females has not been addressed in most

published articles on the disorder, there is at least one documented case thought to be CTE in a female (Maroon et al., 2015). The case involved a 24-year-old female with a history of autism and severe self-abuse involving head banging, and CTE was diagnosed on autopsy (Hof, Knabe, Bovier, & Bouras, 1991). In addition, a case of *dementia pugilistica*, a term previously used to describe boxers being “punch drunk” was identified on autopsy of a 76 year-old woman who was the victim of domestic abuse (Roberts, Whitwell, Acland, & Bruton, 1990, p. 918).

A published case study focused on a former female ice-hockey player is raising questions about the long-term effects of concussion in young female athletes. The female 29-year-old former athlete suffered 10 concussions by age 19 due to ice hockey injuries, and has cognitive impairments lasting more than 9 years later (Eme, Gilbertson, & Oehler, 2013). Cases such as this, along with media attention occasionally covering professional female athletes with concussions, have brought attention to the need for research focused on female athletes who have concussion (Concussion Legacy Foundation, 2016).

Continuing in Sports after Concussions

There is no recommended time to retire from amateur or professional sports based on a specific number of concussions. Recommendations for retirement from sports due to repetitive concussions have traditionally been based on response to injury, including duration of symptoms (Cantu, 2003; Elbin et al., 2013). Most research on repetitive concussions has been conducted with collegiate and professional athletes and with more male athletes than with female athletes.

A dose-responsive relationship has been recognized in athletes with multiple concussions. Athletes with a history of at least two concussions have a more prolonged recovery than do athletes with one or no previous concussions (Elbin et al, 2013; Iverson

et al., 2004; Kerr et al., 2018). Newer technology, such as serum biomarkers and functional imaging, show promise of providing objective data on metabolic disturbances in the brain, but are being used mainly in research. Until more research is available on recovery after multiple concussions in females compared to males, no specific recommendations for retirement from sports based on sex can be made. The psychological, psychosocial, and physical aspects of a concussion injury and the potential for future injury in female adolescent and young adult athletes all influence recovery.

Summary and Conclusion

Adolescence and young adulthood is a time of physical maturation, as well as cognitive and psychosocial development. Identity development is a major psychosocial task during adolescence. Female adolescent and young adult athletes with concussion may consider their role as an athlete to be a major part of their developing sense of self. How an injury such as SRC affects a young woman's sense of self-identity is not known. Symptoms of concussion can be any combination of physical, cognitive, emotional, and sleep-related problems. The limited amount of research involving female athletes with concussion indicates that they have more concussion symptoms at baseline testing and after concussion, and may take longer to recover, with little empirical data to support rational for these findings. The effects of physical and cognitive rest on a female adolescent or young adult athlete during recovery from SRC have not been explored. Much of our knowledge of the effects of concussion, both immediate and long-term, are based on studies with male collegiate and professional athletes. Concussion in the female adolescent and young adult athlete may affect not only physical functioning, but academic and psychosocial function as well. To date, little is known about the day-to-day experiences of the female adolescent and young adult athletes with concussion.

CHAPTER III

METHODOLOGY

The purpose of this study is to understand the experiences of late adolescent and young adult females with SRC. To achieve this purpose, the method of inquiry is guided by the theoretical context of interpretive phenomenology. The research plan, including the research design, setting, and participants is presented. Data generation strategies, including recruitment, data collection, and data analysis, are described from an interpretive phenomenological perspective. Criteria used throughout the study to ensure trustworthiness of the study are identified. Steps taken to protect the rights of participants in the study are discussed.

Research Design

The study will use an interpretive phenomenological approach to describe and interpret the lived experiences of late adolescent and young adult females with SRC. The female with a concussion is the best source of information on her experiences, as she uniquely perceives them. For this reason, an interpretive phenomenological approach offers the most appropriate method to uncover the essence and meaning of these experiences.

Setting

The participants for this study will be recruited from the community, through recruitment flyers, word-of-mouth, and social media outlets. The recruitment flyers will be posted on all campuses of Georgia State University and in the community surrounding

the downtown campus. The recruitment flyer will also be used for social media postings and for response to any email contacts provided to the principal investigator by word of mouth or social media.

Participants

Participants will be selected purposively based on their experiences with SRC. For the purposes of the study, female late adolescent and young adult females with SRC will be defined as females between the ages of 18 to 26 years of age who self-report that they have been diagnosed with a SRC within the past three years. Females of this age group were chosen based on the similarity of their developmental stage. Restricting potential participants to those with a concussion diagnosis within the past three years will keep the sample reasonably homogenous in the sense of how long ago the SRC occurred (Smith et al., 2009).

Additional inclusion criteria are (a) the ability to read, understand, and speak English; and (b) willingness to be interviewed and audiotaped. These inclusion criteria are being used to ensure that potential participants will be able to speak for themselves in order to capture the experience in the participants' own words. Exclusion criteria include (a) females with a diagnosis of concussion that was not sports-related, (b) females with a diagnosis of SRC that occurred over three years ago, and (c) females with acute symptoms of SRC.

Concussion symptoms usually resolve in 10 days, but can last longer in adolescents and young adults (McCrory et al., 2013). Potential participants will be asked to schedule an interview after they have recovered from the most acute symptoms and have returned to cognitive activities. It is expected that this period will occur at least two weeks after the concussive injury, but may be longer for some potential participants.

These sampling criteria will be used to obtain a representative sample of females for whom the phenomenon of SRC will be meaningful (Smith et al., 2009).

Purposive sampling will continue until saturation is reached. Saturation refers to the repetition of themes that emerge from the analysis of interview transcripts, and indicates confirmation of previous data (Morse, 1994). An initial estimate for sample size is 10 to 15 participants in the study. However, due to the emergent design involving a continuous interplay of data collection and analysis, sample size cannot be determined until data collection and analysis are underway (Guba & Lincoln, 1989).

Data Generation Strategies

Purposive sampling will be used to recruit a sample of a minimum of 10 to 15 females who have suffered a SRC. After Institutional Review Board (IRB) approval is obtained, recruitment flyers with information about the study will be posted on all campuses of Georgia State University and in the community surrounding the downtown campus. The recruitment flyer will also be used for social media postings and for response to any email contacts provided to the principal investigator by word of mouth or social media. Individuals with an interest in participating will contact the principal investigator by email or phone to receive information about the study and to be screened for eligibility. Participants will be limited to those who read and speak English, are between 18 and 26 years of age, have had at least one self-reported SRC within the past three years, and are willing to be interviewed and audiotaped. The principal investigator will arrange for an interview date, time, and place with each participant according to the participant's preferences.

The purpose of the study, including possible risks and benefits of participation, will be discussed with interested potential participants prior to data collection. Written

informed consent (see Appendix A) will be obtained from participants. The principal investigator will then proceed with data collection with the participant in a private, comfortable, quiet environment mutually agreed upon by the investigator and the participant.

Data Collection

The focus of data collection in interpretive phenomenology is inviting participants to offer a rich, detailed account of their own experience with the phenomenon being studied (Smith et al., 2009). Data will be collected from participants using semistructured interviews (see Appendix B). An audiotaped, in-depth interview will be conducted with the participants. The researcher will keep written field notes to record nonverbal communication and other observations made during each interview.

Each interview will begin with questions designed to establish comfort and rapport between the researcher and participants. The participant will initially be asked to “Tell me about what happened when you had a concussion while playing a sport. What do you remember about how you felt (your symptoms) when you had a concussion?” Subsequent questions will be asked, as needed, to explore more deeply the experiences that the participant describes after the initial open-ended question is answered. Questions will then aim to explore the female’s story of how she remembers suffering a concussive injury and what she has experienced since the injury. For example, participants will be asked, “Tell me what it has been like for you since you had a concussion. What has it been like for you at school and work? What has it been like in sports or recreational activities? What has it been like with your friends? With your family?”

Subsequent questions will be posed to explore the participant’s thoughts and feelings about other female athletes with concussion. Participants will be asked, “Do you

know any other young women around your age who have had concussions due to playing sports? What do you know about them?” and “If you could give advice to other young women with concussion, what would you tell them?” The final questions ask what the participant believes nurses and doctors need to know about females with concussions in order to take better care of them. Participants will be asked, “What do you think nurses and doctors need to know in order to be most helpful to females your age who have concussions? Is there anything you can think of that would not be helpful?”

Each interview will end with an opportunity for participants to add information about anything that was not included in the interview questions. The final interview question will be, “Is there anything that you can tell me that I haven’t asked about that might help me to understand you and what life has been like for you since you had a concussion?” This will give participants the option to add information about their feelings or beliefs about their concussion experience that were not included in their answers to previous questions in the interview.

A demographic data form will be administered to the participants by the principal investigator. This form will be used to collect data on sport(s) played, number of years in that sport and others, and the number of concussions suffered and when those concussions occurred. This demographic information will be obtained in order to describe the sample. The demographic form can be found in Appendix C.

Data collection will require approximately 30 to 45 minutes of the participant’s time. Duration of the study from initial recruitment to completion of data collection is anticipated to be six months, but will be extended as needed if the research team determines that data analysis fails to show saturation. A \$20 gift card will be given to each participant at the completion of their interview as compensation for their time.

Data Analysis

The interviews will be audiotaped and transcribed verbatim by a professional transcriptionist. The researcher will listen to each audiotaped interview repeatedly in order to edit the transcribed interviews to ensure accuracy of each transcript. Field notes taken by the researcher during interviews will be incorporated into the narrative text. Field notes include observations made by the researcher during the interview process, such as vocal intonations and physical expressions, will be analyzed simultaneously with the transcripts (Crist & Tanner, 2003). The principal researcher will record personal feelings and thoughts throughout the study in a reflective journal. An audit trail will be kept throughout the study to keep track of decisions made during the study and why those decisions were made (Smith et al., 2009).

Data analysis will be conducted by the researcher, a PhD nursing student, and the dissertation committee, which consists of an expert in qualitative research, a nurse researcher with extensive experience with adolescents, and a content expert in concussions and sports injuries. The research team will discuss interpretations of meanings and recognize the principal researcher's assumptions as a nurse experienced in the care of female adolescents and young adults. Data collection and data analysis will occur simultaneously. Analysis of the interpretative phenomenological study will be an ongoing iterative and inductive process, beginning in the field and informing data collection as it proceeds (Smith, 2007). Data analysis will begin when the first interview is completed, using the steps outline by Smith et al. (2009), which encourage a reflective engagement with the participant's account.

In the first step of data analysis, each interview of a female with SRC will be read and reread by the researcher to ensure that the participant becomes the focus of analysis

(Smith et al., 2009). The second step of analysis will involve more exploratory line-by-line reading of each transcript while making notes and comments on words and phrases used by participants. These initial notes, or codes, represent key objects of concern to the participant as well as the language used when they explain their experience (Smith et al., 2009). This second step of interpretive phenomenological analysis becomes more interpretive as conceptual codes are identified through reflection and discussion with the research team (Smith et al., 2009). In this step, individual codes are grouped into conceptual codes by comparing words and phrases between transcripts, and evaluating similarities and differences among transcripts. Because data collection and analysis will occur simultaneously, codes identified in the first transcript can be confirmed with the second participant, and so on as the study progresses.

Data analysis will include peer debriefing with members of the dissertation committee to aid in exploring different avenues of meaning. Team involvement adds depth and insight to interpretations (Crist & Tanner, 2003). The interpretive team consists of researchers who are experts in interpretive phenomenology or in the content areas of inquiry.

In the third step, emergent themes will be identified from exploration of the conceptual code categories and returning to the data, representing the cyclic nature of analysis in interpretive phenomenology. Emergent themes will be expressed as phrases that speak to the essence of the whole text while containing enough particulars to be grounded in the data (Smith et al., 2009). Once themes are identified by consensus of the research team, connections across themes will be examined and themes will be clustered according to their relatedness. Themes representing parallel or similar understandings will be placed together. A table or figure will be created to give a graphic representation

of the structure of the emergent themes and their relatedness. In the final step of analysis, patterns across cases will be identified, pointing to ways in which participants represent unique experiences yet share qualities that show connections for the whole (Smith et al., 2009). Themes that represent patterns across cases will be reviewed and discussed by the dissertation committee and by key participants to validate the interpretations.

Trustworthiness

Careful attention will be paid to ensuring trustworthiness during this study, particularly during data collection and analysis. Trustworthiness refers to rigor in qualitative research. The goal of rigor in qualitative research is to represent study participants' experiences accurately (Streubert & Carpenter, 2011). Guba (1981) proposed four criteria for trustworthiness in qualitative inquiries: credibility, transferability, dependability, and confirmability. Lincoln and Guba (1985) further suggested means for meeting each criterion in the pursuit of rigor. In the study, credibility will be established by immersing myself in the research data. This immersion in the data will occur by (a) listening to the recorded interviews, reading, and rereading the transcripts; (b) making reflective and observational entries in my field notes; and (c) validating data collection and analysis with study participants through member checking (Lincoln & Guba, 1985). Member checking is the most crucial technique for establishing credibility as it allows the investigator to say that his/her interpretations are adequate representations of participants' realities (Lincoln & Guba, 1985). Member checking can occur continuously throughout the study in an informal method. For example, a participant can be asked, "Other females have told me. . . . Did you experience this after your concussion?" This form of member checking will allow the investigator to validate interpretations as the investigation progresses.

Transferability in qualitative inquiry can be referred to as “fittingness” and refers to whether the findings are meaningful in other situations (Streubert & Carpenter, 2011, p. 49). Thick descriptions, including relevant quotes from participants, will be presented in the findings to enable those interested in making a transfer to reach a conclusion about whether transfer is possible (Lincoln & Guba, 1985). Dependability is related to the establishment of credibility, and is concerned with the stability of the data. The inquiry audit is a technique that can be used to establish dependability of the study findings (Lincoln & Guba, 1985). Audiotaped interviews will be transcribed verbatim and verified with the audiotaped data, contributing to dependability and confirmability. In the study, the process for any decisions made and why the decisions were made will be documented so that an outside reviewer can explore the process and judge decisions that were made as the design emerged. Confirmability also involves auditability, or a recording of activities that another individual can follow, including researcher reflections, with an objective to show clear evidence of the thought processes that led to the conclusions (Lincoln & Guba, 1985).

Researcher Bias

In qualitative research, the researcher is an instrument. Objectivity will not be possible in the interpretive phenomenological study because the researcher will be observer, interviewer, and interpreter (Streubert & Carpenter, 2011). It is in the interaction between the researcher and participants that knowledge will be created in this study. In phenomenological inquiry, the researcher’s prejudgment is considered to be what makes interpretation possible (Ray, 1994).

My experience is that of an educated, white, upper-middle-class female who has lived in both the northeastern and southeastern United States. My interest in females

with SRC is based on my experience working with adolescents with a variety of illnesses and injuries. Focusing on late adolescent and young adult females with concussions is based on my belief that females, particularly females involved in sports activities, are not getting the media or research attention their male counterparts are receiving.

Protection of Human Participants

Protection of human subjects will be assured by (a) IRB approval, (b) informed consent of participants, and (c) the assurance of confidentiality. After IRB approvals are obtained from Georgia State University, written informed consent will be obtained from the participants. The purpose of the study will be explained to any potential participants before consent is signed, and the investigator will answer any questions about the study. Confidentiality, as well as potential risks and benefits of participation in the study will be discussed with potential participants before consent is obtained. Participants will receive a copy of the signed consent.

Confidentiality of participants will be maintained through use of identification numbers on the demographic form for each participant. Only the research team (the researcher and the dissertation committee) will have access to the roster of participant names and corresponding identification numbers. This roster will be kept in a locked file cabinet that will be separate from the study data in the office of the researcher. Transcripts and coded information will be kept in a locked cabinet in the locked office of the principal investigator. The researcher will destroy audiotapes of the interviews, as well as the participant roster and assigned identification numbers one year after study completion. Lastly, the use of pseudonyms will be explained to participants so they will understand how they will be represented anonymously in any reports or manuscripts that are produced from the findings of the study.

Summary

In this chapter, I presented an overview of the research method of interpretive phenomenology to study the experiences of late adolescent and young adult females with SRC. The setting, participants, and data generation strategies have been discussed. Data collection and data analysis will be carried out using the steps outlined in this chapter to ensure trustworthiness of the study. Researcher bias, as well as protection of human subjects, has been discussed.

CHAPTER IV

RESEARCH PROCESS

In this chapter, I discuss the research process, including the research design, setting, and recruitment of participants. An interpretive phenomenological perspective was maintained during the data generation process, from data collection through data analysis. Trustworthiness was assured in the research process. Protection of the rights of participants was also ensured.

Research Design

An interpretive phenomenological approach was used to describe and interpret the lived experiences of late adolescent and young adult females with SRC. The purpose of this study was to explore the experiences of late adolescent and young adult females with SRC. The female with a concussion is the best source of information on her experiences, as she uniquely perceives them. For this reason, an interpretive phenomenological approach offered the most appropriate method to uncover the essence and meaning of these experiences.

Setting

Eligible participants for this study were recruited from the community, through recruitment flyers, word-of-mouth, and social media outlets. The recruitment flyers (see Appendix D) were posted on campuses of Georgia State University and in the community surrounding the downtown campus. The recruitment flyer was also used for social media postings, and for response to any email or phone inquiries about the study.

Participants

Participants were chosen based on their experiences with SRC. For the purposes of this study, female late adolescent and young adult females with SRC were defined as females between the ages of 18 to 26 years of age who self-reported that they had been diagnosed with SRC within the past three years. Females of this age group were chosen based on the similarity of their developmental stage. All participants were enrolled in college. Restricting potential participants to those with a concussion diagnosis within the past three years kept the sample reasonably homogenous in the sense of how long ago the SRC occurred (Smith et al., 2009). All participants had recently experienced the phenomenon of interest.

Additional inclusion criteria were (a) the ability to read, understand, and speak English; and (b) a willingness to be interviewed and audiotaped. These inclusion criteria were used to ensure that potential participants were able to speak for themselves in order for the researcher to capture the experience in the participants' own words. All participants met these criteria, demonstrating the ability to understand the interview process and articulate their experiences.

Exclusion criteria included (a) females with a diagnosis of concussion that was not sports-related, (b) females with a previous diagnosis of SRC that occurred over three years ago, and (c) females with acute symptoms of SRC. Concussion symptoms usually resolve in less than 10 days but can last longer in adolescents and young adults (McCrory et al., 2013).

Potential participants were asked to schedule an interview date after they had recovered from the most acute symptoms and had returned to normal functioning. It was expected that this period would last approximately two weeks after the concussive injury.

These sampling criteria were used to obtain a representative sample of females for whom the phenomenon of SRC would still be meaningful (Smith et al., 2009).

Sample size was determined by data saturation with a goal of 10 to 15 participants. Purposive sampling continued until data saturation was reached. Data saturation refers to the repetition of themes that emerge from the analysis of interview transcripts and indicates confirmation of previous data (Morse, 1994). Fifteen participants were recruited for the study.

Data Generation Strategies

After IRB approval was obtained, recruitment flyers with information about the study were posted on campuses of Georgia State University and in the community surrounding the downtown campus. The recruitment flyer was also used for social media postings and for response to any email contacts provided to the principal investigator by word of mouth or social media. Individuals with an interest in participating contacted the principal investigator by email or phone to receive information about the study and to be screened for eligibility. Participants were limited to those who read and spoke English, were between 18 and 26 years of age, had at least one self-reported SRC within the past three years, and were willing to be interviewed and audiotaped. The principal investigator arranged for an interview date, time, and place with each participant according to the participant's preferences.

The purpose of the study, including possible risks and benefits of participation, was discussed with interested potential participants prior to data collection. Written informed consent (see Appendix A) was obtained from participants. The principal investigator then proceeded with data collection with the participant in a private, comfortable, quiet environment mutually agreed upon by the investigator and the

participant. Seven participants reported seeing the study flyer posted on the downtown university campus. Four participants reported finding out about the study through word of mouth, and another two participants found out about the study when a previous participant posted the flyer on a private group social media site. Two more participants reported seeing the flyer in a coffee shop located near the downtown campus.

Data Collection

The focus of data collection in interpretive phenomenology is inviting participants to offer a rich, detailed account of their own experience with the phenomenon being studied (Smith et al., 2009). Data were collected from participants using semistructured interviews (see Appendix B). An audiotaped, in-depth interview was conducted with each participant. The researcher kept field notes to record nonverbal communication and other observations made during each interview.

Data collection occurred in university library study rooms, coffee shops, the researcher's office, and university common areas familiar to the participants. Seven interviews took place in private university library study rooms. One interview took place in an off-campus coffee shop. Another interview took place in a student area of a university classroom building, while very few students were in the area and the conversation could not be overheard by others. Five interviews took place in a private university office. The last interview, originally scheduled for a university library study room, was conducted in a student center at the participant's request. All interviews were conducted in a private and comfortable environment chosen by the participant. The interview settings were reasonably quiet as far as background noise or hallway noise.

Each interview began with questions designed to establish comfort and rapport between the researcher and the participant. An interview guide was used to stimulate

dialogue (see Appendix B). The participant was asked initially, “Tell me about what happened when you had a concussion while playing a sport. What do you remember about how you felt (your symptoms) when you had a concussion?” These questions led the participant to begin telling the story of what she remembered about her concussion experience.

Subsequent questions were asked to explore more deeply the experiences that the participant described after the initial open-ended questions were answered. Questions aimed to explore the female’s story of how she remembered suffering a concussive injury and what she has experienced since the injury. Participants were asked, “Tell me what is has been like for you since you had a concussion. What has it been like for you at school and work? What has it been like in sports or recreational activities? What has it been like with your friends? With your family?” The majority of participants talked about their experiences with concussion symptoms and how these symptoms affected their daily life, including their interactions with friends, family, and schoolmates or teammates.

Additional questions inquired about the participants’ thoughts and feelings related to other females with concussions. Participants were asked, “Do you know any other young women around your age who have had concussions due to playing sports? What do you know about them?” and “If you could give advice to other young women with concussion, what would you tell them?” The final questions asked about what the participant believed nurses and doctors need to know about females with concussions in order to take better care of them. Participants were asked, “What do you think nurses and doctors need to know in order to be most helpful to females your age who have concussions? Is there anything you can think of that would not be helpful?”

Each interview ended with an opportunity for participants to add information about anything that was not included in the interview questions. The final interview question was, “Is there anything that you can tell me that I haven’t asked about that might help me to understand you and what life has been like for you since you had a concussion?” This gave participants the option to add information about their feelings or beliefs about their concussion experience that were not included in their answers to previous questions in the interview.

A demographic data form was administered to the participants by the researcher after written consent was obtained. This form was used to collect data on sport(s) played, number of years in that sport and others, and the number of concussions suffered and when those concussions occurred. This demographic information was obtained in order to describe the sample. The demographic form can be found in Appendix C.

Interviews averaged 35 minutes in length, with the shortest lasting 20 minutes and the longest lasting 76 minutes. The participants were attentive during the interviews and concluded the interviews when they felt there was no more to discuss. The duration of the study from initial recruitment to completion of data collection lasted 10 months. Participants were compensated for their time with a \$20 gift card at the completion of their interview. Each participant was allowed to choose from a variety of gift cards from stores of interest to them.

Data Analysis

The interviews were audiotaped and transcribed verbatim by a professional transcriptionist. The researcher listened to each audiotaped interview repeatedly in order to edit the transcribed interviews to ensure accuracy of each transcript. Field notes taken by the researcher during interviews were incorporated into the narrative text. Field notes

and observations made by the researcher during the interview process, such as vocal intonations and physical expressions, were analyzed simultaneously with the transcripts (Crist & Tanner, 2003). The researcher recorded personal feelings and thoughts throughout the study in a reflective journal. An audit trail was kept throughout the study to keep track of decisions made during the study and why those decisions were made (Smith et al., 2009).

Data analysis was conducted by the researcher, a PhD nursing student, and the dissertation committee, which consisted of an expert in qualitative research, a nurse researcher with extensive experience with adolescents, and a content expert in concussions and sports injuries. The research team discussed interpretations of meanings and recognized the principal researcher's assumptions as a nurse experienced in the care of female adolescents and young adults. Data collection and data analysis occurred simultaneously. Analysis in this interpretative phenomenological study was an ongoing iterative and inductive process, beginning in the field and informing data collection as it proceeded (Smith, 2007). Data analysis began when the first interview was completed, using the steps outline by Smith et al. (2009), who encouraged a reflective engagement with the participant's account.

In the first step of data analysis, each interview of a female with SRC was read and reread by the researcher to ensure that the participant became the focus of analysis (Smith et al., 2009). The second step of analysis involved more exploratory line-by-line reading of each transcript while notes and comments were made on words and phrases used by the participants. These initial notes, or codes, represented key objects of concern to the participant as well as the language used when they explained their experiences (Smith et al., 2009). This second step of interpretive phenomenological analysis became

more interpretive as conceptual codes were identified through reflection and discussion with the research team. In this step, individual codes were grouped into conceptual codes by comparing words and phrases between transcripts and evaluating similarities and differences among transcripts. Because data collection and analysis occurred simultaneously, codes identified in the first transcript could be confirmed with the second participant, and so on, as the study progressed.

Data analysis included peer debriefing with members of the dissertation committee to aid in exploring different avenues of meaning. Team involvement added depth and insight to interpretations (Crist & Tanner, 2003). The interpretive team consisted of researchers who are experts in interpretive phenomenology or in the content areas of inquiry.

In the third, emergent themes were identified from exploration of the conceptual code categories and returning to the data, representing the cyclic nature of analysis in interpretive phenomenology. Emergent themes were expressed as phrases, which spoke to the essence of the whole text, while containing enough particulars to be grounded in the data (Smith et al., 2009). Once themes were identified by consensus of the research team, connections across themes were examined and themes were clustered according to their relatedness. Themes representing parallel or similar understandings were placed together. A table was created to give a graphic representation of the structure of the emergent themes and their relatedness. In the final step of analysis, patterns across cases were identified, pointing to ways in which participants represented unique experiences, yet shared qualities showing connections for the whole (Smith et al., 2009). Themes that represented patterns across cases were reviewed and discussed by the dissertation committee and by key participants to validate the interpretations.

Trustworthiness

Careful attention was paid to ensuring trustworthiness during this study, particularly during data collection and analysis. Trustworthiness refers to rigor in qualitative research. The goal of rigor in this qualitative research was to represent study participants' experiences accurately (Streubert & Carpenter, 2011).

Guba (1981) proposed four criteria for trustworthiness in qualitative inquiries: credibility, transferability, dependability, and confirmability. Lincoln and Guba (1985) further suggested means for meeting each criterion in the pursuit of rigor. In this study, credibility was established by immersing myself in the research data. This immersion in the data occurred by (a) listening to the recorded interviews, reading, and rereading the transcripts; (b) making reflective and observational entries into my field notes; and (c) validating data collection and analysis with study participants through member checking (Lincoln & Guba, 1985). Member checking is the most crucial technique for establishing credibility as it allows the investigator to say that his/her interpretations are adequate representations of participants' realities (Lincoln & Guba, 1985). Member checking occurred continuously throughout the study in an informal method. For example, participants were asked, "Other participants have told me. . . . Did you experience this after your concussion?" This form of member checking allowed the investigator to validate interpretations as the investigation progressed.

Transferability in qualitative inquiry can be referred to as "fittingness" and refers to whether or not the findings are meaningful in other situations (Streubert & Carpenter, 2011, p. 49). Thick descriptions, including relevant quotes from participants, were presented in the findings to enable those interested in making a transfer to reach a conclusion about whether transfer is possible (Lincoln & Guba, 1985). Dependability is

related to the establishment of credibility, and is concerned with the stability of the data. The inquiry audit is a technique that can be used to establish dependability of the study findings (Lincoln & Guba, 1985). Audiotaped interviews were transcribed verbatim and verified with the audiotaped data, contributing to dependability and confirmability. Any decisions made and why the decisions were made were documented so that an outside reviewer can explore the process and judge decisions that were made as the design emerged. Confirmability also involved auditability, or recording of activities that another individual can follow, including researcher reflections, with an objective to show clear evidence of the thought processes that led to the conclusions (Lincoln & Guba, 1985).

Researcher Bias

In qualitative research, the researcher is an instrument. Total objectivity was not possible in this interpretive phenomenological study because the principal investigator was observer, interviewer, and interpreter (Streubert & Carpenter, 2011). It was in the interaction between the researcher and participants that the knowledge was created in this study. In this phenomenological inquiry, the researcher's prejudgment was considered to be what made interpretation possible (Ray, 1994).

My experience is that of an educated, white, upper-middle-class female who has lived in both the northeastern and southeastern United States. My interest in females with SRC is based on my experience working with adolescents with a variety of illnesses and injuries. Focusing on late adolescent and young adult females with concussions was based on my belief that females, particularly females involved in sports activities, are not getting the media or research attention their male counterparts are receiving.

Protection of Human Participants

Protection of human subjects was assured in this study by several means: (a) IRB approval, (b) informed consent of participants, and (c) the assurance of confidentiality. After IRB approval was obtained from Georgia State University, written informed consent was obtained from participants. The purpose of the study was explained to potential participants before consent was signed, and the investigator answered any questions about the study. Confidentiality, as well as potential risks and benefits of participation in the study were discussed with potential participants before consent was obtained. Participants received a copy of the signed consent. Confidentiality of participants was maintained through use of identification numbers on the demographic form for each participant. Only the research team (the researcher and the dissertation committee) had access to the roster of participant names and corresponding identification numbers. This roster was kept in a locked file cabinet that was separate from the study data in the office of the researcher. Transcripts and coded information were kept in a locked cabinet in the locked office of the researcher. The researcher will destroy audiotapes of the interviews, as well as the participant roster and assigned identification numbers one year after study completion. Lastly, the use of pseudonyms was explained to participants so they would understand how they would be represented anonymously in any reports or manuscripts that are produced from the findings of the study.

Summary

In this chapter, I presented an overview of the research process using interpretive phenomenology to study the experiences of late adolescent and young adult females with SRC. The setting, participants, and data collection strategies were discussed. Data

analysis was carried out using rigorous methods to ensure trustworthiness of the study.

The plan for protection of human participants was also presented.

CHAPTER V

FINDINGS AND DISCUSSION

This chapter contains a discussion of the findings of the study, including participant characteristics and themes. This information was obtained from the participants, allowing them to describe themselves and their experiences in their own words. Following the discussion on participant demographic variables, the findings of the study are presented. Themes and subthemes emerged from the interpretation of the interviews with 15 females who experienced one or more SRC. Excerpts from the interviews, in the participants' own words, are used throughout this discussion to illustrate the themes. The participants represented a group of late adolescent and young adult females who suffered concussions in a variety of ways related to sports activity. They experienced numerous similarities in their day-to-day lives after their concussive injuries.

Participant Characteristics

The participants of the study were 15 late adolescent and young adult females who had at least one SRC. The demographic questionnaire (see Appendix C) was completed by each participant after the consent form was signed. All of the participants lived in the southeastern United States in urban or rural areas. Demographic characteristics can be seen in Table 2. Two participants were African American, one was Hispanic, one was American Indian, and nine were White. Two participants identified two or more races, one Asian and White and one African American and White.

Table 2

Demographic Characteristics of Participants

Characteristic	<i>n</i>	%
Age		
18–19	9	60
20–21	3	20
22–24	3	20
Ethnicity		
American Indian/Alaska Native	1	7
Black or African American	2	13
Hispanic or Latino	1	7
Mixed Asian/White	1	7
Mixed African American/White	1	7
White	9	60
Concussions per participant		
1–2	12	80
3–4	3	20
Sport		
Cheerleading	2	13
Gymnastics	1	7
Ice Skating	1	7
Lacrosse	3	20
Skiing	1	7
Soccer	5	33
Swimming	1	7
Volleyball	1	7

The participants ranged in age from 18 to 24 years, with a mean age of 19.5 years. All of the participants were college students at the time of their interview, and their concussions occurred either while in high school or college. This group of participants suffered 30 concussions, with a mean of two concussions per participant. All of the participants experienced at least one SRC within the three years prior to the time of their interview.

The SRC suffered by the participants occurred during a variety of organized and recreational sports activities. Five (30%) of participants in this study suffered SRC while playing soccer, three (20%) while playing lacrosse, and two (13%) participants had SRC related to cheerleading. In addition, gymnastics, ice skating, volleyball, swimming, and downhill skiing were each the cause of SRC reported by participants in this study. In

addition to SRC, one participant also suffered a concussion related to a fall at work, and another suffered two concussions related to motor vehicle crashes.

Themes

Interviews with the late adolescent and young adult female participants revealed their experiences with SRC. Whenever possible, the participants' own words were used to name the themes that emerged from interpretation of the experiences described by the young women in the study. Pseudonyms were used to protect the identity of the participants. The themes and subthemes are outlined in Table 3.

Table 3

Themes and Subthemes

Theme	Subtheme
Telling myself I'm fine	I knew I wasn't okay
So much pain	My eyes hurt Sound hurt
I'm out of the loop	
I didn't feel like myself	
People don't understand	An invisible injury All concussions are different

“Telling myself I'm fine” is about what many of the participants remember thinking when they first suffered a SRC. The participants told themselves that they were fine. Almost all of the late adolescent and young adult female participants spoke about not being sure what was happening when they were first injured. They remembered trying to talk themselves out of an injury or denying their immediate symptoms as they tried to continue their activity. “I knew I wasn't okay” is a subtheme referring to the participants recognizing that they were injured in some way; even if they were not sure they suffered a concussion.

“So much pain” refers to the pain each participant described experiencing after her SRC. The most common pain reported was a headache. “So much pain” was present in all the interviews. “My eyes hurt” and “Sound hurt” are subthemes under “So much pain.” Most of the participants reported sensitivity to light and several reported sensitivity to sound. Exposure to light and sound both contributed to the pain for these young women.

“I didn’t feel like myself” refers to what the participants remembered as they thought back to how they were feeling after their injury. The participants did not feel like themselves. Differences in their day-to-day lives as they recovered from SRC caused participants to feel that they were not feeling or acting like their normal selves.

“I’m out of the loop” refers to a sense of isolation experienced by participants as they recovered from their concussions. The young women in this study felt disconnected from other people in their lives. This theme encompasses participants’ inability to communicate with peers by using technology for texting and social media access in the initial symptomatic period after their SRC. Their normal means of communication involved technology more often than speaking by phone or in person. This contributed to feelings of being disconnected from their social groups.

“People don’t understand” is about participants’ experiences with others in their daily life while they were recovering from SRC. There were people in these young women’s lives who did not understand concussion symptoms and what those who are recovering from concussions experience. People in the lives of the young women included friends, family members, classmates, teammates, teachers, coaches, and anyone the participants interacted with in their day-to-day lives. Two subthemes emerged under this theme. “An invisible injury” relates to the lack of easily identifiable signs and

symptoms after SRC in comparison to other sports-related injuries, such as broken bones or bruises. “All concussions are different” relates to the variety of possible concussion symptoms that can be experienced. The potential physical, cognitive, emotional, and sleep-related symptoms of concussion (see Table 1) are not experienced the same by everyone who suffers a concussion. Others, including family and friends, in the daily lives of the young women in this study did not understand that concussions do not present the same way in all people. The participants did not want to have to explain their symptoms repeatedly so that others could understand.

These themes represent what the female participants experienced after suffering SRC. The themes and subthemes, whenever possible, are expressed as phrases used by participants. These phrases capture the essence of experiences that were similar to this group of participants.

“Telling Myself I’m Fine”

“Telling myself I’m fine” relates to what the late adolescent and young adult females in this study told themselves either immediately after their injury or during their recovery. In almost every interview, participants spoke of having this dialogue with themselves. Some remembered thinking they were “fine” initially after their injury and reported not immediately realizing what had happened to them. Others reported telling themselves they were “fine” at other times during their recovery. “I knew I wasn’t okay” refers to what participants reported thinking to themselves, either while they were telling themselves they were “fine” or at other times during recovery from their injury.

Gina remembered, “The first concussion I had . . . I actually kind of blew off. I really didn’t want to get off the field.” Although she was aware that she was hit in the head by a softball, she reported thinking that she “just had . . . a headache, this isn’t fun.”

Gina remembered being so focused on her game that she believed she could continue playing with a headache. She described what she was telling herself as “not hurting me that bad so I’m not going to deal with it until after the game because we only had, like, 30 more minutes of game time left.” Gina felt that she could make it through the rest of the game and remembered thinking, “It’s not a big deal.” Gina was not denying her symptoms; she just did not realize how serious her injury could be because she was focused on finishing the game. An emergency services provider at the game saw her having trouble with balance and removed her from the field. Gina knew she would have continued to try to play after her SRC if someone had not removed her from play.

Liz was hit in the head with a lacrosse ball during a high school game. Although she remembered her head hurting immediately, Liz reported that she “tried to keep running, because I had the ball.” Although she was aware that she had just been hit in the head and had a headache, Liz did not realize the significance of her injury. She remembered thinking “Um, well, like, I was like, confused for most of it . . . but I was fine . . . I just had a headache.” The option to stop running did not occur to Liz until her headache became so intense that she could not keep going. She stated, “I just wanted to keep playing because I knew I had the ball. But I didn’t really feel anything immediately.” Liz was not aware of the need to stop playing after her SRC until the headache pain limited her ability to run and play ball.

Jenny had a concussion after she “clashed bodies” with another high school lacrosse player during a game. She remembered, “Falling completely horizontally towards the ground like, just like, clunk,” as well as brief changes in her vision, described as “seeing black” for a few seconds along with a headache that “was horrible.” Still, she told players near her that “No, I’m fine, I’m fine,” and continued to play. Her headache

subsided a bit and she continued to participate in the game. Jenny explained, “Afterward, it was just kind of like a headache.” Looking back, she remembered thinking, “I bumped my head or something, but I was like . . . I don’t think I have a concussion. I really just thought I was okay.” Jenny was diagnosed with a SRC two days later, after her team captain and coaches expressed concern about her fall and referred her to the school trainer. She continued playing because she did not realize that her headache was due to a concussion.

Macy was hit in the face with a lacrosse stick while running with the ball during a high school game. After falling backwards and hitting her head on the ground, she reported losing consciousness for a few seconds. She remembered having a headache but also wanting “to get back in the game.” An athletic trainer was present, and the trainer and coach did not allow her to continue playing because they thought she had a concussion. Macy stated, “I never had a head injury before, so I was just like, ‘Oh, I’m fine. It’s okay.’” Her coach refused to let her continue playing even though Macy protested. Macy had not suffered a concussion before and did not realize the seriousness of her injury, even though she remembered having preseason education and baseline concussion testing. Each of these young women experienced a thought process that did not match the symptoms they knew they were feeling or the concussion education they had previously received. Immediately after a SRC, many of them almost instinctively pushed themselves to continue with their activity and diminish their symptoms.

“I knew I wasn’t okay.” The young women in this study described their feelings and thoughts as they reflected on their experiences with SRC. Many of the participants reported that they now believed they knew, on some level, that something was wrong with them after their injury, even if they were telling themselves and others that they

were “fine.” In most of the interviews, there was the idea that they “knew they weren’t okay,” and they discussed reasons for why they denied symptoms or pushed through symptoms.

Some of the participants told themselves “I’m fine” when symptoms, such as headaches, persisted after a SRC. For example, Claire spoke of telling herself that she was okay several months after her first concussion, when she bumped her head on bleachers in the gym and later went to gymnastics tumbling practice. She stated, “I’m a teenager, I was like, ‘I’m fine. Keep going’.” The slight bump on her head was not causing a headache or any other symptoms, so Claire did not think it was anything to worry about. She continued thinking, “I’m fine” until later that night, when she tried to do schoolwork. Several months had passed since Claire’s previous SRC, and she was medically cleared to participate in light physical activity when she hit her head on bleachers in the gym. Because this incident did not immediately cause any noticeable concussion symptoms, she thought she “was okay” to go to tumbling practice. It was not until later that night, when she noticed symptoms similar to those she had after her previous SRC, that Claire suspected she might have suffered another concussive injury. She knew she was still experiencing headaches, and “wasn’t really okay” since she had her first SRC, but still did not initially recognize her symptoms after her second SRC.

Becca, a cheerleader, knew that her postconcussion headaches were getting worse when she returned to high school after her SRC. Her technology class required her to complete daily assignments on a computer. A teacher told her, “I’ve had countless numbers of football players come in here with concussions, and they all did it fine. You can do it fine.” Becca had difficulty with the exhaustion and pain that the computer work caused her. She described it as “really the hardest part, and then I’d go and sleep after.”

Although Becca knew she was not okay, and that exposure to computer screens was increasing her symptoms, she did not know how to ask for help at school.

Although Dani knew she was not feeling back to normal when she returned to her athletic training and her job, she felt that she was capable of returning to her work as a lifeguard. Dani now believes that she knew on some level that she was not okay, and that her return to physical activity prolonged her symptoms. She stated, “I hurt myself more trying to be fine.” Returning to work and her swimming and running routine not only increased her symptoms, but also made her realize that she needed more time to rest at home before returning to full activity.

Faith spoke about her suspicion that multiple small hits or kicks from other cheerleaders likely caused a cumulative injury that resulted in headaches for her. She gave an example of what she has experienced as a cheerleader with a base position when she stated:

We were doing a stunt where the flyer, like, switches up and so her foot would . . . like, come back to me. If I couldn't get out of the way, it would just hit me in, like, the forehead area. It would hurt at first then I'd feel fine, so I didn't think it was a concussion, but then it would happen repeatedly and then I would start getting a headache and dizzy and so I'd have to tell everyone that we'd have to stop.

Faith knew, from annual team preseason concussion education, that a headache, particularly after one or more bumps on the head, could be a sign of SRC. She stated her belief that cheerleaders are at high risk for SRC and stated, “I just know [that] with cheer, obviously there is all the time, like, constant, bodies coming at you.” Faith was talking about cheerleaders being at risk for repetitive small injuries that can accumulate and

result in headaches that might indicate SRC. Faith explained that she believes she might have “had a concussion multiple times” over her years as a cheerleader. After her first diagnosed SRC, she “realized . . . I need to actually, like, rest for a week and a half.” Faith talked about how her experience with SRC was common among her teammates. Her teammates were, for the most part, receptive to supporting each other when one of them expressed signs or symptoms of concussion. She expressed a positive approach by athletes, at least among her teammates, of being open to recognizing SRC signs and symptoms in each other because many of them had experienced a similar injury.

Hailey, who hit her head against a pool wall while swimming laps, knew she was not okay, but now knows that she was not able to analyze clearly what had happened to her. She described what she was thinking after hitting her head, “I knew I’d hit my head hard enough and I was, felt like, disorientation and, I knew I had done something.” Although she knew something was not right, she really could not identify exactly what was wrong. She stated, “I just remember, like . . . being really scared and time was moving really, really slow, but really fast at the same time.” Immediately after she hit her head, she was hanging onto the side of the pool and did not know what to do. Hailey did not think anyone else noticed that she hit her head and stated, “Everyone around me apparently didn’t realize that me going full speed into the wall would give me a concussion, but I was pretty certain I had one.” In addition to suffering a previous concussion due to a fall as a child, she also had experience as an athlete, a lifeguard, and a swim coach. This young woman believed that she was injured, but was confused and disoriented, and did not understand why those around her, such as coworkers and other swimmers, did not realize that she was not okay. She knew she was “not okay” but did not know how to convey this to the people around her. Hailey felt “really frustrated” that

the people around her, other swim instructors and lifeguards, did not know what to do to help her.

Ina, who had a prolonged recovery and persistent balance problems after her SRC, remembered being allowed to watch her team play and trying to convince her coach that she was ready to play. She stated, “I really needed to get back into soccer. I felt sad. After about a month, I was finally able to go to two of my team’s games. I got to watch.” Ina went through months of physical therapy for balance problems after her SRC. She remembered feeling “just really anxious, like, when can I go back in?” Being unable to play caused her to feel frustrated. Ina explained, “I really wanted to play. I really wanted to get in there.” Ina remembered trying to coerce her coach into letting her play, even though she was still having problems with balance. She stated, “I was, like, ‘Coach, I can play.’ And he goes, ‘No, you can’t. You can’t even walk’.” Ina knew she was not able to return to practice yet but watching her team play increased her desire to return to play. Although her athletic trainer and her coach were aware of her persistent symptoms, she still tried to talk her coach into letting her play. She knew, and admitted, that she was still having balance problems and was not “okay.”

Kelly was hit in face with a ball while playing high school lacrosse. She stated, “I just remember, like, sitting out for a little bit and everyone was saying, ‘Oh, no, you’re fine.’ Like, it’s not a big deal.” Kelly admitted to being “really worried about it because . . . I was still dizzy a while.” She dismissed her concern because “the coach doesn’t think it’s a concussion. I’m fine.” She was persuaded to think she was okay because others, including her coach, did not express concern for SRC. She described what it was like to be in school the next day, trying do schoolwork, “My head was hurting, and, like, just being in light. Like, it was making it hurt more.” A friend did an

internet search of Kelly's symptoms and told Kelly that her symptoms could be related to a concussion. This led to Kelly's father taking her to a healthcare provider, who diagnosed her with a SRC. Kelly knew something was wrong but did not initially think she had a serious injury because she believed her coach did not think she had a concussion.

Olivia lost consciousness after her concussion, which she suffered while downhill skiing. She was diagnosed and treated in an emergency room shortly after her injury, which occurred while she was on vacation in another state. Although she never told herself she was "fine" after the initial injury, she described not wanting people to know there was something wrong with her during her recovery. Olivia stated, "I didn't really like to talk about it at school because I didn't like to have people feel bad for me for no reason" and went on to describe herself as "not that person." To explain further, she stated, "Yeah, I didn't want people . . . to think that I was using my concussion as an excuse for everything." Olivia had prolonged headaches and was not able to attend school full time for a few months after her SRC. She stated that she "didn't want that reputation. You know, I want people to see me as not the concussion girl. You know?" Although she had postconcussion symptoms that lasted for several months, she knew she was not okay, but did not want to call attention to herself.

Jenny, the lacrosse player who stated that she ignored her symptoms and continued to play after a SRC, reported what she would do if injured again. She stated, "Now if that happened, I'd probably would be like, 'No, no, no, I don't need to wobble my brain anymore'." Jenny joked that at the time of her SRC, she was "not as wise as I am today." Jenny was diagnosed with a second, non-SRC after high school. This time, she immediately recognized her symptoms of headache and vision problems as

concussion symptoms. Although she had preseason concussion education and screening in high school, she felt that she is far more knowledgeable about concussion symptoms and concussion management now due to her personal experience with concussions. This personal experience with SRC made her more aware of concussion symptoms and how to care for herself.

Ella, who had two collegiate soccer-related concussions, lost consciousness for a few seconds with her first SRC. She was taken out of practice and diagnosed with a concussion the same day. She was still having headaches from her first concussion when she returned to play on her soccer team. Ella explained that she “still really wanted to play,” so she told herself “like . . . it’s been a month, you’re going to be fine. Your worries aren’t real. You’re fine.” She added, “So, I just kind of, like, trying to reassure myself when I knew, like, back of my head that I really wasn’t okay.” Ella continued to think this way until she believed herself. She talked herself into “being fine” and suffered a second concussion during the last game of the season, a month after her first SRC. She described her symptoms after that SRC, “I didn’t black out that time, but just had immediate headaches and spinning.” Because of her previous SRC, she immediately suspected that she had another concussive injury. Looking back at her decision to tell herself she was okay, she remembers thinking, “Of course I’m going to say ‘Yes, I wanna play’.” Ella admitted talking herself into being “fine,” even though she knew she was not okay. She believes that she fully recovered after the second SRC because her season was over, and she had more time to rest from sports and schoolwork.

Summary. Many of the young women in this study admitted to “Telling myself I’m fine,” either initially or during recovery from their SRC, but realized at some point during their recovery that they were “not okay.” During initial data collection and

analysis, the theme “Telling myself I’m fine” surfaced and was discussed with later participants. Most of the participants recalled a time when they remembered thinking they were “fine.” Several participants spoke of realizing “I knew I wasn’t okay,” whether this occurred at the time of initial injury or at a later point during recovery.

“So Much Pain”

Without exception, all participants spoke of how much pain they experienced after their SRC. All of the young women in this study spoke of headache pain after their SRC, making “So much pain” a pattern that emerged during the analysis of the data. Head pain was experienced by all participants in the immediate postconcussion period. In addition to experiencing headache pain immediately after SRC, most of the participants also reported eye pain triggered by exposure to light. “My eyes hurt” refers to light sensitivity that caused increased headache pain in the young women in this study. “Sound hurt” represents the pain many of the participants experienced when exposed to various levels of sound after their SRC.

After Jenny’s SRC, she reported thinking, “Oh man, this is horrible.” She had an immediate headache that she described as “one of the worst head pains. I remember my head really hurting.” In addition, Jenny added, “People knew . . . they could tell my head was hurting . . . when I first stood up, I was crying.” She reported, “My entire skull was just sore . . . so much pain.” The severe headache was her first symptom after her SRC.

Hailey remembered how she felt when she had a SRC after hitting her head on the edge of a pool while swimming laps. In describing this incident, she stated:

I just remember it being really bad . . . hanging on the edge of the pool, holding my head, hoping someone would notice but like . . . in too much pain to actually say anything. I remember lots of pain.

Hailey remembered thinking “I need to take a break from this, because like my brain was not happy with me.” She was talking about the headache pain she experienced in the first two weeks after her SRC, which she described as “just like a really bad drawn out migraine headache.” Her headache was the worst symptom after her SRC, but improved after the first two weeks, and resolved within one month of her injury.

Olivia described what she experienced after her SRC, “I started to get this really bad headache . . . probably the worst headache I have ever had.” Although she also experienced nausea in the first week after her SRC, that did not last as long as her headaches. Additionally, she reported, “It lasted a continuous headache for about two weeks, and then it started to go away, but then it would come back. . . . The effects were really bad.” This young woman referred to the several months of headaches she suffered as “the healing of the headaches.” She described certain school-related activities that increased her pain as “like taking tests and stuff, thinking a lot . . . causing a lot more of my headaches.” Olivia felt that any activity, even basic schoolwork, exacerbated her headaches for about six months after her SRC.

Abby spoke of her experience with headaches after SRC, “Pretty hard . . . painful . . . I just was like, they don’t have any medicines for this, like, something they can just give me so it could go away? But I just had to let it heal on its own.” She was expressing frustration that there was no treatment available to relieve her pain fully after her concussion.

Dani reported being aware of her head hurting immediately after she fell while ice-skating. In addition, she stated, “I felt nauseous, and I honestly didn’t want to get up. I was just going to lay there.” She remembered thinking, “I think I really hurt my head; this is bad.” Dani described hitting her head so hard that “it hurt really bad, and I felt

horrible.” The headache pain caused her to think she was seriously injured and probably had a concussion.

Ella, a collegiate soccer player, talked about constant headache pain after her first concussion. She stated, “I had to do all these things that just triggered more headaches. Everything I did gave me a headache.” Even though she was not practicing or playing with her team for one month, she was “trying to read and study” as well as preparing her own food because she lived in an apartment near her college. Ella remembered headaches, accompanied by dizziness, lasting longer than other symptoms after each of her concussions. She described “immediate headaches,” which lasted for about another month after her second SRC.

Ina remembered thinking, “My head hurts, my head hurts, my head hurts” after her SRC. She went on to say that she had “a lot of headaches” for the first two or three weeks after her concussion. Her headaches were described as “kind of like migraines . . . a lot of pressure on the sides of my head. It was a lot of headaches.” Ina was referring to the pain she experienced in the first three weeks after her SRC. Headaches were her major symptom after her injury.

Although all participants reported a headache as an initial symptom, for some the headache resolved in a relatively short period. Nina, who suffered a SRC when she hit her head while doing gymnastic tumbling practice, remembered having a headache “for about a week” after her injury. She described her headache as “a lot of pressure behind my eyes.” This injury occurred during the summer, so she did not miss any of her classes and had time to rest at home.

Kelly, who had a headache for one to two weeks after her SRC, described her pain as “a headache, but almost like my head throbbing.” She described her experience

with SRC, “It wasn’t super bad headaches and migraines.” Compared to others with SRC, Kelly believed she had a less severe concussion because her headaches improved after one week and resolved after two weeks.

Faith, a collegiate cheerleader, talked about noticing her head hurting during practice. She stated, “The flyer’s foot hit me in forehead area and it hurt at first, then I’d feel fine, but then it happened repeatedly, and I started getting a headache.” In addition, she described her headache as “It feels just like full, like it’s not like a pain as much as it’s pressure.” Her headache pain lasted about one week, and she explained that she felt “fine . . . after I . . . just like rested a lot.” Faith was describing a headache that she believed occurred after repetitive hits to her head that seemed minor when she thought of them individually. After being diagnosed with a SRC, she recovered quickly with no residual headache pain after a week of rest.

A headache is what Liz noticed first after she was injured while playing lacrosse. She stated, “It was, like a, a big headache, and I just couldn’t keep running.” Not realizing how badly she was injured, she continued running until her headache pain made it impossible for her to continue. Liz had to sit out for the remainder of her game, and then ride the team bus back to her home school. She stated, “I just remember like, my headache was really bad in the bus . . . really bad. Like, my head was pounding . . . a lot.” Headache pain was the worst symptom she experienced after her SRC. Liz continued to have headaches for “about three weeks to a month,” but they were never as bad as the pain she experienced on the night of her injury.

Several participants reported headache pain as persistent. These young women continued to suffer from headaches that persisted up to three years after their concussions. Abby’s SRC occurred almost three years prior to her interview, but she still experienced

headaches. The headaches are not frequent, but she reported, “To this day it still hurts, like, I still feel it and when I get certain hairstyles, I’ll feel it, and it’s like sometimes I get headaches from it.” She was referring to pain in the area of her head that hit the wall in the gym on the day she was injured. Abby expressed frustration that her healthcare provider did not believe that this intermittent pain was due to her SRC. She stated, “It shouldn’t still feel like this,” and explained that “they don’t take it serious or whatever.” Abby felt that her doctor does not think her current headaches are due to her concussion, and she is upset about this.

Becca spoke of having “constant headaches” after her SRC. She stated, “I was constantly having headaches . . . I felt sick. The headaches were awful, and it actually triggered migraines.” She had two SRC. In addition, she explained, “So, I’ve had, like, for the past three years I’ve had just migraines, on and off.” Becca continued to have frequent headaches a few years after her last SRC and believed that they are due to her concussions. Medication prescribed for her migraine headaches has provided some relief for her pain.

Claire had a total of four concussions; two SRC and two concussions related to motor vehicle crashes. Headache pain affected her daily high school life as she recovered from her concussions. For example, she reported, “Somedays my mom would have to pull me early (from school) because my headaches were too bad.” She still has headaches “all the time.” Her physician told her that the headaches were a result of her concussions. Migraines were not a problem before her concussions, but she now has migraine headaches. Claire stated:

I’ve started having migraines, which I’ve never experienced before. And, I don’t know if that’s . . . I’m, you know, I’m in . . . still a prime age of, like, my body’s

changing, and . . . hormones and all those kinds of things. So, I mean, that might be the reason, but just looking at it, like, I have migraines on this side of all the concussions, versus I have never had a migraine on that side. So, I don't know if, like, the concussions caused that.

Claire understood that migraines in female adolescents might be due to normal hormonal changes that take place in females in her age group. She did not understand why her current headaches, which had been diagnosed as migraines, were always on the side of her head that was hit when she had her concussions. She reported that she believes that her concussions have caused her current problem with migraine headaches.

Gina, who has had several SRC, remembered the pain she experienced with her injuries. Although she reported a headache as the first symptom with each concussion, she stated the headache after her third concussion was the worst. She described the headache after her third SRC as “It hurt really bad. I felt like I got an immediate headache. The headaches for those initial three weeks were just more of like the sharp, stabby, pounding headache.” Additionally, Gina experienced nausea for three weeks with the headache after this concussion. She reported, “Then I started feeling better. The headaches got more responsive to pain relievers . . . and that would actually help a lot.” Gina also reported that she still gets headaches “every like four or five days, on the right side of my head, and it's usually a migraine.” These migraine headaches have been a persistent problem for the two years since her last SRC. Gina, a college student at the time of her interview, was still experiencing migraine headaches accompanied by nausea at least once a week. She wondered how these headaches would affect the rest of her life.

Macy has had two concussions—one SRC and one concussion due to a fall in the shower. She remembered having headaches after her first concussion, which occurred

when she collided with another lacrosse player and hit the back of her head on the ground. Macy reported, “I was, like, freaking out because I didn’t know what happened. And so, I had a headache, but . . . I wanted to get back in the game.” A coach had to explain to her that she was not allowed to continue playing because she reported nausea and a headache after the injury.

Macy’s headaches after the first concussion resolved within a couple of weeks, but she suffered a second concussion after falling in the shower several months later. The headaches worsened after she tried to get back into training months after the second injury. As she tried to increase her weight training and running, which was recommended by her healthcare provider, she reported that her headaches “would come back.” She went on to explain that she had started college by this time, and “probably missed 30 days per semester . . . from my headaches . . . they were literally debilitating. I couldn’t do anything.” Macy remembered being told by her physician that she was “in the 1% with this kind of injury” and she was told, “Chances are your headaches aren’t going to go away.” Her description of her persistent headaches was “really, really bad, especially on my menstrual cycle. It’s bad!” She received medical care for her headaches, including occipital nerve blocks, and stated, “That helped a little. However, I still get headaches when I run . . . or use the elliptical.” Macy was expressing frustration that she is unable to engage in regular exercise because these activities exacerbate her persistent headaches.

Each participant described pain, specifically headache pain, experienced because of her SRC. All of the young women reported having head pain immediately after their injury, and the majority of participants described headaches lasting for several weeks. In addition, several of the young women described persistent headaches, with some

reporting headaches lasting up to three years after their last concussion. They believe that their persistent headaches are due to their concussive injuries.

“My eyes hurt.” Most participants in this study spoke of eye pain related to exposure to light after their SRC. The young women in the study reported that exposure to light worsened their headaches. The types of light causing pain included light from digital screens, sunlight, indoor lights, streetlights, sports field lights, and car headlights. The majority of the participants reported that these light sources caused eye pain and worsened headache symptoms.

Abby described having to stay in a dark room for several days after her concussion, “Because my head was hurting so bad, I couldn’t . . . look at bright stuff . . . even white stuff, because it gave me a headache . . . my eyes would hurt or something.” Anything other than darkness made her headache worse in the first week after her SRC. Light from her cell phone was particularly intolerable. For example, she explained, “I tried to be on my phone and stuff, even though the doctor told me not to, and I couldn’t even look at my phone.” She described how she felt when trying to use her phone as “I couldn’t even look at it . . . I just really wanted to cry. That’s just how bad it hurt every time I looked at it.” The eye pain and headache caused by brief use of her cell phone was severe enough to make her not use her phone. When she tried to return to school the week after her injury, she found “the lights were very bright at school. It was just too bright. I just needed to be home again.” Abby wanted to be back in her normal school routine but found that she could not tolerate being exposed to constant bright light.

Becca also remembered exposure to bright light causing her head to hurt more after she returned to school after her SRC. She stated, “I had a big problem with the whole bright light thing. I was constantly having headaches.” Becca described how using

a computer affected her after her return to school, “Technology hurt. . . . I constantly felt sick. I was very tired, which got worse after . . . interacting with technology.” Her visual symptoms made her feel tired and caused headache and nausea.

Claire remembered first noticing a problem with bright light when she was in the emergency room immediately after her SRC. She stated, “I couldn’t open my eyes because it was so bright . . . it hurt too much . . . it’s . . . white everywhere, and it just gets really . . . reflective.” Returning to school also caused discomfort related to light sensitivity. She described going back to school as “hard . . . you know . . . the bright asylum. Lights that they have in the hallways . . . it was a lot for me to process.” Her visual symptoms were overwhelming. Claire had to be picked up early from school several times because her headaches “were getting too bad.” The exposure to light, particularly at school, caused intolerable eye pain and headaches after each of her concussions.

Dani described various activities that caused her pain after her concussion. She stated, “I definitely didn’t want to look at my phone, or computer, or read, or really just focus on anything . . . because it hurt . . . that first week.” Opening her eyes to look at almost anything caused her pain in the first week after her SRC. Dani reported exposure to sunlight being a problem even after the first week of recovery. She stated:

I was so just bothered by it for a couple of weeks like I couldn’t look at anything. It just hurt to be outside . . . even if it wasn’t that bright. . . . The sun in particular . . . being outside . . . it made my head hurt. It made my eyes hurt . . . and behind my eyes for a couple weeks. I love driving, but it was like the sun was super bright and just everything was just too much. It was kind of overwhelming, I guess. I felt like it was too much going on at once . . . I don’t

know. I just felt like my brain was tired and I just couldn't take everything in . . . like the cars and the sun . . . and everything.

Dani did not realize that sunlight would be such a problem until she tried to drive more than a week after she suffered her SRC. Driving required her to focus on several different things at once, and this was difficult and caused more eye and headache pain for several weeks after her injury.

Ella remembered light sensitivity being the worst trigger for her headaches after her first concussion. She stated, "It was just constant headaches and lights were miserable." Her first SRC occurred during an early morning practice. Ella remembered returning to her apartment at school, "I got back to my room and the sun was just coming up and my room faced the sunrise. And so . . . even . . . with my eyes closed . . . it caused an immediate headache." In a bright room, keeping her eyes closed did not prevent eye and headache pain from sunlight. Using her phone caused similar pain. She explained, "I tried to use the brightness all the way down, that still didn't work. It still hurt and caused the headaches, and spinning, and nausea." Ella's visual symptoms made her headache worse, and caused dizziness and nausea.

Ella had a second SRC one month after her first injury. This occurred while she was playing in a soccer game at another school, and she remembered being very uncomfortable on the return trip after the game. She stated, "That drive was not good, just a bunch of nausea and the lights going by the road were really bad." Ella experienced pain when she saw streetlights and lights from other vehicles on the ride back to her home school. A few days later, not realizing she would still have trouble with outdoor light at night, Ella drove herself home. She explained, "It was night time so all the street lights flying by was just causing immediate headaches and I should not have

been driving. I realized after I was like halfway there. The light was really painful to look at.” Ella did not realize that streets light and lights on other vehicles would cause her more pain until she was on the road driving home, even a few days after this SRC. She went on to explain that this sensitivity to light lasted “about three weeks,” and only improved after her semester ended and she was able to rest at home.

Gina remembered the lights in the emergency room being too bright after her SRC. She stated, “They turned down the lights in the room for me because my eyes were bothering me really bad.” Her eye pain and sensitivity to light lasted for more than a few weeks:

A lot of strain with my eyes, especially . . . the fast movements on the TV . . . having to focus . . . would just kind of give me a headache . . . my eyes would start to hurt whenever I would try to focus on the TV for more than like 20 minutes.

She explained that she could sometimes read a textbook or notes without eye pain and headache, because “reading didn’t hurt as much as watching TV.” Gina, who now has chronic migraine headaches, experiences visual symptoms very similar to her concussion symptoms when she has the migraines. She explained, “Now when I have the migraines . . . the headaches around my eye . . . they come back. And so, I can’t have any lights on in my room, I have to close the drapes.” The problems she had with light sensitivity causing eye and headache pain are similar to what she experiences now with her migraines.

Hailey also described her visual symptoms as similar to migraine symptoms. She stated, “I’d have, like, the vision difficulty that you encounter with a migraine where things were kind of like fuzzy, and light hurt. . . . It kind of felt like my eyes were

overstimulated.” In addition, she described her eye pain as “really bad . . . and I couldn’t watch screens.” Hailey remembered being told to let her eyes rest and added, “I guess it helped my headache and stuff.” When talking about managing schoolwork, she recalled working on a project as “a huge struggle . . . stressful . . . because after an hour or so looking at a computer screen . . . I just started getting a massive headache.” She described thinking that “my brain was not happy with me,” and learned, through trial and error, to take breaks when she worked on a computer in the weeks after her SRC. If she continued using a digital screen after noticing her eyes and head hurting, she found “I’d get a migraine headache basically. . . . I would definitely feel like much more tired, just mentally tired . . . really exhausted.” Hailey’s visual symptoms were exacerbated by working on a computer, causing eye pain and headaches, as well as exhaustion.

Ina also reported light sensitivity causing migraine-like pain, particularly during the first two weeks after her concussion. She explained, “Light was definitely something that affected my headaches, extremely. Sensitivity to light was pretty prominent during the first week or two, and after that it started to go away, but I still had to wear sunglasses.” Her discomfort resulting from exposure to light was described as “like if I got a glimpse, even if I had all the shades drawn, it would just like hurt my eyes, like behind my eyes.” Light from digital screens caused similar pain. Ina explained, “I couldn’t look at a computer screen, I couldn’t . . . I couldn’t use the phone. They were kind of like migraines . . . a lot of pressure on the sides of my head.” She missed almost a month of high school after her SRC but was able to video-chat with her class from home without having to look at a computer screen. Ina reported that this helped her because “you know, I could get up if I needed, I could turn it off if I needed.”

Jenny remembered being told by her physician to avoid light from any screens for at least a couple days after her concussion. She reported immediately thinking, “How am I supposed to not look at screens for two days when I have exams?” Her father “immediately just like took my phone and I was really upset.” Jenny did not look at the screens on her phone or computer for several days, and she believed that allowed her to recover quickly.

Kelly did not realize she had a concussion until she did not feel right at school the day after her injury. Headache and light sensitivity were her main symptoms. She described what happened at school, “So I went to school the next day, and I was trying to like do schoolwork, and like, my head was hurting, and like, just being in light . . . like, it was making it hurt more.” Although she did not realize she had a concussion at this point, she knew that exposure to light in the school was making her eyes and head hurt. A classmate pointed out that these symptoms were possibly due to a concussion. This led Kelly to go to the school nurse and she was sent home. Kelly noticed more light sensitivity when she went outside to be picked up early. She stated, “It was really when I went outside, and light was making it worse, and I was like, that seems like a concussion.” The eye pain and headache pain worsened when she was exposed to bright sunlight.

Liz experienced light sensitivity immediately after her concussion. She stated, “I remember the lights because it’s, like, in the football field . . . all the big lights are there, and they were super bright.” She was already experiencing a headache, and believed the lights made her eyes hurt and “made the headache worse.” She reported, “I just didn’t wanna look at the lights, not even on my phone or anything.” Even on a lower brightness setting, Liz found that using her phone made her eyes hurt and worsened her headache.

Nina remembered having light sensitivity “that lasted . . . maybe like three or four days” after her SRC. She described how she felt, “I had a headache. I would always want the room to be dark, and if it was daylight, my shades were closed.” Her pain was “a lot of pressure behind my eyes. . . . It really would be really painful to my eyes.” Nina experienced light sensitivity, even with shades closed and indoor lights turned off, in the first days after her concussion.

Olivia spoke of light from screens being a cause of pain and nausea after her SRC. Light sensitivity was a symptom she remembered experiencing immediately after her injury. She stated, “Light was really bad. It was just like getting your eyes dilated. It was really bad. It caused more of the headaches.” Although a doctor instructed Olivia to stay off her phone, she admitted, “I did try to use it . . . just because I’m 18, you know . . . I had to be on my phone, but . . . Yeah. Texting, being on the phone, social media . . . I definitely had to stay off . . . a month, maybe.” She occasionally tried to use her phone for texting and social media but could not continue due to increased symptoms of nausea, eye pain, and headache. In addition, Olivia had to wear sunglasses anytime she was exposed to sunlight or other bright light. She stated, “Wearing sunglasses did help it but . . . it’s not like I could tell them to turn the lights off . . . if I’m in public or anything. So . . . I would wear sunglasses to be in bright light or be outside in bright sunlight for maybe three, four months.”

Sensitivity to light was the most common trigger for eye pain and headaches reported by participants. Light sensitivity was a major symptom for these young women after their concussions. Light sensitivity caused migraine-like headaches after their injuries. Those with persistent migraine headaches felt that their concussions triggered the chronic headaches.

“Sound hurt.” Many of the young women spoke about sound as a source of pain after they experienced their SRC. Some had sensitivity to sound immediately after their injury. Others reported that “sound hurt” for several weeks after their SRC.

Some of the participants reported sensitivity to sound to be a short-term problem. For example, Ella did not have a significant sensitivity to sound:

There was one time that I went to practice . . . and they were all like in a huddle and they were screaming, and I was like, ‘I’m going to walk away’. I think that was the only time . . . it hurt my ears, my head. After I walked away, it got like a little duller.

Faith remembered, “The first and second day were really loud, with like the pressure feeling already there. It just felt like it would make it a little worse. But then after that it would be fine.” Ella was talking about sound being more of a trigger for a headache in the first two days after her SRC.

Abby remembered severe pain in her ears and her head if she used her cellphone. She reported, “Even just talking on the phone, it gave me a headache. I tried to . . . leave it on speaker, that was . . . even worse.” Listening to any sound on her cell phone caused her headache pain to worsen. She described her experience with her phone, “It felt like I heard a bunch of technology or something in my ear . . . it’s like something just kept piercing in my ear . . . some weird feeling.” She found this experience “pretty hard . . . painful.” For Abby, sound was a major trigger for her headaches.

Hailey did not have sensitivity to sound, “as long as it was a very low volume.” She added that if the sound escalated to “yelling or, like, high pitched,” she would start to have a headache. Hailey tried listening to audiobooks after her SRC because she could tolerate low volume sound more easily than she could tolerate reading a book or a digital

screen. If the noise started to cause a headache, she reported, “I’d have to turn the audiobook off for a little bit and take a nap. But that was like the least annoying or like pain-inducing thing I could do.” Louder sounds, such as “My roommate . . . being really, really loud hurt my head.” If exposed to loud noise levels, Hailey would develop a headache she described as “a really bad migraine headache.” Claire described her return to high school after her SRC:

Everything’s, like, loud, and moving, and people are doing whatever . . . being in an environment that was so . . . loud. I couldn’t do loud noises . . . it was just too much . . . it would just give me an immediate . . . migraine headache.

She was overstimulated by the noise level on a normal high school day when she returned to school. The noise level made Claire’s head hurt and affected her ability to stay in school for a full day.

Dani remembered, “Not wanting to listen to anything like music, people talking, things that were loud” after her SRC. She felt “like they were exceptionally loud and annoying.” People around her, at home or at work, annoyed her. For example, she reported being annoyed by the radio and by people at work “who would whistle,” and other noises she described as “bouncing around.” These noises felt “like piercingly loud, compared to normal” to her. Dani explained how noise bothered her when driving after her SRC, “I love driving, but I couldn’t play music.” Her headache worsened when she tried to drive her car, and she attributed it to “just too much stimulation going on.” She explained that the combination of bright sunlight and sound from music was “just too much. . . It was kind of overwhelming.” Dani wanted to be able to drive herself to her normal activities but felt that she could not handle too much stimulation at one time without getting a headache.

Gina remembered not being able to tolerate having friends over due to her sound sensitivity after her SRC. This was described as “tough with my friends . . . sitting at the house with me for a while, just being there with me. I couldn’t really talk to them a whole lot.” She could not talk to her friends “because it would hurt my head hearing the noise.” Gina described the sound of her friends’ voices as “pressure.” The sound of her own voice also caused discomfort, which she explained as “the pressure of . . . vibration coming from me . . . just the effort of putting a sound out with my voice hurt my head.” She explained that she also had ringing in her ears and “everything sensory for me was just painful . . . as in my ears were basically ringing. I had constant ringing in my ears those first three weeks. I would get one of those pounding headaches with any sound.” Exposure to noise caused Gina to feel pressure and ringing in her ears that increased her headaches in the first few weeks after her SRC.

Liz, who suffered her SRC while at an away high school lacrosse game, noticed sensitivity to sound on the bus ride back to her home school. She stated, “I just remember, like, the one thing that was irritating me was the noise. . . . It was . . . little, like, whisperings, but not, it wasn’t like, big noises that day, but . . . I just didn’t wanna hear any noise.” Liz felt irritated by what she would consider normal conversational noise on any other team bus ride. Because she had suffered a SRC, the noise level contributed to her headache pain.

Macy was one of the few participants who reported sensitivity to sound, but not to light. She stated, “Sunlight didn’t bother me. Noise was terrible.” Her sensitivity to sound lasted for almost a year after her last concussion. She explained, “I couldn’t go to basketball games, noise was the worst.” Music, which she previously enjoyed listening to while driving or riding in a car, was intolerable. Macy stated, “I would drive in the car

with no music. I couldn't go to any functions that were loud at all." In addition, she "still couldn't go to any functions that were more than, like one person, which is nothing. I couldn't go to anything. That was kind of that for like the first year." Exposure to noise contributed to Macy's headaches for at least one year after her last concussion. This symptom played a major role in what activities she could tolerate as she recovered from her concussion.

Olivia also reported learning to avoid loud activities, such as pep rallies at school, after her SRC. She explained, "There were a couple days every now and then [when] I would stay home, I would just know that that would be a loud day, and I would just stay home." When discussing how she figured this out soon after returning to school, Olivia gave this example:

Like we would have . . . certain events going on at school like pep rallies and stuff and I would just go home, because at pep rallies, in the gym, like the sound, it echoes. . . . So, I was just like . . . I knew . . . because I remember one day after the concussion, I didn't realize we were having a pep rally, so I got in there, the sound was just so bad. It was like someone screaming in your ear constantly. It was really bad. So, I was just like, 'Okay, from now on, I'm not gonna come as much as I want to' because it's just really bad.

Olivia's headache pain was exacerbated by sensitivity to noise at school activities. She learned, through trial and error, what noise level would trigger too much headache pain.

During initial data collection and analysis, the theme of "So much pain" surfaced often and was intentionally discussed with later participants. All participants spoke of the pain they experienced after their SRC. The majority of participants spoke of light

sensitivity contributing to their headache pain. Many of the young women in this study also talked of sound contributing to their headache pain after their SRC.

Summary. All of the young women in this study experienced headache pain after their SRC. For most participants, exposure to various forms of light caused eye pain and a worsening of their headaches. Types of light causing pain included sunlight, indoor light, streetlights, car lights, and digital light from screens. Sound was also reported as a trigger for headache pain by some of the participants. Sounds that triggered increased headache pain included voices, music, yelling, and cheering. Sensitivity to light and sound limited the activities participants could tolerate after their concussions.

“I’m Out of the Loop”

The participants described feeling removed from their social groups as they recovered from their concussions. They wanted to continue to interact with their peers but were limited by their symptoms. “I’m out of the loop” reflects the participants’ sense of being out of touch with their friends, classmates, and teammates during their recovery from SRC. The young women reported feelings of isolation that resulted from an inability to use technology to communicate with peers. Participants felt removed from electronic communication after their concussions, primarily due to their inability to use their cell phones or other digital devices to text and use social media sites. They normally communicated on a regular basis by using technology. When sensitivity to light and sound made using cell phones and computers intolerable, most of the young women were cut off from their primary methods of communication.

Jenny told the story of her father taking her phone away as soon as she was diagnosed with her concussion. She stated, “He . . . immediately . . . took my phone and was like, ‘This is mine the next couple of days’ and I was really upset because I was just

like, ‘No’.” Because her cell phone was the tool that kept her in touch with her peers, she was horrified when her dad took it from her. Jenny’s dad had an idea that allowed her to stay in touch with others. She explained, “He would hold the phone away” to allow her to use voice-to-text to communicate with friends. She remembered being “a little bit more stressed about it than I should have been, but . . . social media is like kind of an important thing.” Being unable to communicate on social media sites caused Jenny to think, “Oh man, I think I’m out of the loop.” Even though her dad tried to facilitate communication with her friends, she felt disconnected if she was not “on social media.” Looking back, Jenny saw that having limited phone use for a few days was not a big deal, but at the time, she felt that she was missing important social interaction.

Abby talked about being glad to return to school after a week of rest at home, even though she still had headaches. Her contact with friends during the time she was recovering from her concussion was limited because light and sound from her phone increased her headaches. She remembered telling friends, “I’ll have to talk to y’all whenever I get back to school. I felt like I was missing out on a lot without being on the phone with my friends and stuff.” Returning to school helped, and she explained this by stating, “Being around my friends and stuff . . . they made me feel better, because I was lonely for a long time.” During the week she was at home after her concussion, Abby missed the contact she would normally have had with her friends via texting and social media on her phone.

Nina remembered not being able to go out with her friends after her SRC, which occurred just before summer break. Light sensitivity was not a major symptom for her, and this allowed her to check in on social media sites to see what her friends were doing. She stated:

I remember not getting to really go out with my friends or anything. And, I just remember seeing them on social media and . . . like, I was invited but I was told not to get out of bed, go out . . . go out and do anything.

Even though she could intermittently tolerate using technology to check social network sites, Nina still felt disconnected from her friends.

Claire, who was a high school student when she suffered her first SRC, felt that her parents and siblings helped her by spending quiet time with her during her postconcussion recovery. She explained, “The whole no TV, no phone, no reading, no . . . no anything . . . just hanging out with my family . . . that was hard, but, I’m really close with my family . . . like, we’re best friends, so, it wasn’t terrible.” Claire went on to say that her siblings and parents “would come in and hang out with me, and talk to me. And so, we’d have a good time, like, just kind of hanging out, and, you know, I got all of my meals in bed.” Because she was in high school and lived at home with her parents and siblings, she felt connected because family members would sit in her room to keep her company. She summed it up, “I mean, I wasn’t at school with my friends, but I’m close with my family.” Claire reported feeling disconnected from her peers, but she was at home with her parents and sibling during her recovery period. This resulted in her not feeling as isolated as some of the other participants. Family played an important role in her daily life, and they were close to her as she recovered.

Ella was competing on a collegiate team when she had her SRC. She was living in an apartment with a roommate and had to avoid light for several days after her concussion. Her friends reached out to her, but she could not communicate using social media without making her headaches worse. Prior to Ella’s SRC, texting on her cell phone or using social media sites were her primary method for communicating with her

peers. She described not being able to do this as “hard, because their reaching out was either a phone or a computer or like FaceTime, and that, I couldn’t do, so I couldn’t really talk to them.” Communicating with her friends using digital screens increased her concussion symptoms. She described how her symptoms of “headaches, and spinning, and nausea” increased if she was exposed to the light from any screens. Ella stated, “I just laid in bed. It was bad because you felt isolated from everybody else. I was pretty much . . . isolated in my room.” Because she was a college athlete, she was living away from home, and her social circle at school primarily included other female athletes. The people in her social circle normally kept in touch through texting and social media. Not being able to use these methods to communicate left Ella feeling disconnected.

Although her athletic trainer checked on her daily, Ella was physically and socially isolated from her teammates while she was recovering from her first SRC. She had another SRC one month later, just prior to a semester break. This allowed her to be at home after the second concussion, “I was home, so that helped. My mom let me lay in my room. She would get me things that I needed . . . so I just laid in bed. My family is very nice, and they took care of me.” Ella noticed a difference between her recoveries from these two SRC. Although she did not have a lot of contact with peers after either SRC, being at home allowed her to have close contact with her family members. This allowed her to remain connected with people who were interested in her wellbeing. Ella felt less isolated after her second SRC because she was with family, and not dependent on technology to feel connected to people who cared about her.

Gina spoke of “severe symptoms that lasted probably three full weeks.” She described that time as “really bad . . . I couldn’t use my phone . . . you know how teenagers . . . will lay in their room at night. I couldn’t do that. I would have to talk to

people on the phone more than I would text.” Not being able to “talk to anybody” refers to her memory of a difficult time. Speaking about adjusting to talking on the telephone as an unusual event for her, she explained, “This was . . . interesting for our generation because I think nobody wants to talk on the phone.” Gina is talking about how she and her college-age peers normally communicated. They communicated via texting or using social media sites on their cell phones. She went on to explain, “A lot of my friends were great and would like adapt to that and that’s how I would talk to everybody.”

Gina reported that talking on the phone rather than texting friends “made my relationship with a lot of people better because I wasn’t texting them as much.” She felt that she developed deeper relationships with friends who were willing to take the time to talk to her instead of texting or using social media. Although the severity of her postconcussion symptoms caused her to be disconnected from some peers, Gina had several friends who were willing and able to speak by phone. In her experience, this was not common for late adolescents and young adults. Gina appreciated the fact that some of her friends made this adjustment for her. She did not feel totally disconnected from her social groups because some of her friends were willing to change how they communicated with her.

Becca talked about how she felt left out when she had to sit out of her sport for months after her second concussion. “I was so sad. . . . That broke my heart” she stated. After cheerleading for many years, she excelled in the sport until she suffered her second SRC. Before she was allowed to exercise again, she was permitted to attend her team’s practices. She described what that was like, “I would sit at practice, and watch everyone. At that point cheerleading had become my life. I would sit on the sidelines; I’d cheer them on, and I was . . . I was just kind of sitting there, like, watching them.” Becca felt

disconnected from her social group of teammates after her SRC. Being permitted to attend practice without participating did not make her feel better. Due to the extensive rehabilitation required after her second SRC, she never returned to competitive cheerleading because of the risk of permanent injury. She still feels sad about this, “I miss it so much.”

Hailey was in her first year of college when she had her SRC. Her memory of recovery from this injury includes “having this constant headache, and . . . I just felt really, like, disconnected from everyone else.” She described it as “isolating myself, and just like hiding in my room all day and being, you know, in pain but also just like anxious, and just very, very lonely.” Her college friends were not willing to cancel their activities to come and sit in a dark room with her. She stated, “I just remember it being really bad . . . all I could do was lie in my bed. I couldn’t watch screens or anything . . . and they wanted to be out doing stuff and I just remember that being really rough.” Hailey was told not to look at screens and to rest. She said, “I guess it helped my headache and stuff, but as far as feeling kind of disoriented and detached from everything, it made it 10 times worse.” She understood that avoiding screens was part of her prescribed treatment, but she found it very difficult to be cut off from her friends and classmates.

Olivia quickly discovered that being on her phone caused her pain after her SRC, and this kept her from communicating with friends. She explained it as:

I had to stay off of it for a while. . . . I did try to use it. . . . Just because I’m . . . I’m 18, you know I had to be on my phone, but . . . Yeah. Texting, being on the phone, social media . . . I definitely had to stay off social media because staring at the screen for a while is just not . . . a month, maybe. I would every now and then, but it was just weird because it was just like, I don’t know. I don’t

usually talk on the phone this much. It took me a lot longer to respond to text messages . . . It was weird to have to communicate by phone . . . Yeah.

Olivia was talking about her struggle to avoid using her phone to text and communicate with friends via social media after her SRC. Although she understood that digital screens could increase her visual symptoms and her headache pain, she admitted to using her phone a few times. Like some of the other participants, Olivia was not accustomed to communicating without using technology. Because of her postconcussion symptoms, she reported telling friends, “I would prefer to just be on the phone, that way I can just talk to you that way.” She went on to explain that her boyfriend and family were the people who understood this. Olivia, like some other participants, was still in high school when she suffered her SRC. Living at her home with her parents, and with a boyfriend who lived close-by, she was able to stay connected with some people in her everyday life without using social media.

The young women in this study wanted to stay connected to their peers and to others in their daily lives. Sensitivity to light and sound were two of the most common reasons the young women were unable to keep in touch with others, particularly if they tried to communicate using technology. Prior to their SRC, the participants used their cell phones to stay in communication with their peers. They did this by texting and accessing social media sites on their phones. This is how they communicated, rather than by talking on their phones or in person. After their SRC, most participants experienced headaches, as well as sensitivity to light and sound. These symptoms played a major role in disconnecting participants from their peers and others in their lives. Those still living at home with their parents were less likely to depend on cell phones to communicate and reported less of a sense of being socially disconnected.

“I Didn’t Feel Like Myself”

The theme, “I didn’t feel like myself,” represents a variety of feelings and thoughts described by participants after they suffered SRC. Many of the young women reported noticing both short-term and long-term changes in themselves that made them feel different from what they normally felt and saw themselves. Most reported feeling “not themselves” when they were experiencing particular symptoms, but the symptoms related to this theme varied among individual participants.

Becca remembered feeling off balance after each of her two concussions. The feeling of being “off-balance . . . for a couple of weeks after each one” was the symptom that caused her to state, “I didn’t feel like myself at all.” She described herself normally as “a decently graceful person . . . a cheerleader with some sort of balance,” but after her concussions said she “suddenly had . . . like . . . none. I had trouble walking a straight line. I had a weird sense of balance. It was bad.” Although Becca also had headaches after each concussion, her inability to “walk a straight line” was the change that caused her to feel the most unlike her normal self.

Dani also remembered feeling off balance after her SRC, which she described it as “I felt . . . uncoordinated.” She remembered thinking, “I feel like I’m going to fall. I just didn’t feel like myself.” This feeling lasted “almost a couple of months before I . . . even went back to being myself.” Although she was able to return to workouts and her job, activities such as climbing steps would make her feel off-balance, even as other concussion symptoms subsided. Dani also spoke about her family pointing out a difference in her temperament for several months after her SRC. She remembers being agitated and reported that her parents and siblings still mention how she acted when she “wasn’t herself.” Dani did not recognize this agitation in herself until her family

members pointed it out. She remembered feeling “like my brain was just all over the place. That was really weird, very strange feeling.” Dani acknowledged changes in her behavior after her parents and siblings pointed it out, but she did not understand why she was not acting like herself.

Hailey described feeling “anxious, and just very, very lonely” and spoke of how she “continued to isolate myself” in her room for a few weeks after her concussion. Although she felt very isolated from the social scene at college, she did not realize that she “wasn’t herself.” Hailey talked frequently with her mother during these weeks and reported, “My mom was actually the person . . . who noticed just how not myself I was.” She was living in a college dormitory during this time but felt cut off from friends during her recovery. She believes this caused her to feel depressed. Hailey’s mother, by keeping in close contact by phone, was able to recognize that Hailey was not acting like herself. This observation by her mother was what convinced Hailey to follow up with a healthcare provider for ongoing postconcussion care, which included counseling sessions.

Some of the participants spoke of problems with memory after their SRC. For most, issues with memory were short-lived. For example, Ina, who returned to school on a part-time basis a few weeks after her SRC stated, “I forgot where I put things, forgot where my classes were.” When she returned to school, a friend had to help during her first week back at school. A few participants reported problems with memory for a longer period after SRC. Dani, for example, noticed problems with her memory after her initial symptoms resolved. She reported, “I noticed a big difference when I went back to school, um, I just remember like not being able to memorize. And then when I started doing math things . . . I had to actually think about it.” Dani went on to explain that she had to “practice my way back into being good at that . . . and I still don’t feel like I’m as

good at it.” Dani also talked about having trouble with her sense of direction for a few months after her SRC, “After my concussion I got like kind of turned around, which is really weird. I was so frustrated because I never had to think about that before.”

Although she has been successful in college since her SRC, Dani wondered if she had any lasting cognitive effects from her single concussive injury.

Macy, who had two concussions, described all the activities she missed due to her persistent symptoms after her last injury. She stated, “I probably missed 30 days per semester that year . . . from my headaches. They were literally debilitating. I couldn’t do anything.” Macy had to adapt to an abbreviated school schedule during her recovery. Academically, she stills feels that she is “80% like myself, but I’m not like that 100%, and I don’t know what was missing.” She reported feeling “stress . . . especially going into college” as a major concern. Macy explained that, “I was terrified of academics. My memory is still pretty bad . . . and . . . I’m still not academically where I was.” Macy has struggled with some of her core college classes and remains concerned that whatever is “missing” could limit her chances of successfully completing her college degree.

Claire reported not feeling like herself due to persistent problems with memory and academics. She reported, “I’ve had noticeable cognitive delays” and explained that “memory loss is still a big symptom that I have . . . it takes . . . longer to figure things out.” In addition to this making her feel “distinctly different” from her preconcussion self, she added that her cognitive delays “cause more severe problems in everyday life.” Claire explained that she has had to “relearn how to learn things, like, in a more detailed, slower way. It takes me longer to read. It’s something you have to live with, learn how to cope with.” In addition, she gave examples of how her postconcussion cognitive issues affect her daily life:

I definitely experience . . . short-term memory loss. Like in conversation, sometimes I have a hard time keeping up because I can't remember what somebody had said just a bit earlier. And things like that. Yeah . . .or like little details, I, I can't remember a lot of smaller details of things, like, if someone tells me a time. Before, it never fazed me. I'd just look at something and remember it for like, forever. Like it's enough that my family has noticed a difference. People I know notice a difference in how I work. Like how fast I am at responding, or remembering numbers, remembering things to do, remembering those kinds of things. My family and close friends, who knew me before and now after, have noticed a difference.

Claire was aware that she might never be the same person she was before her concussions. Her persistent cognitive issues are what cause her to feel different from her preconcussion self. After suffering multiple concussions, both SRC and non-SRC, she feels that she is coping well, mainly due to support from her family and friends.

Nina, who denied any long-term complications from her SRC, remembers having trouble with reading in the first week after her concussion. She stated, "I remember, like, not knowing why I couldn't read but I just couldn't figure out like little words. Like, how to pronounce them. It was a nuisance." This lasted for about a week for Nina. Although Nina's symptoms after her SRC resolved quickly compared to others in this study, being suddenly unable to do something she had been easily doing for many years caused Nina to "not feel like myself."

Olivia had a severe intolerance to loud noises after her concussion, and she believed this contributed to changes in her mood and behavior. She stated, "I do find myself to be a lot more introverted than I used to be." For example, she reported, "I

remember one day after the concussion, I didn't realize we were having a pep rally, so I got in there, the sound was just so bad. It was really bad." Overall, she described herself as "not really a group person anymore. I'm more of like . . . a couple of friends, or by myself, or just me and my boyfriend, or just me time." A close friend first noticed this about Olivia, and pointed it out, "You don't really talk anymore." Olivia explained:

I guess she noticed that I would be to myself more than usual . . . It was . . . I didn't know who I was, honestly. I don't know . . . I just . . . I could feel myself not being myself anymore, especially toward graduation. Because I wasn't really excited to do any senior activities. I wasn't excited about prom. I wasn't excited. . . . It was weird because it wasn't like me.

Olivia was able to tolerate more social activities compared to shortly after her concussion; however, she still saw herself as less likely to tolerate activities with groups of people. She felt that her personality has changed because of her SRC.

Many of the young women in this study reported a sense of not feeling like themselves after their SRC. The symptoms related to their feelings varied among participants. For some, it was noticing a change in balance. For others, it was trouble reading or focusing after their SRC. Missing school and avoiding certain social situations due to sensitivity to light and sound contributed to this sense of a different self in other participants. Most participants who spoke of a sense of "not feeling like myself" reporting this feeling resolving as their postconcussion symptoms diminished. For those few participants with persistent cognitive symptoms, the effect of their symptoms on their education and future career is unknown.

“People Don’t Understand”

The young women in this study spoke of other people not being knowledgeable about SRC. This lack of understanding, as reported by participants, applied to how concussions occur, what concussion symptoms are, how long recovery can take, and how concussions affect people differently. Other people in the young women’s lives included family members, friends, teammates and classmates, as well as teachers, coaches, and athletic trainers. The subtheme, “An invisible injury,” encompasses the frustration felt by participants when those around them could not see their symptoms, because the symptoms of concussion are often not visible. Participants felt that their injury was often “invisible” to others because the symptoms were not seen outwardly, as are symptoms of other sports-related injuries. “All concussions are different” is a subtheme relating to the range of concussion symptoms that are experienced at different levels and for different periods by individuals.

Abby stated that none of her female friends has had a concussion, “I’m the only one. Yep, it was only just me.” Her peer group did not have much experience with others who had suffered concussions, and Abby felt that no one really knew what she was going through. Gina reported that, “A lot of people . . . even a few of my friends . . . didn’t fully understand how bad a concussion can be.” Some of her friends “didn’t understand how debilitating it could be.” She reported that she “lost some friends” after her concussions because “they thought that I was making up a lot of the symptoms.” Her belief was that this was due to a lack of concussion education directed at high school and college athletes. Gina felt that other athletes with a history of SRC were the most likely to understand her symptoms and what she was experiencing during concussion recovery. Like some other participants who had persistent postconcussion symptoms, she was

frustrated by people who “had to ask a lot of questions and really struggled to kind of understand what I was going through.” Gina felt that those who also had persistent symptoms were the most likely to understand what she was going through.

Macy, who had persistent postconcussion symptoms for almost three years after her last concussion, stated, “People kind of just assumed that I was better.” She described being reluctant to share that she “still has headaches” with her peers because she believes “they’d be like, ‘Oh, like I thought you were over it’ or like, ‘Oh, that should have been healed a long time ago’.” Macy felt that it was too much for her to have to explain because “not a lot of people understand it at all.”

“An invisible injury.” The young women in this study understood that their SRC did not result in signs and symptoms that were easily recognized by other people. They knew that their teammates, classmates, teachers, and others in their day-to-day lives could not actually see their headache pain, light and sound sensitivity, exhaustion, and other symptoms in the same way that other sports injuries were visible. These participants were frustrated by this, and did not want to have to explain repeatedly their postconcussion symptoms.

Claire, who had several concussions and prolonged symptoms, felt that her friends and classmates did not understand that concussion symptoms could persist. She stated, “I’d be like, ‘Oh, man, I have a headache,’ I’d say it, like, all the time. And my friends would be like, ‘You always have a headache,’ like, you know, those kinds of things.” Claire explained that after having several concussions, she knew to avoid activities that were likely to cause headaches or other symptoms. She stated, “You can kind of feel your body and know, like . . . this does not feel right.” Although some of her friends understood that she was having long-term symptoms after her concussions, some

classmates and friends were less understanding. She explained that she “wouldn’t have understood had I been in their shoes, either.” She spoke of not wanting to “be complaining all the time or acting like I had something wrong.” Claire stated that brain injury is invisible. She explained what she believed others think about concussion:

They don’t really think my brain is like . . . bruised, injured, and . . . so you’re having to let that heal, just like you carry your arm in a cast for a couple of months or weeks or whatever like when you break it . . . you have to think of your brain as the same way like you’re having to let it sit there and rest and heal for a while. . . . It’s like because we can’t see it, we don’t think about it as much.

Although Claire was frustrated by the lack of concussion knowledge in those around her, she understood why others did not understand why her symptoms were persistent. She attributed this to other not being able to visualize her symptoms.

Hailey used the term “what a concussion looks like” when talking about how female cheerleaders are hit by body parts of other cheerleaders while doing a stunt. She described this as “it isn’t what people think a concussion looks like.” This participant was describing small repetitive injuries that athletes, such as cheerleaders, can experience without the injury being noticeable to anyone watching the stunt. Hailey felt that people, in general, do not understand that SRC can occur in female athletes, such as cheerleaders, by injury mechanisms that are not necessarily recognized as capable of causing concussive injuries.

Jenny, looking back at her SRC, spoke of what she would do if she found herself in the same situation. She stated, “I would not do what I did and . . . keep playing.” Jenny explained what she now understands about SRC, “The brain is a very sensitive thing and people definitely don’t realize that because you can’t see it and sometimes you

can't even feel it. It's like the brain is so much more sensitive." Based on her personal concussion experience, she now understands that SRC does not usually mean loss of consciousness or easily recognized signs and symptoms.

"All concussions are different." Many of the participants spoke about the similar presenting symptoms of their concussions. However, the persistent postconcussion symptoms varied among individuals. The young women who had longer term or persistent symptoms felt that people in their lives did not understand that no two concussions present the same way. Concussion symptoms vary in severity and in time to resolution from person to person.

Becca felt that people in her day-to-day life, particularly friends, teammates, classmates, and one teacher, did not understand that recovery from SRC varies according to the individual. She emphasized that athletes need to "really know the signs and know the variables of the signs and symptoms." Becca felt particularly frustrated when a teacher dismissed her symptoms and compared her to football players with concussions.

When Macy returned to her classes after her second concussion, she also found it "really hard because . . . lot of times everybody expects a concussion to last like a month at tops and they don't understand anything else." Her postconcussion symptoms have persisted for almost three years, longer than average after a concussion. She reported, "People kind of just assumed that I was better." Macy found that her peers thought she was "over it . . . or like . . . it should have been healed a long time ago." This made her reluctant to tell classmates and teammates about her symptoms. She described this as "overly harsh to go through, because not a lot of people understand it at all." She does not want to have to explain her symptoms to others.

Kelly remembered thinking, “Well, I didn’t wanna make a big deal of it, like, ‘Oh, I probably have a concussion,’ and then find out that I don’t.” She was not sure if she had a concussion and compared her injury to what she knew of concussions, which she explained as “Like in movies when people get concussions . . . it’s always like they get knocked out, and they’re like throwing up everywhere, and it’s from car crashes and stuff.” Kelly did not think her lacrosse injury was serious enough to be a concussion. She reported, “I just didn’t think mine was like that. We get our heads hit all the time . . . So, we just assume unless it’s really bad, nothing is wrong.” Although she received preseason concussion education and baseline screening, Kelly did not understand SRC. She was not alone, and reported that her teammates thought the same way. She stated, “Unless, like if, everyone sees it, and then like, one person’s . . . on the ground, like, people don’t think it’s serious.” Her concussion “wasn’t like that,” and she did not have “super bad headaches and migraines.” Kelly did not realize that she had a concussion because her SRC was different from what she thought concussions looked like.

Olivia struggled with “what to tell people.” She didn’t want to “make a big deal out of it . . . didn’t really like to talk about it at school because I didn’t like to have people feel bad for me for no reason.” In addition, she “didn’t want teachers to think that I was using my concussion as an excuse. I didn’t wanna be that person. . . . I want people to see me as me, not as the concussion girl.” Olivia had headaches and light and sound sensitivity for at least six months after her SRC. She missed several weeks of school and then slowly returned to her full schedule. Olivia felt that peers and teachers expected her to return to her preconcussion function earlier, and she did not want to call attention to herself or explain herself.

Summary. The participants spoke of wanting their peers and others in their day-to-day life to recognize that concussion symptoms were not always visible and varied from one person to the next. Many of the young women spoke of a general lack of knowledge of concussion causes and effects among their peers and other people in their daily lives. Some participants admitted that they also had limited understanding of concussions. A personal history of concussion was reported by a few participants as the factor that contributed most to their own understanding of symptoms and the recovery process. The young women in this study understood that concussions do not usually cause visible signs of trauma, but they expressed frustration at having to explain their symptoms repeatedly to others.

Summary

In this chapter, the pattern and themes that emerged from the late adolescent and young adult female participants' stories were presented. The themes emerged from the description and interpretation of the experiences of the young women in this study. The pattern and themes constitute the experience of SRC for this group of young women.

In the first theme, "Telling myself I'm fine," participants described their thoughts at the time of their injury and throughout their recovery. Many reported believing they were not seriously injured after their SRC. A part of this theme is the young women's knowledge that they were not okay, even when they were telling themselves or others that they were well enough to continue their activity.

All of the young women in this study spoke of the pain they experienced after SRC. This is the focus of the theme "So much pain." This theme was expressed throughout all interviews. The pain experienced by the participants after their SRC, particularly headache pain, affected the daily life of each of the young women after their

injury. Descriptions of sensitivity to light and sound, which triggered pain for many of the young women, were part of this theme.

Feeling isolated and disconnected from others was the focus of “I’m out of the loop.” The participants normally communicated with their peers through technology, such as texting and using social media sites on their cell phones. Pain due to sensitivity to light and sound significantly affected their ability to communicate with peers, causing participants to feel disconnected from their peers.

The theme “I didn’t feel like myself” encompasses a change in the way participants viewed themselves as they recovered from their concussions. The symptoms causing this sense of a “different self” varied among participants. For some, balance problems in the immediate postconcussion period caused them to feel like a different person. Some participants found that being unable to enjoy their normal activities caused mood changes. Problems with memory caused a sense of being different for a short period for some of the young women. A few participants described persistent cognitive issues that caused them to be concerned about their future academic careers.

In the theme “People don’t understand,” the young women spoke about their frustration with those in their daily lives. Participants spoke of a general lack of understanding of concussions among their friends and others around them. The lack of visible signs of injury, as well as the wide range of possible symptoms of SRC was part of this theme. Participants felt that others did not understand that each individual with SRC has a different experience.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to explore the experiences of late adolescent and young adult females with a history of one or more SRC. Fifteen late adolescent and young adult females who suffered SRC were interviewed about their experiences. Although all participants were college students at the time of their interview, 80% were high school students when they had their SRC. Using data analysis steps delineated by Smith et al. (2009), interpretive phenomenology was used to describe and interpret the lived experiences of late adolescent and young adult females with SRC.

Five themes were identified from the interviews with the young women: (a) “Telling myself I’m fine,” (b) “So much pain,” (c) “I didn’t feel like myself,” (d) “I’m out of the loop,” and (e) “People don’t understand.” Two themes were present in all interviews. “Telling myself I’m fine” was what participants told themselves when they were initially injured or later, during their recovery and “So much pain” referred to pain, primarily headache pain, experienced by all of the participants after their SRC.

The young women spoke of things they recognized in themselves as different from their normal selves in the theme “I didn’t feel like myself.” “I’m out of the loop” referred to the sense of social isolation felt by participants during their recovery from SRC. Finally, the last theme, “People don’t understand,” related to feelings the young women had about the responses of others to their concussion symptoms.

This study explored a population of late adolescent and young adult females who had suffered at least one SRC within three years of their interview. The limitations of the study, conclusions and implications of the findings, and recommendations for nursing education, practice, and research are discussed in this chapter.

Conclusions Drawn From the Themes

The themes that emerged from the data provided insights into the experiences of late adolescent and young adult females who suffered at least one SRC. Two of the specific aims of the study, how late adolescent and young adult females with SRC experienced changes in their school, work, athletic, and social lives; and how late adolescent and young adult females with SRC perceived their educational, athletic, and social future were uncovered during the analysis of the interview transcripts. Relationships with teammates, classmates, close friends, and family members were described by the young women. However, given that high school and college settings place adolescents and young adults in close proximity on a daily basis (Arnett, 2015), it is interesting that relationships with boyfriends or significant others did not emerge during the analysis of the interview transcripts.

The last specific aim, how nurses may help, did not emerge during the analysis of the data. This specific aim was part of the original study design and all of the young women were asked a follow-up question related to this during their interview (see Appendix B). However, few participants reported any interaction with a nurse or nurse practitioner in relation to their SRC. Although most participants were high school students at the time of their SRC, only those needing learning accommodations when they returned to school mentioned a school nurse involved in their care. Other participants spoke of their physician, athletic trainer, or physical therapist as the

healthcare provider they remember caring for them after their SRC. Participants' suggestions for how nurses and other healthcare providers can improve the care of females with SRC are discussed in the recommendations for practice and education sections of this chapter.

The theme "Telling myself I'm fine" addressed what the young women in this study told themselves, either at the time of their injury or during their recovery. Pain, particularly headache pain, and its effect on all aspects of the participants' lives, emerged in the theme "So much pain." The theme "I'm out of the loop" addressed the young women's sense of social isolation as they recovered from SRC. "I didn't feel like myself" related to the effect that postconcussion symptoms, particularly prolonged symptoms, had on the participants' sense of themselves and their future athletic, academic, or professional self. The theme "People don't understand" emerged from the participants' sense of frustration at the lack of knowledge of concussion symptoms and recovery among their peers and others in their daily lives.

"Telling Myself I'm Fine"

The young women in this study told themselves they were okay and able to continue their activities, both immediately after their SRC and in some cases, during or later in their recovery. Particularly with the first concussion, participants did not realize how serious their injury was. This finding persisted across most interviews, regardless of what others might have noticed about the participants' symptoms. Although participants spoke of receiving preseason concussion baseline testing and education, they were not sure if they themselves had a SRC. This finding is supported in the literature. Studies with high school and college athletes have shown that concussion knowledge is not significantly different between males and females, but knowledge alone does not predict

intention to report or actual reporting of concussion symptoms (Chrisman, Quitiquit, & Rivara, 2013; Kroshus, Baugh, Daneshvar, Nowinski, & Cantu, 2015; Register-Mihalik et al., 2013). One study found that high school athletes with access to an athletic trainer had more concussion knowledge, but this also did not result in athletes reporting suspected concussions more frequently (Wallace, Covassin, Nogle, Gould, & Kovan, 2017). A study of college athletes found greater intention to report concussion symptoms among females, but no significant differences in reporting of SRC symptoms between male and female athletes (Kroshus, Baugh, Stein, Austin, & Calzo, 2017). The young women in the current study did not initially recognize how serious their injury was and often did not report concussion symptoms, particularly after their first SRC.

The subtheme of “I knew I wasn’t okay” reflects thoughts participants reported having after their SRC. Some reported thinking they were not okay while trying to convince those around them that they were fine, particularly when continuing activities or returning to school. Consistent with literature on concussion knowledge and attitude toward reporting behaviors, participants in the current study believed that their persistent postconcussion headaches were not serious enough to keep them from practicing and competing with their teams. One young woman suffered a second SRC after she dismissed her headaches in order to play in the last game of the season. Researchers studying high school athletes found that less than half of recalled concussion events were reported to a supervising adult, with a belief that symptoms were not serious enough to report and not wanting to be removed from play as the major reasons for underreporting SRC (Register-Mihalik et al., 2013; Sullivan & Molcho, 2018).

Although studies with high school and college athletes have found no significant difference in knowledge of concussion symptoms in males versus females, greater

intention to report SRC symptoms among females in this age group has been reported (Kroshus et al., 2017; Miyashita, Diakogeogiou, & VanderVegt, 2016; Wallace, Covassin, & Beidler, 2017; Weber et al., 2019). Knowledge and attitude toward reporting concussion symptoms were not examined in the current study, yet the need for further investigation into the relationship of these variables with actual reporting of concussion symptoms is supported by the findings.

Those young women who suffered a previous concussion reported that their personal experience with SRC made them more aware of signs and symptoms. This finding of previous SRC experience causing young women to be more aware of concussion symptoms has not been previously reported in the literature. This finding does, however, support previously cited studies indicating that knowledge of concussion symptoms alone does not predict the reporting of concussion signs and symptoms.

“So Much Pain”

All of the young women in this study remembered suffering considerable pain, particularly postconcussion headache pain. Participants spoke of headache pain that could be eased, but not completely relieved after their SRC. Headache pain was the most persistent and disabling postconcussion symptoms reported in the current study. This finding is supported in the literature. Researchers have reported headache to be one of the most common and most persistent symptoms after concussion (CDC, 2015c; Lucas, 2011; McCrory et al., 2018).

Although most participants experienced gradual resolution of their postconcussion headaches over a period of several weeks, a few of the young women continued to suffer from chronic headaches up to three years after their last concussion. Persistent headaches after SRC, often described as migraines due to accompanying symptoms such as light

sensitivity and nausea, have been found to occur more commonly in females. Studies have found that persistent migraines, lasting more than six months after SRC, were more common in high school and college age females than in males (Mihalik et al., 2013; Seifert et al., 2017). In addition, a history of migraine headaches prior to a concussion, as well as female gender have been identified as risk factors for migraines after concussion in adults (Lucas, 2011; Lucas, Hoffman, Bell, & Dikman, 2014).

In the current study, participants spoke of chronic headaches affecting their ability to function normally. This finding is supported in the literature. In a study of male and female high school athletes, Mihalik et al. (2013) found postconcussion headaches were associated with greater symptom severity scores and a longer time to return to normal activity after SRC. In a qualitative study of male and female college athletes with SRC, Moreau, Langdon, and Buckley (2014) found that pain emerged as a theme because all of the participants reported headaches.

Cover et al. (2018) interviewed former college athletes with a history of SRC and found that chronic headache pain affected their daily life for a period of less than a year. This is in contrast to the current study, in which several participants reported migraine headaches persisting for several years after SRC. Participants in the current study spoke of migraine headaches interrupting their ability to attend school and complete course work on time, as well as to tolerate physical activity at their pre SRC level. Researchers studying male and female adults found that those with postconcussion symptoms lasting more than six months after injury had a decrease in HRQOL (Voormolen et al., 2018). HRQOL scores were significantly lower in females than in males.

The young women in this study remembered severe sensitivity to light after their SRC. Exposure to light caused eye pain and increased headache pain. Reported by most

participants in the current study, this finding reinforces existing literature. Sensitivity to light is a common symptom of concussion but resolves within one to two weeks for most adolescents and adults (CDC, 2015c; McCrory et al., 2018). For some participants in the current study, light sensitivity lasted for weeks or months, and persisted even longer for those with migraines. In order to minimize eye sensitivity and a resultant increase in headache pain, these young women had to limit their exposure to light, which limited their ability to participate in many of their normal activities. In a study of adolescents and adults with concussive injuries, light sensitivity persisting greater than three weeks was found to affect QOL negatively (Clark et al., 2017). Interestingly, females represented 60% of the adolescent and adult group with persistent light sensitivity. The findings of the current study support the need for additional research on potential treatment of light sensitivity in late adolescent and young adult females with SRC.

Sensitivity to sound was described by some of the participants after their SRC. For these participants, sensitivity to sound and the ear pain and headache caused by various sounds did not last more than a couple weeks. Sound sensitivity is less common than light sensitivity as a postconcussion symptom; however, females report this symptom more often than males (Frommer et al., 2011). This finding of sound sensitivity in some of the participants is represented in the literature. Although there is little published research on sound sensitivity after SRC, Landon et al. (2012) investigated the experiences of male and female adults after TBI and found that their participants discussed sound sensitivity in terms of how noise affected them and their social choices. Participants in both studies reported that many more sounds were perceived as noise after their injury, and these noises were associated with annoyance and/or discomfort. In both studies, participants avoided exposure to sound by changing their daily schedule and

social activity. In a study of collegiate athletes with a history of SRC, Blake, McVicar, Retino, Hall, and Ketcham (2019) found that the severity of persistent postconcussion symptoms, such as sound sensitivity, decreased QOL by reducing participants' ability to tolerate normal daily activities. In the current study, sensitivity to sound was not a major postconcussion symptom for most participants. However, for those who experienced this symptom, sound sensitivity greatly affected their ability to return to normal academic, social, and athletic activities.

“I’m Out of the Loop”

The young women in this study were unable to maintain their normal communication with peers through texting and use of social media sites in the initial recovery period. “I’m out of the loop” reflected a sense of being out of touch with friends, classmates, and teammates felt by participants in the early days or weeks after their SRC. The current generation of late adolescents and young adults are connected electronically more than any generation before them (Arnett, 2015). This dependence on technologic devices creates challenges for adolescents and young adults with SRC. Anxiety over missing rewarding digital connections, or fear of missing out, has been found to drive social media engagement in adolescents (Przybylski, Murayama, DeHann, & Gladwell, 2013). The young women in the current study reported that not being able to use their smartphones or any other digital screens contributed to stress, boredom, and feelings of being disconnected from others in their social circle. This finding is represented in the literature. In a study of college students, Vorderer, Kromer, and Schneider (2016) found that being continuously connected to others was more important to study participants than being able to browse the internet.

Although spending time in social interaction with peers is a normal behavior pattern in adolescence (Erikson, 1968; Spear, 2010), the young women living at home reported the extra time spent with family members as a positive memory surrounding their SRC. However, the young women who were living in college housing reported feelings of isolation. For some, the athletic trainer at their school was in contact with them daily and monitored their symptoms and progress. These findings were consistent with the literature. Qualitative studies conducted with female collegiate athletes with prolonged postconcussion symptoms found that athletes living away from their families reported feeling isolated and needed support from their families, as well as from athletic trainers, coaches, and teammates (Andre-Morin et al., 2017; Caron et al., 2017).

“I Didn’t Feel Like Myself”

The young women in this study became aware of both short- and long-term changes in themselves after their SRC. The symptoms that led to participants feeling different from their normal selves varied from person to person. Participants reported a change in their sense of balance that caused them to feel very different from their normal athletic self. In the immediate aftermath of a concussion, problems with balance are typical, and usually resolve with two to five days (McCroory et al., 2018). However, prolonged vestibular deficits have been found to be associated with extended recovery times and poorer performance on neurocognitive testing in children and adolescents (Corwin et al., 2015). In the current study, participants who reported that they required vestibular therapy also had a prolonged postconcussion recovery, and a delayed return to both physical and academic activities.

Several participants spoke of not feeling like themselves after their SRC due to memory problems, as well as problems reading and processing information. Like many

of the other symptoms reported, most felt that their cognitive function returned to normal in several weeks, but a few of the young women reported ongoing cognitive issues; these participants also reported suffering multiple concussions. Participants with persistent postconcussion cognitive problems described having to learn new study habits and restructure their daily college schedule to allow more reading and study time. This finding is consistent with a study of high school and college students, in which Wasserman, Bazarian, Mapstone, Block, and van Wijngaarden (2016) found that females and those with a history of previous concussion were more likely to report academic difficulties. In a study of male and female collegiate athletes with a history of SRC, Sicard, Moore, and Elleberg (2018) found that subtle alterations in cognitive function following SRC were greater in females than in their male counterparts and had the potential to persist into the chronic phase of injury. The findings of the current study support literature suggesting that cognitive function returns to normal within a couple weeks for most adolescent and young adult females, but may persist for those with a history of previous concussion.

In the present study, mood and personality changes were also reported by participants after SRC. Changes in their mood and personality made some of the young women feel like they were “not themselves” after their SRC. One participant reported being easily agitated for several months after her concussion; however, she did not notice this change until her family noted that she was not herself. Another participant continued to avoid crowds and loud environments, which she originally learned to avoid due to her sensitivity to noise. She no longer had noise sensitivity at the time of her interview, yet still preferred quiet environments. She viewed this as a change in her personality after her concussion. In addition to similar stories of emotional and behavioral responses

described by female college athletes after SRC, Andre-Morin et al. (2017) found symptoms of depression reported by participants with long-term symptoms. In the current study, only one participant spoke of depression after her SRC, and she credited her mother with noticing changes that led to effective treatment. This participant recalled feeling very isolated in her dorm for weeks. Her mother called daily and noticed that the young woman was not acting like herself. The participant reported that her mother then drove to campus to pick her up and take her to a healthcare provider.

In the current study, those participants with mood or personality changes after SRC were unaware of this until a change was noticed by another person. This finding of not being aware of these types of changes in oneself after SRC was not found in the literature. The findings of the current study illustrate the importance of a support system for adolescent and young adult females with SRC. For the study participants, the support of family members and close friends was critical in identifying postconcussion symptoms.

“People Don’t Understand”

The young women in this study felt that there was a lack of concussion knowledge among their friends, peers, teammates, and teachers. This lack of understanding, as reported by participants, applied to how concussions occur, what concussion symptoms are, how long recovery can take, and how concussions affect people differently. A recent study of five female collegiate athletes also found that participants reported a general lack of concussion knowledge among themselves and their friends, teammates, and family members (Andre-Morin et al., 2017). Among participants in this study, a general lack of knowledge of concussion signs, symptoms, and management was a consistent notion throughout the interviews.

The young women in the present study reported feeling frustrated when those around them could not see their symptoms like symptoms of other sports-related injuries of loss of consciousness or broken bones can be visualized by others. The subtheme of “An invisible injury” encompassed the daily struggles participants experienced when they felt the need to explain their symptoms when teammates or classmates questioned their inability to return to school or sports activity. The unseen nature of concussive injury and the related social struggles of those suffering SRC have been reported in the literature (Childers & Hux, 2017; McCrory et al., 2018). In a narrative inquiry of the experiences of a collegiate athlete with SRC, Caron et al. (2017) found that a concussed athlete might seem normal to those around them because the physical and psychological effects of SRC cannot always be seen. Moreau et al. (2014) reported a similar theme among female college athletes with SRC. The findings of the current study support the lack of basic concussion knowledge among high school and college athletes, as well as non-athlete students, teachers, and other adults. Participants knew their symptoms were related to a brain injury, but this did not translate into signs or symptoms that were easily visualized by the people around them.

“All concussions are different” is a subtheme related to the range of concussion symptoms experienced by different individuals. Many of the young women in this study reported daily struggles when they were past the acute recovery phase and were reentering their academic, social, and athletic lives. Those around them did not understand that recovery from SRC is very individual, and there is no specific amount of time to resolution of symptoms. The lack of understanding these participants felt from the people in their lives contributed to a sense of isolation.

Late adolescent and young adult women with SRC were frustrated by the lack of knowledge of concussion symptoms and treatment among the people involved in their daily lives, such as classmates and teammates. They felt that people around them did not recognize their concussive injuries because, unlike other sports injuries, there might not be any visible signs of brain injury. In addition, participants felt that their peers did not understand that no two concussions are the same. The findings of this study support the need for increased concussion education among adolescents, young adults, teachers, families, and healthcare providers.

Recommendations for Nursing Practice

The participants in the current study, late adolescent and young adult women with a history of SRC, expressed a desire for nurses and other healthcare providers to educate them about concussions. They felt that female athletes, and the people in their daily lives, need a better understanding of what the signs and symptoms of SRC look and feel like. The young women in this study reported that those who suffer SRC need better education on what to expect after the injury. They wished they had understood why they should not use their phone or try to keep up with their school assignments while they were having acute symptoms. Participants did not understand the rationale for why they could participate in some activities, but could not participate in other activities. The young women in this study recommended that nurses, nurse practitioners, and physicians explain that physical and cognitive activity can intensify symptoms after SRC. In addition, participants expressed a need for specific instructions on how to return to their activities gradually.

When dealing with clients who have suffered SRC, nurses and other healthcare providers must take into consideration the level of support available in the individual's

social, academic, and athletic environment. High school athletes may have more support in all of these areas simply because they are more likely to live with parents and have peers other than their teammates. The CDC (2018) recently released guidelines for diagnosis and management of concussion in pediatric patients up to the age of 18 years. These guidelines include education for healthcare providers, coaches, parents, and the athletes themselves. In addition, CDC (2015b) materials specifically geared toward school nurses, teachers, and school administrators are available. These materials include guidelines for supporting students in a graduated return to cognitive activities during recovery from a concussive injury.

Although guidelines exist for academic support for students recovering from concussions, wide variability exists in the development of policies for these students in school districts across the country. Researchers surveying a sample of 1,124 secondary school athletic trainers found that less than half of them were employed in a school that had a policy for return-to-learn after concussion (Kasamatsu, Cleary, Bennett, Howard, & Valovich McLeod, 2016). In a similar study of school nurses employed in high schools, 53% reported that their school had guidelines to assist students with academic accommodations when returning to school after a concussion (Olympia, Ritter, Brady, & Bramley, 2016). School nurses and athletic trainers are in unique positions to collaborate in order to educate other school professionals so that policies to support students recovering from concussions can be developed and implemented.

Academic support for collegiate athletes with concussion has been identified as a positive factor in the management of a student athlete with SRC (Childers & Hux, 2017). In limited data available on female collegiate athletes with SRC, female college athletes with SRC have reported that their recovery was facilitated by coaches and athletic

trainers (Andre-Morin et al., 2017). Collegiate athletes, although they may have access to an athletic trainer, are more likely than high school students to live away from parents and may not have a support group outside of their teammates. Female young adult athletes injured while participating in an activity that was not a collegiate sport, such as recreational team sports, are not likely to have access to a team athletic trainer. They are likely to seek treatment at a university student health center or at their primary care provider's office. These factors contribute to the support system available to late adolescent and young adult females with SRC and need to be considered when planning the individualized care of the client. Nurses and nurse practitioners in student health centers, urgent care clinics, emergency rooms, and primary care offices can initiate concussion evaluation and provide initial instruction on concussion management.

Nurses and other healthcare providers play an important role in increasing awareness of SRC signs and symptoms, both for their clients and for the community. Increasing knowledge of concussion, however, does not prevent SRC. There is little information in the literature on strategies to prevent concussion. In addition to concussion education, development of protective equipment, concussion legislation regarding youth sports, and rule changes in contact sports have been proposed as potential primary prevention methods (August & Torres, 2019; Register-Mihalik, Baugh, Kroshus, Kerr, & Valovich McLeod, 2017). Nurses and other healthcare providers have the greatest potential to prevent complications of concussion by continuing to educate their clients regarding concussion signs and symptoms, as well as stressing the importance of seeking care for management if SRC occurs.

Recommendations for Nursing Education

Nurses are unlikely to have knowledge of late adolescent and young adult females with SRC unless they are directly involved in the care of clients in this population. Concussion studies referenced in nursing texts are not based on the perspective of the young women with SRC, but on data collected largely from samples of male professional and collegiate athletes. Nursing education should focus on increased awareness of young women with SRC in undergraduate and graduate programs, as well as the differences between males and females with SRC. Nursing education could also extend to educational programs for the community and school peers. For example, high school or college students required to complete service-learning projects could provide concussion education to local recreational teams, which are less likely than high school or collegiate teams to have access to athletic trainers. CDC (2018) concussion educational materials are available to the public and can be tailored to parents and athletes, as well as coaches and healthcare professionals. Education for practicing nurses should also include programs for school nurses.

Recommendations for Nursing Research

This research was an initial step in generating new information about late adolescent and young adult females with SRC. Previous research on concussions in this population has primarily been focused on epidemiology. As few studies on the population of late adolescent and young adult females with SRC exist, similar studies would be helpful in increasing knowledge for nurses and other healthcare providers. A similar study with high school female athletes in contrast to collegiate female athletes would provide further insight that might influence care management for these groups. Prospective studies following larger samples of high school and college athletes are

needed in order to investigate the gender differences in variables related to reporting of concussion symptoms. Similar studies conducted with recreational teams and club teams are needed, as these athletes may also be high school or college students. Additional demographic information, such as participants' socioeconomic status and access to healthcare, may add to the knowledge of factors influencing outcomes of SRC.

Other areas of interest for future research include the exploration of diagnosis and treatment for persistent symptoms of SRC. Persistent postconcussion symptoms can affect many areas of daily life, including cognitive and physical functioning. Nurses and other healthcare professionals need to work interprofessionally to identify needs and explore possible interventions that might positively affect the quality of life for young women with persistent postconcussion symptoms. Future studies should follow those with persistent postconcussion symptoms longitudinally to identify the effect of interventions. Lastly, a future study on the experiences of late adolescent and young adult males with SRC could identify specific needs in this group and assist nurses and other healthcare professionals in caring for this population.

Limitations

Limitations for the study include sample size, sample selection, geographic location, and sample characteristics. The sample size was small but reached the maximum number of participants estimated for the phenomenological method used in this study. Saturation was reached before recruitment of participants was completed. The sample was selected from a group of late adolescent and young adult females with SRC in a small geographic location in the southeastern United States. Although all of the participants were college students at the time of their interview, many suffered their SRC while in high school. Those who were high school students at the time of their SRC

experienced a different environment than participants who were living away at college at the time of their injury. It is possible that studying female high school athletes and college athletes separately would produce more homogeneous groups for a study focusing on their lived experiences with SRC. In addition, the length of time that postconcussion symptoms persisted for participants varied from approximately two weeks to almost three years. Discrepancy in the persistence of postconcussion symptoms could have influenced the outcomes of this study. Long-term postconcussion symptoms have a greater effect on an individual's daily life. A similar study limited to those reporting long-term symptoms would likely have resulted in themes that did not emerge in analysis of transcripts in the current study.

Summary

The findings from this study illustrate the importance of listening to the stories of our clients. The young women's descriptions of their day-to-day experiences after suffering SRC provided an in-depth look into the phenomenon of concussion. The knowledge gained from this study should be applied to a larger body of knowledge that aims to guide nurses and other healthcare providers to better care for their clients with SRC. Further inquiry is needed related to young women with SRC in order to identify their needs and provide the best physical, cognitive, and psychosocial recovery.

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APPENDICES

Appendix A: Informed Consent

Title: The Experiences of Late Adolescent and Young Adult Females with Sports-Related Concussions

Principal Investigator: Regena Spratling, PhD

Student Principal Investigator: Ann Snyder, PhD student

I. Purpose:

You are invited to participate in a research study. The purpose of the study is to investigate the experiences of females who have had concussions related to sports activity. You are invited to participate because you are a female between the ages of 18 and 26 years, and you have had a sports-related concussion within the past three years. A total of 10 to 15 participants will be recruited for this study. Participation will require about 45 minutes of your time on one day. Repeat interviews will only be scheduled if needed to clarify information. Interviews will be scheduled between November 2017 and October 2018.

II. Procedures:

If you decide to participate, the student principal investigator will interview you. The interview is expected to last about 45 minutes. The interview will occur at a location and time that you and the investigator have agreed upon. The interview will be audiotaped. Follow-up interviews will be requested only if needed to clarify information from the original interview. If a follow-up interview is requested, it will be scheduled at a time and date agreed upon by you and the investigator, and will last about 15 to 20 minutes.

III. Risks:

In this study, you will not have any more risks than you would in a normal day of life.

IV. Benefits:

Participation in this study may not benefit you personally. Overall, we hope to gain information about the experiences of females who have had concussions related to sports activity.

V. Compensation:

You will receive a \$20 gift card for participating in this study.

VI. Voluntary Participation and Withdrawal:

Participation in research is voluntary. You do not have to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip questions or stop participating at any time. Whatever you decide, you will not lose any benefits to which you are otherwise entitled.

VI. Confidentiality:

We will keep your records private to the extent allowed by law. Identifying information, names, and places will be removed when the interview is transcribed. Dr. Spratling and Ms. Snyder will have access to identifying information. Information may be shared with those who make sure the study is done correctly (GSU Institutional Review Board, the Office for Human Research Protection). We will use a code number rather than your name on study records. The key for the code will be stored separately from data to protect your privacy. The information you provide will be stored in files on a password and firewall protected computer belonging to Ms. Snyder. The digital recording of your interview will be stored in a locked cabinet. The key to the cabinet will be stored separately from the data to protect your privacy. A professional transcriptionist will transcribe your interview. Ms. Snyder will destroy the digital recording of

your interview after transcription is completed. Your name and other facts that might point to you will not appear when we present this study to colleagues or publish its results. The findings will be presented to Ms. Snyder's dissertation faculty committee at GSU. The results of this study may be submitted for journal publication. You will not be identified personally in any reports of this study's findings.

VII. Contact Persons:

Contact Ann Snyder at phone number 678-525-6199 or asnyder1@student.gsu.edu or Dr. Spratling at phone number 404-413-1159 or rspratling@gsu.edu if you have questions, concerns, or complaints about this study. You can also call if you think you have been harmed by the study. Call Susan Vogtner in the Georgia State University Office of Research Integrity at 404-413-3513 or svogtner1@gsu.edu if you want to talk to someone who is not part of the study team. You can talk about questions, concerns, offer input, obtain information, or suggestions about the study. You can also call Susan Vogtner if you have questions or concerns about your rights in this study.

VIII. Copy of Consent Form to Subject:

We will give you a copy of this consent form to keep.

If you are willing to volunteer for this research and be audio recorded, please sign below.

Participant

Date

Principal Investigator or Researcher Obtaining Consent

Date

Appendix B: Interview Guide

1. Tell me about what happened when you had a concussion while playing a sport. What do you remember about how you felt (your symptoms) when you had a concussion? How did you know you had a concussion? What do you remember thinking about when you had the concussion?
2. Tell me what it has been like for you since you had a concussion. What has it been like for you at school or work? What has it been like in sports? What has it been like with your friends? With your family?
3. Do you know any other young women around your age who have had concussions due to playing sports? What do you know about them?
4. If you could give advice to other young women with concussions, what would you tell them?
5. What advice can you give me that might help me to take care of females with concussions?
6. What do you think nurses and doctors need to know in order to be most helpful to females your age who have concussions related to sports activity? Is there anything you can think of that would not be helpful?
7. Is there anything that you can tell me that I haven't asked about that might help me to understand you and what life has been like for you since you had a concussion?

Appendix C: Demographic Information

Age _____ ID # _____

Height _____ Weight _____

Race/Ethnicity (check any that apply):

American Indian or Alaska Native _____

Asian _____

Black or African American _____

Hispanic or Latino _____

Native Hawaiian or Other Pacific Islander _____

White _____

Other _____

Sport being played when concussion occurred: _____

Number of years playing this sport: _____

Other sports played? If so, please list them _____

Type of team (for sport being played when concussion occurred):

College Team _____

Varsity _____ Junior Varsity _____ Club _____ Other _____

High School Team _____

Varsity _____ Junior Varsity _____ Club _____ Other _____

Recreational, Club or travel team _____

Other _____

Number of practices per week: _____

Number of games per week: _____

Date concussion occurred: _____

Number/dates of previous concussions (if any): _____

Appendix D: Recruitment Flyer

Volunteers Needed for Female Concussion Research Volunteers Needed



Who: Females (18 to 26 years old) who have had a concussion related to sports (recreational or organized team sports) within the past 3 years are eligible to be in this study.

Purpose: To hear your story about what having a concussion was like for you, in your own words.

You will receive compensation (\$20 gift card) for your time if you agree to participate in a private, confidential interview about your experiences with concussion. The interview will take no more than 45 minutes of your time and can be done at any location you & Ms. Snyder agree upon.

For more information about this research, call Ann Snyder, Georgia State University PhD Nursing student @ 678-525-6199 or email @ asnyder1@student.gsu.edu