DO SIBLINGS MATTER IN PHYSICAL ACTIVITY? A SYSTEMATIC REVIEW AND EXAMINATION OF PERCEIVED COMPETENCE IN YOUTH SPORT

By

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A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements for the degree of

Kinesiology – Doctor of Philosophy

2015

PUBLIC ABSTRACT

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Family members often shape opinions about physical activity, act as role models, and engage in physical activity with youth. Families are important because they usually provide the first physical activity opportunities to children. Therefore, the family has an important role in developing physical activity beliefs and behaviors. Though parents are very important to physical activity experiences, siblings might also be important. Given their extensive interactions, the different ways they express their relationship, and the relationship length, siblings have many opportunities to compare themselves with one another and influence physical activity experiences. This dissertation examined sibling relationships in physical activity in multiple ways. First, the published research on siblings and physical activity was summarized (Study 1). Next, sport ability beliefs and how siblings compare themselves with one another was investigated (Study 2). Finally, the ways that sibling relationships relate to beliefs of sport ability at different ages was examined (Study 3).

Study 1 showed that siblings are associated with multiple outcomes in physical activity, including physical activity levels, sibling comparisons, and positive and negative experiences. The literature summary also showed that our understanding of sibling dynamics in sport settings is limited. Conducting the summary enabled the creation not only of an outline of previous studies on siblings, but also the identification of important future research needs.

Study 2 focused on sibling comparisons, relationship qualities (i.e., warmth, conflict, and power) among siblings, and perceptions of sport ability in children. We believed that sibling

comparisons would inform perceptions of ability, but this would depend on relationship qualities. Our hypothesis was supported, but only for younger siblings. Younger siblings that compare themselves with their older sibling more frequently and have a warmer relationship with their sibling had higher perceptions of ability in sport.

Study 3 extended Study 2 by studying the role of age of a younger sibling. We hypothesized two possible explanations for the previous finding. One, being fairly young (i.e., average age of younger sibling in Study 2 was 8.5 years old) could have limited the number of interactions with people outside the family, compared to an individual in early adolescence. Thus, sibling comparisons might be important simply because youth were not interacting meaningfully with others (e.g., peers). Alternatively, the finding may be unique to being a younger sibling, regardless of age. The findings of Study 3 suggested that age itself was not an important factor in explaining the relation of sibling comparisons with perceptions of ability.

As a supplemental element to Study 3, the different ways sibling relationships are expressed were examined. Four relationship profiles were found that were tied to different sport ability perceptions, use of older siblings as role models, and degrees of participation in shared activities. For example, *Hostile* relationships had the lowest ratings on these outcomes, whereas *Harmonious* relationships had the highest ratings. These findings suggest that the expression of sibling relationships is an important consideration in physical activity research.

Altogether, these studies enrich our understanding of the contributions that sibling relationships make to physical activity experiences of youth and highlight the importance of continued research on this topic.

ABSTRACT

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Sibling relationships in the physical domain potentially tie to the quality of youth physical activity experiences, yet research in this area is scant and lacks structure. The proximity and length of sibling relationships afford multiple opportunities for social comparison and related self-evaluations (Gamble et al., 2010; Harter, 1999). Importantly, these comparisons are affectively charged; characterized by warmth, conflict, and power differences (Furman & Buhrmester, 1985). The purpose of this dissertation was to explore the potential contributions that siblings make to sport experience of young athletes, specifically perceptions of sport competence. Study 1 consisted of a systematic review of siblings in physical activity contexts to gauge current knowledge on this topic and provide a guide for future empirical endeavors. Collectively, the studies demonstrate that siblings are associated with multiple outcomes in the physical domain including physical activity levels, sport socialization, sibling-based comparisons, and engagement in sex-typed activities. Overall, the findings provide an outline of sibling-based subject areas and identify topics needing further attention to advance the study of sibling relationships in the physical domain.

Study 2 was a cross-sectional survey study that aimed to enrich our understanding of sibling interactions in sport, with emphasis on the association between sibling sport-referenced comparisons, relationship qualities, and perceived sport competence. Our primary hypothesis of a moderated relationship of sibling-based comparisons with perceived sport competence was generally not supported; however, a three-way interaction between birth position (younger or

older sibling), tendency to compare, and sibling warmth significantly predicted perceptions of sport competence. Younger siblings with a greater tendency to make sibling comparisons and higher warmth perceptions were related to higher sport competence perceptions. This suggests that sibling-based comparisons and relational warmth may be salient for younger siblings, whereas older siblings utilize alternative sources of competence information.

Lastly, Study 3 was a cross-sectional survey study that provided a focused examination of age, sibling-based sport comparisons, relationship quality, and perceptions of sport competence of younger siblings in late childhood and early adolescence. The findings further supported the importance of sibling warmth and sibling-based comparisons to competence beliefs. The findings also suggested that the relative contributions that sibling warmth and comparisons make to perceptions of competence were not age-bound. A supplemental examination of sibling relationship profiles revealed distinguishable groups of participants based on their pattern of scores on sibling warmth, sibling conflict, and comparison tendency. These profiles were associated with significantly different outcomes on perceived sport competence, sibling role modeling, and shared activities. In sum, this dissertation highlights the contributions that sibling relationships make to the physical activity experiences of youth and showcases the importance of continued investigation of siblings in the physical domain. This area represents a fruitful direction for researchers to pursue and further our understanding of social processes in physical activity contexts.

To my wife, Briley. Your unconditional love, patience, and support are why this project was possible.

ACKNOWLEDGEMENTS

There are many people I would like to thank for their encouragement and contributions to this dissertation project. I would like to thank the families and youth sport administrators who shared my passion for understanding sibling relationships in physical activity. The numerous stories and discussions were invaluable experiences that kept me motivated throughout the project.

I would like to express my gratitude to my committee members, Dr. Dan Gould, Dr. Deborah Kashy, Dr. Alan Smith, and Dr. Shawn Whiteman, for their guidance and instrumental contributions over the course of my graduate career. I would especially like to thank my advisor, Dr. Alan Smith, for continually pushing me to reach my potential, which I often lost sight of, and ensuring my work reached the highest level of academic contribution. His efforts and expectations shaped the lens that I view academia, and informed the professional I have become.

I would also like to thank the many past and present graduate students that I have been lucky enough to call my peers. Your continued support, encouragement, and mentorship go beyond words. I consider myself extremely luck to have had a graduate experience where I have crossed paths with so many passionate scholars.

Lastly, I would like to thank my family. My parents, Dave and Kim, your love and support throughout my graduate years have allowed me to pursue my passion. To my brothers, Drew, Devon, Bennett, and Spencer, you were the literal sparks that ignited my graduate work. Thank you for your support, arguments, companionship, hostility, and competition. A true demonstration of sibling relationships.

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CHAPTER 1: INTRODUCTION

Extensive scholarly work suggests that family relationships are multifaceted and dynamic (Maccoby & Martin, 1983). As researchers from a range of fields have begun contributing to the study of family relationships, there has been a transition toward interdisciplinary investigations of the family. Informed by disciplines such as psychology, child development, and sociology, sport and physical activity researchers have pursued research questions that contribute to our understanding of the family within the physical domain (Weiss, 2008). These questions are of direct salience to health and well-being, making the study of family dynamics and sport and physical activity experiences important.

Examining the intersection of the family and physical activity has further demonstrated that the physical domain provides a useful laboratory for the study of positive and negative developmental outcomes (Brustad, Babkes, & Smith, 2001; Fraser-Thomas, Côté, & Deakin, 2005; Weiss & Raedeke, 2004). This noted, prior work has primarily focused on relationships with one's parents, coaches, or peers in physical activity settings. These investigations have provided a wealth of information regarding social influence within and outside the physical domain across childhood and adolescence. However, sibling relationships in sport and physical activity have not received a similar level of attention. Siblings possess shared life experiences and engage in ways that meaningfully influence development (Whiteman, McHale, Crouter, 2007), making the study of their salience in physical activity settings potentially valuable.

Since the 1980s numerous studies have been conducted to understand the sibling relationship outside of sport and physical activity. Child development researchers have recently been motivated to understand the unique contributions that siblings make to one another's social, emotional, and cognitive development (Howe, Ross, & Recchia, 2010). For example, child and

family researchers have identified siblings as companions, teachers, and confidants across the life-course. Howe and colleagues (2010) suggest that through sibling interactions youth practice sharing intimate thoughts, learning how to understand another individual's feelings, and how to successfully resolve conflicts. Siblings perceiving a positive relationship are more likely to interact with each other and to have greater opportunities to observe and learn from one another than siblings who do not (Brody, 1998; Stocker, 1994). Moreover, siblings that act as companions or confidants are likely to identify with one another and serve as a source of support in their personal lives (Cicirelli, 1995; Rowe & Gulley, 1992). Accordingly, researchers expect that the influence of a sibling's behavior on adaptive developmental outcomes will be greater when siblings report greater closeness than when reporting conflict and negativity (Yeh & Lempers, 2004). In light of these findings, sibling relationship qualities, like closeness, warrant examination in the physical domain.

Relationship qualities reflect a defining feature of sibling relationships, interdependence. Interdependence between individuals is exhibited in their interactions, which ultimately influence their beliefs, knowledge, attitudes and feelings, and behaviors toward each other (Cicirelli, 1995). However, siblings are not simply individuals engaging in co-acting behaviors. Additional defining characteristics of the sibling relationship include the possession of some degree of common biological origin, a legally defined relationship, and/or some degree of commitment to the norms of sibling roles in a particular family or culture. Sibling relationships are comprised of physical, verbal, and nonverbal interactions between individuals who share knowledge, perceptions, beliefs, and feelings about each other from the time that one sibling becomes aware of the other (Cicirelli, 1995; Dunn, 1988; Sanders & Campling, 2004). Thus, a

sibling relationship can be defined as the total of interactions between children of the same family.

Sibling relationships have attributes in common with many interpersonal relationships but also have unique characteristics. For example, the sibling relationship is often the longest relationship an individual will have across the life course. This duration in itself can be an important factor in determining sibling influence on social, emotional, and cognitive development, which is conceived as an ongoing process (Yeh & Lempers, 2004). This is a notable feature of sibling relationships in light of the prevailing assumption by sport and physical activity researchers that parents are the primary providers of support, both tangible and emotional, and the documented increase in salience of peers in later childhood and early adolescence (Bloom, 1985, Duncan, Duncan, & Stryker, 2005; Savin-Williams & Berndt, 1990). There has been considerably less attention paid to the importance of siblings despite the longevity of their relationships and their potential to shape sport and physical activity experiences.

Also unique to the sibling relationship is that it is ascribed rather than earned or chosen (Cicirelli, 1995). The status of being a brother or sister is one that is obtained by birth or by legal action (i.e., step-siblings, adoptive siblings). Although there can be periods where an active sibling relationship is nonexistent, sibling status cannot be revoked. Sibling relationships therefore experience the benefits associated with a lifelong companion, but also endure conflict, hostility, and hardships. Alternatively, relationships with others (e.g., peers, romantic partners, co-workers) are volitional and can be ended in the face of challenges. This makes the sibling relationship resilient in ways that may not be possible in relationships with others.

During childhood and adolescence, the sibling relationship is one that typically involves daily contact, enabling siblings to profoundly impact development (Howe & Recchia, 2014). According to proponents of attachment theory, a manifestation of this impact is the creation of internal working models of how to interact with others (Bowlby, 1988; Oliva & Arranz, 2005). For example, Updegraff and colleagues (2002) suggest that warm and supportive sibling interactions promote the skills and qualities needed for successful peer relationships. Relatedly, internal working models offer a frame for norm-based behaviors, which help youth learn the importance of context in determining appropriate behaviors (Bowlby, 1973; Sroufe & Fleeson, 1988). This highlights the potential value of examining sibling relationships, specifically within physical activity contexts (e.g., play behaviors, organized sport), when seeking to understand the behaviors and experiences of youth athletes.

A final unique feature of sibling relationships is the extent of their shared and non-shared experiences. Sibling shared experiences are substantial and thought to contribute to sibling similarity, yet non-shared experiences also exist and are believed to contribute to sibling differences (Whiteman, McHale, & Crouter, 2007). Current perspectives propose that a reciprocal interaction of siblings' shared and non-shared experiences and environments can further contribute to individuality (Whiteman, Becerra, & Killoren, 2009). For example, when two siblings participate in sport they will often be exposed to different social environments given they participate on different teams. These environments will include various interactions with different social agents (e.g., coaches, peers). These non-shared interactions will potentially influence their interactions with one another. Additionally, the shared sibling interactions in the household will inform their behaviors outside of the family.

Researchers have used various theoretical perspectives of family and child development when studying the unique developmental importance of siblings (e.g., family systems theory; bioecological perspective; attachment theory; for a review see White & Klein, 2008). Two perspectives inform the present work on sibling relationships in the physical domain: family systems theory and the life course perspective. Bowen's (1978) family systems theory posits that family members are interdependent, such that the behavior of one member affects all members of the family. Therefore, any individual member of the family is embedded within the larger family system and is best understood as a component of that system (Cox, 2010; Kreppner & Lerner, 1989; Minuchin, 1985). Proponents of family systems theory suggest that families are organized into interdependent, reciprocally influential subsystems (e.g., sibling dyads, parent-child dyads, parent dyad; McHale, Updegraff, & Whiteman, 2012). Examining these subsystems and the interactions of their members can enhance our understanding of development (Minuchin, 1988). Moreover, this theory conceives the family unit as an open system with permeable boundaries, meaning that its members can both influence and be influenced by the environment. Accordingly, family members should be studied with consideration of: (a) their interactions with other family members (e.g., siblings) and (b) the environment in which interactions takes place (e.g., sport and physical activity).

The life course perspective (Bengtson & Allen, 1993) is a paradigm used to understand the importance of time, context, and process on human development (Elder, 1994). The framework is used to observe how relationships and behaviors are cultivated while accounting for developmental changes that occur as individuals age and interact with their larger social environment (George, 2003). From this perspective, the family is viewed as a micro-social group comprised of linked individuals that are instrumental in developing observed and future

behaviors (Elder, Johnson, & Cronsone, 2003). Therefore, individuals of the family are assumed to be interdependent and the decisions that one member makes has implications for other family members (Elder, 1994). As the family is exposed to different social environments (e.g., the physical domain, academics) both family norms and larger social norms will additionally influence behavior. While interactions with the social environment help shape the family as a whole, it also allows individual members of the family to exercise some degree of agency. As such, members of the family should be studied in reference to their interdependence and how specific environments, such as the physical domain, put emphasis on behaviors that have the potential to change family member interactions (e.g., social comparisons, competition).

In the physical domain, Weiss and Bredemeier (1983) have suggested that researchers use developmental perspectives that employ theories, designs, and methodologies that capture age-related differences in cognition, perceptions, and behaviors in physical activity settings. In reviewing the developmental sport psychology literature of the time, Weiss and Bredemeier suggested three ways researchers could pursue an understanding of lifespan development in the physical domain: a) select ages of participants based on specific developmental criteria (physical, cognitive, social), b) compare age groups at key periods of development, and c) follow individuals longitudinally. Following these suggestions, numerous researchers have investigated theoretically derived questions focusing on age-related differences in variables of interest in the physical domain (e.g., Fry & Duda, 1997; Horn & Weiss, 1991; McCarthy, Jones, Clark-Carter, 2008; Smith, 1999). Theories employed by physical activity researchers have included competence motivation theory (Harter, 1978), achievement goal theory (Nicholls, 1984), and Bandura's (1986) social cognitive theory. These theories possess developmental components as well as articulate a role for social agents in fostering adaptive and maladaptive outcomes.

Sport and physical activity researchers have often cited the family as an important reference point for understanding the development of a child's physical activity behavior, attitudes, and experiences (Brustad, 2010). Prior research adopting developmental perspectives in the physical domain have explored topics such as parental sport socialization (Dorsch, Smith, & McDonough, 2015), children's ability to distinguish ability and effort in sport (Whitehead & Smith, 1996), and sources of sport competence information (Horn, Glenn, & Wentzel; 1993; Horn & Weiss, 1991). The majority of research studies exploring the role of the family in physical activity contexts have centered on parental influence. Research focused on the developmental significance of siblings in the physical domain has been minimal, yet conceptually appears to hold promise and therefore constitutes an important area for growth.

Developmental and clinical literatures reflect this promise and suggest that siblings play a substantial role in the development of children's personality and emotions (Dunn, 1988; Horn & Horn, 2007; Sanders, 2004). Broader work concerning sibling relationships and their influence outside of sport and physical activity suggests that siblings are developmentally salient, above and beyond the contributions of other social agents, such as parents and peers (Azmitia & Hesser, 1993; Bell, Avery, Jenkins, Field, & Schoenrock, 1985; Brook, Whiteman, Gordon, and Brook, 1990; Fagan & Najman, 2005; Windle, 2000). Additionally, sibling interactions are thought to be unique opportunities for social-cognitive development where competencies are represented as precursors of peer relationships (Dunn, 2007; Howe, Rinaldi, Jennings, & Petrakos, 2002; McHale, Updegraff, & Whiteman, 2012). Given that siblings can influence each other's development, they additionally are expected to influence the nature and course of an individuals' involvement in and emotional reactions to physical activity (Horn & Horn, 2007). Yet, relatively limited research has examined sibling relationships in the physical domain. In

seeking guidance for the most productive next empirical steps in this area, the extant research base spanning multiple disciplines (e.g., child development, family studies, and developmental psychology) should be surveyed and evaluated to identify gaps and areas warranting further investigation. From this appraisal, theoretically- and developmentally-informed studies can be designed and conducted. The three studies presented within this dissertation take these initial steps toward developing this research area.

Study 1 was designed to provide a comprehensive summary of extant literature regarding siblings in physical activity settings. One method of creating a concise summary of literature is to conduct a systematic review. A systematic review is the application of strategies that limit biased interpretation of the literature by applying a systematic collection, appraisal, and synthesis of all relevant studies on a specific topic (Cook, Sackett, & Spitzer, 1995). Conducting a systematic review of the literature allowed for the identification of knowledge gaps and the development of research questions that would advance our understanding of sibling dynamics in physical activity settings. In conducting the review, one area lacking meaningful attention concerned how siblings contribute to perceived competence in sport and physical activity. Perceived competence was specifically identified because of its central role in motivation-based theories and its links to well-being, both within and outside of physical activity (Biddle, 1997; Elliot & Dweck, 2005; Wang & Biddle, 2001).

Study 2 was developed to investigate possible sibling contributions to sport competence beliefs. Given the importance of social agents to the development of competence beliefs through processes such as performance comparisons and the provision of evaluative feedback, the lens of social comparisons was utilized to better understand the potential salience of siblings to perceived competence (Weiss, Ebbeck, & Horn, 1997). Additionally, because sibling

relationship qualities may alter the degree that sibling-based comparisons inform perceptions of sport competence, sibling warmth, conflict, and status/power were examined (Furman & Buhrmester, 1985; Buhrmester & Furman, 1990). Contributing to the rigor of this study, a dyadic design was used to explore the potential interdependence of sibling relationships in the physical domain.

Study 3 extended the work of Study 2 by following recommendations to adopt developmentally informed frameworks to examine the sport experience of youth. As children enter adolescence, the nature of sibling relationships evolve in tandem with biological, cognitive, and social changes (Buhrmester, 1992; Steinberg & Morris, 2001). Previous research has shown that compared to younger children, youth entering adolescence have less interaction, companionship, intimacy, and affection with their siblings (Buhrmester & Furman, 1990). However, these differences have not been explored in physical activity settings and do not necessarily indicate that sibling relationships become less important. Therefore, Study 3 was designed to explore the associations among age of a younger sibling, sibling-based sport comparisons, sibling relationship qualities, and perceived sport competence, specifically in late childhood and early adolescence (i.e., 8-13 years old).

Altogether, this programmatic line of studies was informed by both family theory (Bengtson & Allen, 1993; Bowen, 1978) and the recommendations of physical activity researchers to adopt developmentally sensitive perspectives to understand thoughts, perceptions, and experiences in physical activity contexts (Weiss & Bredemeier, 1983; Weiss & Raedeke, 2004). This offers a foundation for future efforts that systematically address the role of siblings in shaping psychosocial outcomes in physical activity settings. Accordingly, the present dissertation contributes to knowledge in both family studies and sport and exercise psychology.

CHAPTER 2: STUDY ONE

A Systematic Review of Siblings and Physical Activity Experiences

How significant others contribute to and detract from the quality of physical activity experiences has received persistent attention from sport and physical activity researchers (e.g., Amorose & Horn, 2000; Brustad, 1996; Côté, 1999; Horn, 1985; Maccoby & Martins, 1983; Smith, 2003; Ullrich-French & Smith, 2006). Significant others include parents, peers, coaches, and others who offer opinions about physical activity, model activity behaviors, or directly engage in physical activity with an individual. Those in the family unit are regarded as particularly important to enacting physical activity behaviors (Brustad, 2010; see Horn & Horn, 2007, Sallis, Prochaska, & Taylor, 2000). In part because the family is routinely the earliest setting in which physical activity experiences occur. This positions the family in a central role for developing physical activity beliefs and behaviors, making it of particular interest to physical activity researchers.

To date, research has predominately addressed the role of parents in shaping youth physical activity behaviors and beliefs. Empirical work has focused on topics such as parental support, fostering different motivational climates, and role modeling. This work has informed the selection and development of models and frameworks to better understand parental contributions to physical activity experiences (e.g., Expectancy-Value Model, Fredricks & Eccles, 2004, Horn & Horn, 2007; Developmental Model of Sport Participation, Côtè, 1999). Though parental contributions to physical activity experiences of children cannot be overstated, the effect of the remaining family members has yet to garner similar attention. Researchers have often solely focused on the importance of parents, or subsumed individual family member effects as a collective *family-effect* on physical activity behaviors and beliefs. This results in the

marginalization of siblings who have the potential to influence one another's physical activity experiences across the lifespan and warrant examination in their own right. In the interest of stimulating empirical attention the present research is designed to explore siblings in physical activity settings as siblings are important, yet understudied, significant others relative to physical activity experiences.

Because sibling relationships are often the longest lasting of one's life course, they have abundant opportunities to influence an individual's development (Whiteman, McHale, & Crouter, 2007). Physical activity contexts, such as sport, provide an observable environment for siblings to develop a range of social skills, friendships, and engage in social-comparison processes. Nonetheless, there has been limited investigation of how siblings may influence physical activity experiences (Brustad, 2010; Davis & Meyer, 2008; Fraser-Thomas, Strachan, & Jeffery-Tosoni, 2013; Horn & Horn, 2007). Recognizing that sibling interactions are reciprocal and dynamic, their interactions in the physical domain provide a social context that merits further examination by researchers (Horn & Horn, 2007; Weiss & Raedeke, 2004).

As such, drawing connections to studies of siblings in achievement settings outside of sport and physical activity will further inform our understanding of sibling dynamics. Siblings have been identified as companions, teachers, and confidants across the life course (Dunn, 2007; Noller, 2005). This line of research suggests that siblings influence the development of personality and emotions through processes such as socialization, helping behaviors, cooperative tasks and activities, and relatively aggressive or negative behaviors (Berk, 2003; Cicirelli, 1995, p. 6). Consequently, because sibling interactions are so frequent and emotionally intense they are likely to serve as an important context in which siblings develop. Given that siblings play an influential role in the development of the individual, it would seem that siblings would also

affect the nature of the individuals' participation in and affective reactions to physical activity (Horn & Horn, 2007). Accordingly, researchers have begun to direct more attention to sibling investigations in the physical domain.

This increased attention has resulted in diverse efforts to understand the significance of siblings in physical activity settings. Empirical efforts have predominately utilized descriptive designs, focused on siblings in combination with other social agents (e.g., parents and peers), and have examined niche topics. Examples of this work include the experience of siblings as competitors (Davis & Meyer, 2008), familial correlates of physical activity levels (e.g., Sallis et al., 2000), and the links between dyad sex-compositions to socialization and continued involvement in sport or physical activity (e.g., Ziviani, Macdonald, Ward, Jenkins, & Rodgers, 2006). The examination of such diverse topics, without sustained lines of work, risks creating disconnected pockets of knowledge regarding siblings in physical activity settings. Taking the initial steps to developing sibling research in the physical domain, our aim was to review prior work on siblings in physical activity settings and identifying knowledge gaps that require attention.

Reviewing and synthesizing the published work on siblings in physical activity settings was guided by two motives. First, the extant literature examining siblings in physical activity settings is limited, and span a wide array of topics. A systematic review allows for a summary of diverse research questions, methods, and findings regarding siblings in the physical domain (Eysenck, 1995; Murlow, Langhorne, & Grimshaw, 1997). For example, due to the length and strong affective nature of sibling interactions there are many potential sibling-based psychosocial outcomes. Specifically, sibling interactions can result in jealousy (Blazo, Czech, Carson, & Dees, 2014), deidentification (Whiteman, McHale, & Crouter, 2007), and competition (Buhrmester &

Furman, 1990) as well as be a source of support (Brody, 2004), pride (Blazo et al., 2014), role-modeling (Whiteman et al., 2007), and companionship (Cole & Kerns, 2001). With a breadth of sibling-based outcomes it is important for parents, coaches, researchers, and practitioners working with athletes to have a greater understanding of sibling contributions to shaping physical activity experiences. Additionally, reviewing the extant literature regarding siblings in physical activity contexts will provide a framework to understand scientific findings across diverse samples and settings.

Second, for research concerning siblings and physical activity settings to flourish, it is important to identify knowledge gaps and highlight paths for future empirical endeavors. Although there is a wealth of knowledge from child development areas regarding the developmental importance of siblings, only a small amount of this knowledge has been applied to the physical domain. Identifying and integrating the research found across disciplines provides a foundation to develop viable lines of research examining the contribution of siblings in physical activity settings. As such, there are three primary purposes to the present review: a) to examine the evidence of sibling influence in sport and physical activity, b) to emphasize sibling-focused topics needing further elaboration, and c) to identify gaps and provide suggestions for future investigations in the physical domain regarding siblings.

Method

Article Retrieval

The comprehensive inclusion of relevant studies was accomplished by utilizing the following electronic databases in May of 2014 to identify original published research: CINAHL, The Cochrane Library, PubMed, PsychINFO (including PsychARTICLE), SportDiscus, and Web of Science. These electronic databases were utilized again in April of 2015 to identify

recent publications. A date restriction was not set when retrieving potential articles because a published extant review could not be identified. Databases were searched using combinations of the following keywords: sibling, brother, sister, sport, exercise, and physical activity. Filtering of potential articles was conducted in three stages outlined by Lloyd Jones (2004) and Meade and Richardson (1997). Studies were first reviewed by title, then abstract, and finally by full text. At each step, papers were excluded if they did not meet the inclusion criteria (Lloyd Jones, 2004).

Inclusion Criteria

For inclusion, studies were required to: (1) examine siblings in sport and physical activity contexts, (2) be published as full papers in peer-reviewed journals, and (3) be published in English. Unpublished articles, dissertations, and conference proceedings were excluded from the present review (Knipschild, 1995). Of note, studies that did not primarily focus on sibling-related outcomes were included in the present review. For example, studies that investigated familial correlates of physical activity (e.g., family size or number of siblings) were collected and assessed for trends in findings regarding sibling variables. These articles were integrated with studies that primarily focused on sibling dynamics and physical activity experiences.

Data Collection and Analysis

Two researchers extracted data from the included studies into a standardized form developed for this review. The following data were extracted: author, date, methodology, sample characteristics (i.e., sample size, age, sex), key sibling-related variables, physical activity outcome variables, measures, and key results related to siblings and physical activity behaviors. This information is summarized in Appendix A.

For this review, the findings were synthesized in two primary phases. First, the study findings were analyzed dependent on whether the study used quantitative or qualitative methods.

This allowed the researchers to represent collective findings that used similar methods. For example, quantitative studies that isolated sibling-related variables as covariates were analyzed together. Second, once both quantitative and qualitative studies were summarized, the researchers noted commonalities across the respective methodologies to integrate findings and provide a holistic depiction of research investigating sibling dynamics in sport and physical activity contexts. Additionally, risk of bias was analyzed (Appendix B) by reviewing the handling of missing data, freedom of selective reporting, and their use of validated measures.

Handling of missing data was evaluated using the authors' reporting of steps taken to address missing data. Freedom of selective reporting was based on the authors' reporting of study finding. Studies that selectively reported their findings were highlighted. Due to the open responses of qualitative interviews, it is difficult to assess whether all findings were reported. Qualitative studies demonstrating analytical rigor (e.g., triangulation, axial coding) were believed to avoid selective reporting. Validity standards in qualitative research were additionally challenging to discern because of the necessity to incorporate rigor, subjectivity, and creativity into the scientific process (Johnson, 1999). Given the breadth of qualitative methods, the present study did not assess the specific evaluative criteria used in the identified qualitative studies (Whittemore, Chase, & Mandle, 2001). While these criteria are particularly applicable to quantitative studies, the information presented was used to assist in determining empirical rigor.

Results

Article Retrieval

The initial search process identified 4,894 articles. Removal of duplicates resulted in 3,464 articles for further review (see Figure 1). Next, by reviewing the titles of the collected articles 200 articles were kept for further review. Following a review of the study titles, abstracts

were carefully read. Studies with abstracts related to siblings and physical activity resulted in 69 articles receiving full review. At the conclusion of full review, 59 studies were retained for the present review. Of these studies 47 used quantitative methods, 11 used qualitative methods, and 1 used mixed methods (for a summary of each study, please see Appendix A). Additionally of interest was the general outlets in which the identified papers were published. Of the 59 published papers, 21 were in public health journals, 20 were in kinesiology based journals, 6 were in psychology journals, 4 in child and family development journals, 2 in sociological journals, and the remaining 6 were classified as "other" (e.g., Journal of Occupational Science, PloS One). To best avoid bias in the article retrieval process, an independent research assistant was asked to also complete the filtering process. When discrepancies arose the primary researcher and research assistant would discuss the articles until agreement was reached regarding their inclusion or exclusion.

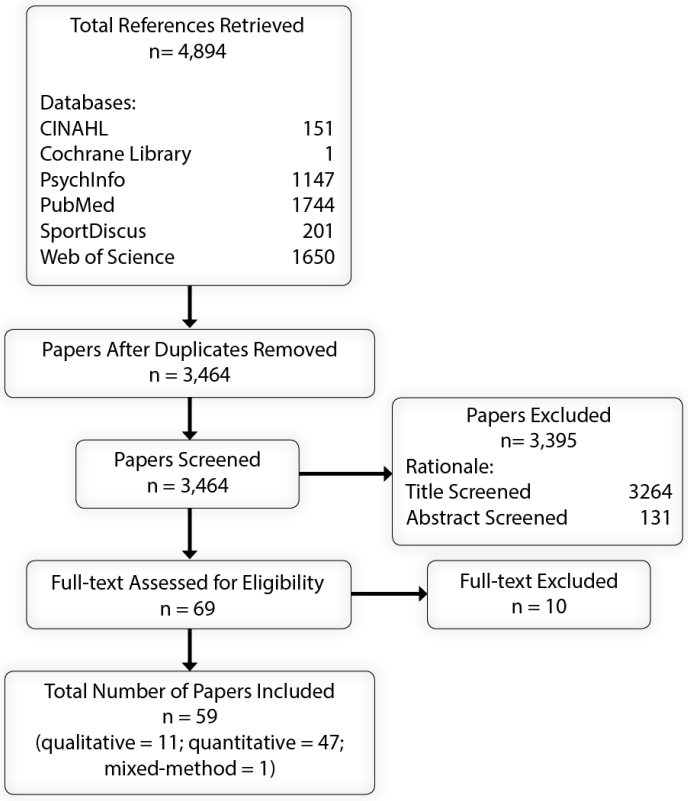


Figure 1. Article Retrieval Flowchart.

Topic Area Synopses

Emergent from the identified articles were five topic areas (see Table 1). Each topic area is discussed in further detail in the following section.

Table 1

Topic Areas of Sibling and Physical Activity Systematic Review

Topic Area	Short Description
Family Correlates of Physical Activity	
	Family size positively related to physical activity involvement
	Family co-participation in physical activity related to increased personal involvement
	Having siblings compared to being an only child related to more physical activity
Sibling Focused Investigations of Physical Activity	
	Sibling participation in physical activity linked to personal involvement
	Birth order differences in physical activity levels
	Time expenditures in shared activities
	Sibling support instrumental in predicting physical activity rates
Positive and Negative Experiences	
	Positive experiences: support, encouragement, pride, role-modeling
	Negative experiences: jealousy, differential treatment, rivalry, performance pressure
Sex Composition Findings	
	Different experiences of warmth and conflict often linked to sex composition
	Lacks consistent findings
Sibling Sport Comparisons	
	Comparison of career performance statistics
	Experience of comparisons by siblings and other social agents

Note. Short descriptions are provided each topic area.

Family correlates of physical activity. Previous research has often used the larger familial unit as the subject of study to understand the family's influence on physical activity levels. Studies using the larger family unit have limited sibling findings, often focusing on the number of siblings or briefly reporting the existence of siblings. From this perspective, the size of the family has often been identified as a correlate of individual physical activity levels. In

these investigations the findings specific to siblings becomes difficult, if not impossible to separate from familial factors.

For example, Barnett (2008) examined the relationship between individual, parent, and family characteristics with physical activity levels. Results indicated that having more siblings predicted greater involvement in both individual and team sports. In addition, McMinn and colleagues (2011) examined the family and physical activity levels. While not the only family relationship of interest, their findings suggested that having more siblings was positively related to time spent on sport participation or physical activity. These findings generally contradict research supporting the resource dilution hypothesis (Blake, 1981) where increased family size results in familial resources being divided among more individuals. The authors attribute the positive association between family size and physical activity participation to the increased potential for more leisure time physical activity when more children are present. These contrasting findings between family size and resource availability presents an area warranting further investigation.

To date, much of the research investigating the role that siblings play in sport and physical activity levels has utilized primarily Caucasian, middle-class families. To broaden investigations of family and home correlates of youth physical activity levels McMinn and colleagues (2011) purposefully utilized a multi-ethnic sample. With a large sample primarily representing three different ethnic backgrounds (i.e., white European, South Asian, and black African-Caribbean), the relationship between family and home characteristics (e.g., SES, number of siblings, family physical activity support) to physical activity levels was investigated. Because siblings are a common element of the home environment their number was included. The only significant difference between ethnic groups showed that, for white European participants,

having siblings was associated with engaging in more physical activity. These findings suggest family factors, such as ethnicity, may result in different instances of sibling influence in shaping children's physical activity.

Considering the previous studies' findings pertaining family size and physical activity behaviors, Trent and Spitze (2011) sought to understand the difference between having siblings and being an only-child. Their investigation of the social activities of adults with and without siblings found that young adults without siblings engaged in fewer social activities, including organized sports and physical activities. The authors suggest that because siblings can act as teachers or partners for practicing social and cognitive skills, it is plausible that only-children are less sociable than children with siblings. While these findings are insightful, they are equally tenuous. The findings do not explore the comparative advantages that only-child families may have in regard to parental resources (e.g., undivided parental attention and familial resources), or highlight the role that other significant relationships may play in the absence of siblings (e.g., friendships).

Unfortunately, the number of longitudinal studies involving siblings has been scarce in the physical domain. The studies that were identified generally included sibling characteristics as family correlates of physical activity behaviors. For example, Cleland and colleagues (2011) investigated if longitudinal relationships existed between the family environment and physical activity levels among youth. Specific to siblings, findings demonstrated that for younger female participants (5-6 years old) having a sibling co-participate in physical activity was directly associated with their own weekend moderate to vigorous physical activity (MVPA). This finding suggests, for younger girls, that having a sibling co-participate, rather than observe or support their involvement, may be important for promoting physical activity behaviors.

Sibling focused investigations of physical activity. While many publications suggested that sibling research in sport and physical activity contexts has been devoid of attention, one topic consistently examined has been the association of siblings and participation in sport or physical activity. In general, findings suggest that having a sibling who participates in sport or physical activity has a strong positive association with an individual's own participation (e.g., Bagley, Salmon, & Crawford, 2006; Cislak, Safron, Pratt, Gaspar, & Luszczynska, 2012; Wold & Anderssen, 1992). Prior empirical efforts have also demonstrated that the general level of physical activity is different based on birth order. Specifically, younger siblings have been found to engage in more risky or extreme sports (Sulloway & Zweigenhaft, 2010), while older siblings are consistently found to be more active than their younger counterparts (e.g., Eaton, Chipperfield, & Singbeil, 1989; Loucaides, Plotnikoff, & Bercovitz, 2007; Sallis, Prochaska, & Taylor, 2000; Seabra, Mendonça, Tamis, Malina, & Maia, 2011).

Exploring family characteristics such as number of parents in the household, parental income, and only-child versus multiple children has produced mixed findings related to sibling physical activity levels. Higher income families and single-parent families have been associated with higher levels of child physical activity (Duncan, Duncan, Strycker, & Chaumeton, 2004). The relationship between income and physical activity has previously been established (see Sallis et al., 1992) suggesting that a higher income allows for more instrumental support of physical activity, but the investigation of single- versus two-parent families has been limited. Yang, Telama, and Laakso (1996) suggests that the level of involvement from parents is equally, if not more, important in determining child activity levels than the mere presence of a parent. Therefore, youth in two-parent families with passive parental involvement in physical activity

had lower physical activity levels than children from single-parent families (Yang, Telama, & Laakso, 1996).

Examining the tie of siblings to physical activity is useful, yet rarely have siblings been the sole focus of examinations in the physical domain. Many studies have included sibling characteristics in their measures to explore if their presence, gender, or ordinal position in the family has an effect on physical activity behaviors. Of the studies that have used siblings as the primary unit of investigation topics such as time-expenditures and general physical activity behaviors have been examined. Pertaining to time expenditures, Tucker and colleagues (2008) have found that same-sex siblings spend an average of 10 hours a week doing structured activities together (e.g., sports and hobbies) and far more time engaged in unstructured activities (e.g., hanging out). Specifically, brother-brother dyads spent the most time engaging in both structured and unstructured activities with one another. The heightened time expenditures between brother-brother dyads was suggested to exist because girls' close relationships tend to center on intimacy, often achieved through conversation, whereas boys' close relationships are based more on shared activities (Maccoby, 2000).

Duncan and colleagues (2004) utilized hierarchical linear modeling to assess sibling dyads and physical activity behaviors. They specifically sought to understand if sibling physical activity levels were related, and if individual or higher level family covariates influenced physical activity. At the individual level of analysis, older siblings were found to be more active than younger siblings. The family level of analysis indicated that higher levels of sibling and family support were related to higher levels of sibling physical activity. This finding is in line with previous work suggesting the importance of family support on youth physical activity levels (e.g., Sallis, Buono, Roby, Micale, & Nelson, 1993)

Positive and negative experiences. A common finding throughout many of the reviewed publications was sibling contributions to both positive and negative experiences in sport. Siblings were reported as sources of encouragement, support, jealousy, and rivalry across diverse sport experiences. In Côté's (1999) study assessing the family's role in talent development siblings emerged as influential role-models for their younger siblings. Siblings were additionally cited as providers of support and encouragement for each other's sport careers and physical activity pursuits (Blazo et al., 2014; Cislak et al., 2011; Côté, 1999; Davis & Meyer, 2004). Côté's findings further outlined that older siblings serve as role-models in sport who display the work ethic necessary for talent development. Findings also showcased accounts of cooperation between siblings, as opposed to rivalry or competition. For example, siblings often organized and engaged in physical activities that involved the entire family that fostered working together and enjoyment, as opposed to intense competition. These family activities were cited as contributing elements to creating favorable settings for developing sport and social skills of youth.

Davison (2004) investigated the potential gender differences in activity-based support from parents, peers and siblings in adolescent physical activity. Echoing Côté's (1999) results, siblings were identified as salient sources of support in the physical domain. For males, support from a brother was associated with higher levels of physical activity. Females reported that support from a brother or sister was related to higher physical activity. Davison suggests that these findings could reflect that males are less likely to admire their sister's athletic prowess as a result of an over-generalization of gender differences in physical activity. Alternatively, females could be less gender stereotyped with respect to physical activity. Looking more broadly at the activity levels of adolescents in their study, highly active individuals reported having higher support from their siblings.

Investigating the role of family members as socialization agents to sport Ebihara and colleagues (1983) asked family members to report their reasons for participating in sport. Children reported that their father was the primary socializing agent to sport, but older siblings were also influential. From the perspective of the younger sibling, older children were seen as role-models and often eased the entry to sport due to the vicarious learning experiences that an older child's participation provides. This investigation also demonstrated the reciprocal nature of sibling relationships in that younger siblings were reported as a source of reinforcement for the older sibling's sport involvement. These findings suggest that sibling relationships are not purely hierarchical, but instead dynamic, where an individual is changed by, and influences the experience of physical activity of siblings

Many of the included articles highlight the adaptive function of sibling in physical activity, yet this relationship is also prone to a broad array of negative experience. Blazo and colleague's (2014) findings further support many of the previously mentioned sibling experiences in sport and physical activity (e.g., sources of support and reinforcement) but also provide insights on negative experiences. Examples of these negative experiences include jealousy, performance pressure, and abandonment. Participants reported that these negative experiences were persistent and often strained the sibling relationship outside of sport. The negative experiences associated with sibling achievement in sport exemplifies the range of sibling outcomes in sport and physical activity, many of which have yet to be studied in depth.

One area that further contrasts sibling experiences in physical activity settings focused on sibling cooperation and competition. Davis & Meyer's (2008) study explored the experience of competing against a sibling in sport. Sibling competitors were reported as a source of motivation and providers of emotional and instructional support, even while serving as an opponent (Davis

& Meyer, 2008). Interestingly, siblings were simultaneously depicted as a source of pressure, suggesting a relationship including experiences of dissonance.

Evident from our review was that sibling experiences in sport do not operate in a social vacuum and are influenced by other relationships. Child development researchers have established that parents will undoubtedly treat their children differently and that these experiences are rather common. The differential treatment of siblings in the physical domain has been found to lead to jealousy and resentment (Blazo et al., 2014; Harwood & Knight, 2009). Research that provides further insight on these negative experiences would assist in the development of interventions focused on overcoming or coping with perceptions of parental favoritism, or sibling envy and jealousy.

Sex-composition findings. The sex-composition of sibling and parent-child dyads has produced mixed findings related to physical activity behaviors. Compared to peers and parents, siblings of the opposite-sex more readily provide opportunities for children to engage in less sex-typed activities (McHale, Kim, Whiteman, & Crouter, 2004). Therefore, females with brothers have reported more occasions of playing sports or engaging in physical activities than in same-sex dyads (Bagley et al., 2006; McHale et al., 2004; Stoneman, Brody, & MacKinnon, 1986). As previously outlined, the findings of Tucker and colleague's (2008) investigation of sibling time expenditures would suggest that individuals in mixed dyads develop relationships through different behaviors. For example, boys are likely to foster relationships by engaging in similar activities, while females develop relationships through conversations and intimacy (Maccoby, 2000). Consequently, having an older brother may lead to increased engagement in sport and physical activity for a younger sister.

Findings regarding same-sex siblings have also been similarly linked with sport and physical activity involvement (e.g., Tucker et al., 2008). Ziviani and colleagues (2006) conducted a study to better understand different perspectives of youth involvement in sport. By interviewing parents and children, researchers found that having an older sibling of the same-sex that participated in sport and physical activity was associated with increased levels of physical activity in the younger sibling. Additionally, having a same-sex sibling that is involved in sport and physical activity significantly contributed to the continued involvement of physical activities of the younger child.

Sibling sport comparisons. Blazo and colleagues (2014) demonstrated that comparisons are an influential phenomenon of the sibling sport experience. In their study, younger siblings reported a spectrum of comparisons perceptions. Participants reported making performance comparisons with their sibling, in addition to being compared to their sibling by other social agents (e.g., family members, teachers, coaches). Limited work has examined the outcomes associated with sibling comparisons in physical activity contexts. Investigations focused on sibling comparisons have primarily used performance records to determine comparative success. For example, Abel and Kruger (2007) compared the batting averages and career lengths of siblings in professional baseball. Without a guiding theory, the authors used career statistics as markers of goal-driven behavior and career achievement. Findings suggested that older, non-pitching siblings had significantly higher batting averages and longer careers. These differences were not significant for pitching sibling dyads. The authors suggest that older siblings have greater access to familial resources and have higher performance expectations.

In a similar study of sibling performance and participation data, Sulloway and Zweigenhaft (2010) conducted a meta-analysis to better understand if younger siblings would

engage in more risky behaviors in sport. The researchers found that younger siblings were found to be 1.6 times as likely to engage in riskier sports (e.g., football, skydiving, rugby) than their older siblings. From baseball performance data, finding suggested that younger siblings were approximately 10.6 times more likely to attempt risky in-sport behaviors, such as stealing bases, than their older sibling.

General Summary

The present review was conducted with two primary aims: to explore and summarize the literature regarding siblings in sport and physical activity, and to identify gaps in our understanding of siblings while also highlighting avenues for future investigations in sport and physical activity settings. The landscape of sibling research in the physical domain provides a limited body of literature for researchers to draw upon and further develop our understanding of this particular family relationship. Findings were broadly related topics such as family size, sibling support, sport socialization, sibling-based comparisons, and sibling constellation variables. While these investigations provide a backdrop for the development and pursuit of new research questions, a coherent picture of sibling significance in the physical domain is lacking. Throughout this review it became apparent that findings are unclear and often offset one another. Researchers have not systematically pursued topics dealing with siblings in sport and physical activity, which has lead to issues of consistency in samples, methods, and reporting.

Discussing how the present findings are situated in the broader understanding of sibling relationships is equally important. Outside of sport, prior work has suggested that siblings can act as instigators of both positive (e.g., caretaking, empathy; e.g., Brody, 1998; Buhrmester & Furman, 1990) and negative behaviors (e.g., substance use, delinquency; e.g., Samek & Rueter,

2011, Rowe & Gulley, 1992). Our findings suggest that siblings additionally facilitate one another's entry and engagement in sport and physical activity.

Additionally, research has found that siblings construct and assume social roles and enact their own versions of helpers, friends, collaborators, or competitors in unstructured play (Dunn, 2002; Oden, 2006). In such varied roles, siblings learn about social relationships and stimulate each other's language and social development, emotional expression, perspective taking, and physical coordination (Oden, 1988). Many factors influence the focus, content, roles, and processes of youth play. Parents' involvement with their children and their reactions to sibling interactions may affect sibling relations and differences between siblings (Dunn, Slomkowski & Beardsall, 1994; Herzberger & Hall, 1993; MacKinnon, 1989). The findings of the present review enrich our understanding of how the setting (i.e., sport or physical activity) and relationships within that setting (i.e., sibling sport relationships, influence of parents) affect youth outcomes.

Sibling relationships in sport and physical activity settings are not unique in their experience of both positive and negative outcomes. Siblings often have similar experiences outside of sport. For example, sibling relationships can be important sources of support (e.g., Avioli, 1989; Brody, 2004; Cicirelli, 1991). Avioli (1989) describes instrumental and expressive types of support in sibling relationships. Instrumental support requires close proximity as it involves practical help whereas expressive support, such as offering advice and sharing problems, can be provided whether the siblings live near each other or not.

Alternatively, sibling relationships have also been linked to negative affective experiences. For example, sibling jealousy has been investigated and consistently linked to parental differential treatment (Dunn, 2000; Kolak & Volling, 2010; Kowals & Kramer, 1997).

We may expect siblings' feelings of jealousy to influence the effects of differential parental treatment. If an adolescent has a highly conflictual relationship with their sibling, feelings that a sibling is favored may have different meaning compared to when a sibling relationship is compassionate (Scholte, Engels, Kemp, Harakeh, & Overbeek, 2006). These findings have implications for how sibling relationships operate in the physical domain, but have yet to be studied extensively.

The broader literature regarding sibling dyad sex composition and sibling relationships is similar to the present review. Gender has been found to be an important factor in the closeness of sibling relationships, with sister-sister dyads being closest, followed by cross-sex siblings and finally, brother-brother dyads (Cicirelli, 1994; Dunn, 2002; Lee et al., 1990). One suggested reason for this finding is that females are socialized to become nurturers and to express themselves emotionally (Dunn, 2002) which may also be the reason that research finds sisters to be more helpful and supportive than brothers (Block 1984; Jacklin & Reynolds, 1993). Voorpostel and colleagues (2007) suggest that the type of support needed is additionally important, as boys are more likely to provide practical support whereas girls are more likely to provide emotional support. Our review constrains the setting of sibling relationships and results suggest similar degrees of closeness, but varied experiences of physical activity. Continued research is needed in this area to enrich our understanding of sex and siblings in physical activity settings.

Lastly, the examination of sibling-based social comparisons in child development literatures has also been limited. Sibling comparisons have often been linked to characteristics of the sibling relationship (i.e., birth position, age difference; Feinberg, Neiderhiser, Simmens, Reiss, & Hetherington, 2000; Noller, Conway, Blakeley-Smith, 2008; Jensen et al., 2015) and

the importance of the comparison setting (Tesser, 1980). Generally, the findings suggest that older siblings, and siblings close in age utilize more downward comparisons, while younger siblings are more likely to make upward comparisons. Moreover, the negative effects of upward comparisons tend to be more prevalent when siblings are close in age and experience more hostile relationships (Noller et al., 2008). Alternatively, upward comparisons between siblings have also been associated with adaptive outcomes, where an individual basks in the accomplishments of their sibling (Tesser, 1980). Our review advances the limited work in this area to exploring literal performance comparisons and the qualitative experience of comparing, and being compared, to a sibling.

Future Directions

By collecting and examining the various articles, numerous claims were made that depicted the scarcity of sibling research. These claims are generally warranted but do not apply to all research questions. Many of the identified articles dealt with siblings and their impact on physical activity levels. Whether a direct influence from a sibling, or reporting the number of siblings present in the family, a basic understanding of *if* activity levels are affected by siblings exists and now researchers are encouraged to broaden the scope of their research endeavors by examining *how* siblings affect activity levels.

First, researchers are encouraged to adopt developmentally informed perspectives to examine the psychosocial and behavioral changes within individuals across the lifespan as well as the differences and similarities in the nature of these changes across individuals (Weiss & Raedeke, 2004). Crafting research questions from a developmental perspective requires that researchers address three fundamentals: describe the changes in behavior or psychological processes, to explain the changes in relationships among behaviors or psychological processes,

and explain the course of development. Weiss and Bredemeier (1983) suggested that researchers utilizing a developmental perspective employ theories, designs, and methodologies that capture age-related differences in cognition, perceptions, and behaviors in physical activity settings. While adopting theories from fields such as psychology and child development literatures (e.g., family systems theory and attachment theory) will be advantageous, sport and physical activity researchers are additionally encouraged to develop theories ground in physical activity contexts that incorporate sibling interactions.

Next, future research questions should be developed that to move beyond exclusively studying sibling constellation variables such as age difference, birth order, or family size. Sibling constellation variables like these are useful in describing the structure of sibling relationships but fail to advance understanding of how siblings influence physical activity. For example, one research area devoid of attention is the empirical understanding of sibling rivalry. Questions such as, is sibling rivalry adaptive or maladaptive in sport and physical activity?; Can sibling rivalry influence an individual's motivation to participant in physical activity? Have yet to be explicitly investigated.

For the sibling literature to flourish in the physical domain there are methodological concerns that should be acknowledged. As this review illustrates, there has been abundant investigations focused on the family, but the instances where sibling interactions are the focal point of investigation are scarce. One method that has been underused in the physical domain is dyadic data analysis (Kenny, Kashy, Cook, 2006). Dyadic analysis emphasizes that researchers investigate all members in a relationship to account for the inherent interdependence of relationship data. Often a single person's perspective is collected and used to depict their relationship with another individual. Unfortunately, this does not accurately grasp the reciprocal

influences between the individuals. Accurately modeling the interdependence of data will allow researchers to better understand the perspectives of all members of a relationship and move the field forward.

Perhaps one of the more difficult tasks is to overcome the inherent obstacles of recruiting sibling participants. Gaining access to a sibling sample can be extremely challenging. If a researcher aims to collect data from both members of a sibling dyad, logistical considerations are necessary. These include coordinating with families to have both siblings at a location for data collection at the same time, as well as determining which siblings are needed for data collection. Additionally, delimiting a sibling sample necessitates a delicate process based on sound rationale that considers numerous sibling constellation variables. For instance, do researchers want any and all siblings to participate? Should only dyads be used? If dyads are used, is the birth-order, age gap, and sex-composition of the dyad relevant? Moreover, there are other relationships to consider as well. Therefore, collecting data from a martially intact family may produce different results from divorced, remarried, same-sex, or cohabitating parents. These concerns put added pressure on researchers to provide sound rationale for their sampling that is empirically and theoretically supported.

Another area of research that has grown in the child and family development literature is the investigation of sibling relationship qualities (Buhrmester and Furman, 1990; Furman and Buhrmester, 1985). Having an appreciation for the affective underpinnings of sibling relationships will allow researchers to examine how sibling interactions can be linked to adaptive or maladaptive outcomes in sport and physical activity. Studies that look beyond constellation variables and integrate relationship qualities will provide insight concerning the affective expression of social interactions and physical activity behaviors.

Stemming from the current review, the use of Bandura's (1969) social learning theory to understand the role-modeling behaviors between older and younger siblings merits further investigation in the physical domain. Physical activity researchers have readily used social learning theory to understand physical activity behaviors of youth, but have primarily focused on parental role-models. Children routinely observe the standards and behaviors of not only parents, but also siblings (Bandura, 1991). Social learning theory is one perspective that is predominately cited in explaining how siblings influence one another's development (Samek & Rueter, 2011). Therefore, the study of sibling interactions in the physical domain using a social learning theory stands to make contributions to our understanding of how siblings can shape and give meaning to physical activity experiences.

Conclusions

Many researchers posit that the family is the most important reference point to understand physical activity behavior and attitudes (Brustad, 2010). This notion is not surprising given that the family is the typical setting for the initial exposure to different sports and modes physical activity. Because the family can be instrumental in forming an individual's physical activity experience, researchers should examine the means by which families exert influence. The majority of research to date has examined parental influence due to their implicit role as providers of physical activity opportunities and establishing familial norms concerning physical activity. The findings of the present review extend our understanding of how the family influences physical activity experiences by demonstrating that siblings meaningfully influence a variety of physical activity outcomes. However, the significance of siblings in the physical domain has yet to be examined in a systematic manner. With the majority of investigations focused on physical activity levels, there is limited understanding of the psychosocial outcomes

associated with sibling interactions in physical activity contexts. Therefore, the contributions siblings make to sport and physical activity experiences remains unclear. Theoretically driven work is needed to bring structure and depth to this research area. Such examinations will substantially improve understanding of the developmental significance of siblings in the physical domain.

CHAPTER 3: STUDY TWO

Sibling Comparisons and Perceived Sport Competence in Young Athletes

A vast amount of research has been dedicated to the investigation of children's perceptions of competence in different achievement domains (e.g., social, academics, or physical), with significant others (e.g., parents, coaches, teachers, peers) identified as salient to the development of perceptions of competence in these contexts (Harter, 1978; Harter, 1999; Horn & Hasbrook, 1987). While the importance of parents, peers, and coaches has been well established, the investigation of the sibling relationship has lacked the same depth. Child development researchers have examined the unique contribution that siblings make to one another's social, emotional, and cognitive development (Azmitia & Hesser, 1993; Bell et al., 1985; Dunn, 2007; Howe, Ross, & Recchia, 2011). This work often suggests that sibling relationships are salient, beyond the contributions of parents and peers. Individuals in the family unit are often cited as particularly important agents of socialization to sport and physical activity (Brustad, 2010; see Hohepa, Scragg, Schofield, Kolt, & Schaaf, 2007; Horn & Horn, 2007, Sallis, Prochaska, & Taylor, 2000). For example, siblings can support recreation behaviors that promote positive health behaviors like physical activity (Hohepa et al., 2007). Given the potential influence that siblings have in fostering physical activity behaviors, their ability to inform one another's perceptions of competence in the physical domain warrants further investigation. By focusing our attention on the role siblings' play in the formation of sport competence perceptions, researchers stand to advance the understanding of an understudied significant other in physical activity settings.

Few studies have been conducted to examine siblings in the physical domain. Prior empirical endeavors have demonstrated that the physical domain is an important setting for the development of social, physical and cognitive competencies (see Weiss & Raedeke, 2004). Though most youth participate in sport at some level early on, relatively little is known about sibling interactions during the sport experience of youth. Acknowledging this gap, the present study is designed to evaluate how sibling relationships inform an individual's perceptions of competence in sport.

Broadly, self-perceptions are an individual's beliefs, attitudes, thoughts and feelings about one's self in general or in reference to abilities, skills, competencies and behaviors (Fox, 1997; Horn, 2004; Shavelson, Hubner, & Stanton, 1976). Self-perceptions can be conceptualized with domain-specificity as well as at general levels that encompass an individual's self-worth (Hagger, Biddle, & Wang, 2005; Harter, 1988; Marsh & Shavelson, 1985). The investigation of self-perceptions is important considering their strong influence on motivational processes (Horn, 2004; Weiss, Ebbeck, & Horn, 1997). Researchers have become increasingly interested in enhancing youth self-perceptions in sport and physical activity to foster the adaptive outcomes in performance, behavior, and well-being (Horn, 2004). For example, examining self-perceptions in the physical domain has been instrumental in understanding physical activity participation (Fox, 2000), physical fitness (Marsh, 1996; Marsh & Redmayne, 1994) and peer relationships (Smith, 2003). Further investigation of self-perceptions in the physical domain is central to understanding the quality of experience in youth sport and physical activity.

Prior research has been dedicated to identifying and understanding the sources of information that children use for evaluations of competence. Sources include feedback from significant others (e.g., parents, peers, and coaches), performance comparisons with others,

internal criteria, and actual performance statistics and outcomes (Horn, Glenn, Wentzell, 1993; Horn & Hasbrook, 1987; Weiss, Ebbeck, & Horn, 1997). Horn and Weiss (1991) examined the self-evaluations children make in the physical domain and found that there was a developmental shift in the sources of competence information. Younger children placed more importance on the performance information they received from their parents, while children approaching adolescence showed greater preference for peer comparisons and evaluations (Horn & Weiss, 1991). While these findings emphasize the role of parents and peers in shaping physical self-perceptions, researchers have yet to examine sibling contributions to competence information in sport and physical activity.

Because self-perceptions are informed by internal criteria and objective standards often grounded in social interactions, the use of Festinger's (1954) social comparison theory provides a framework to examine the critical content of competency beliefs. Social comparison is the evaluation of one's own abilities in reference to the abilities of others (Suls & Mullen, 1982). Driving this process are three comparison motives: self-evaluation, self-improvement, and self-enhancement. Self-evaluations are conceptualized as the drive to determine where one stands relative to others. Social comparisons for self-improvement are done to gather information and learn how to enhance ability or to perform more effectively. Lastly, social comparisons for self-enhancement are done to bolster or enhance an individual's subjective well-being (Gibbons & Buunk, 1999; Suls & Wheeler, 2000; Suls & Wills, 1991). Festinger suggested that individuals are likely to engage in social comparisons with those who are close to one's own ability or considered similar. Equally important is that as ability discrepancies between individuals increase, it is not possible to accurately evaluate ability with the target and the tendency to compare will decrease (Festinger, 1954; Wheeler & Suls, 2005).

A comparison target has the potential to produce both positive and negative feelings for the individual making comparisons (Pelham & Wachsmuth, 1995). As discrepancies with a comparison target become greater, contrast effects arise. Contrast effects highlight the differences between individuals and often produce negative self-evaluations. Alternatively, assimilation effects lead to estimating the self as similar to a comparison target. Prior research suggests that in close relationships individuals are more likely to engage in comparisons that have assimilation effects and integrate information about their partner into their perceptions about the self (Brown, Novick, Lord, & Richards, 1992).

Developmentally, comparisons and competence beliefs are most likely a function of two interrelated factors (Horn, 2004). First, the ability to critically make comparisons and develop competency beliefs may be due to cognitive-developmental maturation. As children age their ability to process information becomes more detailed and sophisticated. Such maturation can influence how comparisons inform the way an individual views themselves and his/her abilities. Because youth may lack detail when gathering competence information from comparison targets they are likely to utilize more basic modes of self-evaluation.

The proxy model of social comparison proposed by Martin and colleagues (2000; 2002) suggests that inferring competence beliefs can be done by generalizing the outcomes of a similar other (proxy) to the individual's performance on a similar task. As a child matures they are likely to become more systematic in forming their self-perceptions based on a proxy (e.g., the influence of related attributes). Therefore, children may be prone to assume they are similar with a sibling's ability and hold the belief that if a sibling can successfully complete a task, by association the comparer can too.

As children develop, so to does their social environment, which further influences competence beliefs. At first, the parents are generally believed to be the primary social sources of competence information by internalization processes. Repeated contact with the parents begins internalization whereby a child adopts the norms, roles, and evaluations established by the parents as their own (Aronfreed, 1969; Harter, 1999). This process is initially highly dependent on interaction with proximal social agents and is believed to occur because significant others provide 'social mirrors' which allow a child to detect her or his opinions toward the self. These reflected appraisals from significant others are believed to be internalized as self-perceptions. As the child ages, they encounter and interact with an increased number of 'social mirrors', integrate self-evaluations, and compare with others which has the potential to further inform self-perceptions.

Comparisons with siblings are an apparent context for self-evaluation (Gamble et al., 2010). Sibling comparisons often begin in infancy and persist over the lifespan (Cicirelli, 1996; Dunn, 2000, Noller, Conway, & Blakeley-Smith, 2008). Siblings offer comparison targets with many shared characteristics and interactions that are affectively charged (Dunn, 2002). Moreover, outside of school siblings spend the most time with each other, providing an opportunity for a strong relationship to form and to generate ample interactions for comparisons to occur (McHale & Crouter, 1996). Due to the time spent with one another and the potential length of relationship, multiple opportunities exist for a sibling to serve as a 'social mirror' to evaluate aspects of one's self (Gamble et al., 2010; Harter, 1999).

Activities such as sport provide a social environment where the development of positive self-perceptions can be overtly fostered or damped by a sibling. For instance, siblings that take an active role as teachers and companions in sport are likely to provide opportunities for children

to learn new abilities and enhance feelings of efficacy. Alternatively, sibling interactions that undermine feelings of success or control stand to reduce feelings of competence. These effects may be contingent upon relationship quality, with higher quality sibling relationships (e.g., characterized by warmth) having a greater influence on health behaviors and subsequent outcomes such as competency beliefs than lower quality sibling relationships (Furman & Buhrmester, 1985; Hohepa et al., 2007). Research suggests that sibling relationship qualities can have major effects on development in a variety of settings (Furman & Buhrmester, 1985).

Prior investigations support four primary sibling relationship qualities: status or power, closeness or warmth, conflict, and rivalry. Status and power refer to the degree and direction of asymmetry in the sibling relationship (Buhrmester & Furman, 1990; Furman & Buhrmester, 1985). During childhood, differences in power are a common feature. Often the older sibling is cognitively and physically more mature than younger siblings, which attributes them higher power in the sibling relationship. However, as the younger child develops and approaches adolescence there is a shift from an asymmetric relationship to one that becomes more equal (Buhrmester & Furman, 1990; Yeh & Lempers, 2004). A warm or close sibling relationship is characteristic of friendly, sympathetic and cooperative behaviors (Dunn, 2002). Warm sibling relationships are positively associated with social support and the development of interpersonal and cognitive skills (Noller, 2005). Research suggests that there is a developmental trend for sibling relationships to become less warm once the older sibling reaches adolescence due to the increased involvement with peers. A conflictual sibling relationship is characterized by competition and antagonism (Furman & Buhrmester, 1985). Sibling conflict is often cited as a contributor to individualization, and negatively related to social support (Noller, 2005). Not surprisingly, sibling relationships fraught with rivalry experiences have been shown to be highly

correlated with conflictual relationships. As such, a sibling relationship characterized by rivalry can be conceptualized as a sub-type of a conflictual sibling relationship.

Though research has shown relationship qualities contribute to self-perceptions (e.g., Gamble et al., 2010), little is known regarding how sibling comparisons inform perceptions of competence in sport or physical activity. Additionally, investigating the association between sibling-based comparisons and perceptions of competence in tandem with relationship qualities in the sport contexts will expand our understanding of how interactions with significant others inform self-perceptions. The present work addresses two research questions in an effort to better understand both sibling dynamics and physical self-perceptions. First, are sibling-referenced comparisons associated with sport competence beliefs in youth athletes? Second, does the sibling relationship quality moderate the association between sibling comparisons and perceived sport competence? With these research questions in mind, the purpose of this study was to investigate the association between sibling sport-referenced comparisons, sibling relationship qualities, and perceptions of sport competence.

Grounded in the assumption that siblings are salient targets of internalization processes, assimilation effects, and proxies for comparisons it was hypothesized that a greater tendency to make sibling-referenced comparisons would be associated with higher sport competence perceptions. This association was also hypothesized to change in magnitude as a result of relationship qualities. Sibling warmth was expected to foster perceptions of competence between siblings because the sibling would not be perceived as a threat to self-perceptions, but rather a source of information for self-improvement or as a similar comparison target that leads to feelings of competence as suggested by the proxy model of social comparison. Sibling conflict was expected to dampen or lower reports of competence due to fewer instances of internalization

or contrast effects being used to the detriment of self-evaluations as they highlight differences between the comparer and target.

Method

Participants

Participants consisted of 49 sport-involved sibling dyads. To be included in the sample the younger sibling was required to be seven, eight, or nine years old and to have an older sibling within four years of the younger sibling's age. This age range was specified to gain insight on youth self-perceptions during a developmental period akin to identity formation, newfound cognitive abilities, and changing social connections and expectations (Gamble et al., 2010). If multiple siblings matched this description, the sibling closest in age to the younger sibling was invited to participate. Two dyads comprised of twins were excluded from further analysis as the current investigation aimed to include dyads with identifiable members (e.g., older and younger siblings), resulting in a final sample of 47 dyads. Participants included 25 female and 22 male (M_{age} = 10.94 ±1.49 yrs.) older siblings who were predominately firstborn children (83%). Younger siblings consisted of 23 female and 24 male participants (M_{age} = 8.45 ±1.01 yrs.) who were mostly second born children (79%; see Table 2 for summary of demographic information). All participants were asked to complete established measures of study variables.

Table 2

Demographic Information

	N	Minimum	Maximum	Mean *(SD)*
Younger Siblings				
- Female	23			
- Male	24			
Age		7	11	8.45 (1.01)
Birth order		2	7	2.36 (.85)
Number of Siblings		1	11	2.00 (1.60)
Sport Seasons		1	16	4.90 (3.70)
Ethnicity			76% Caucasian	
Living Situation			98% Live with both Parents	
Older Siblings				
- Female	25			
- Male	22			
Age		8	13	10.49 (1.49)
Birth order		1	6	1.32 (.91)
Number of Siblings		1	11	1.98 (1.6)
Sport Seasons		1	17	5.90 (4.02)
Ethnicity			89% Caucasian	
Living Situation			96% Live with both Parents	

Procedures

Following approval from the Institutional Review Board participants were recruited from youth recreational sport leagues. Initially, the primary researcher contacted local youth recreational sport league administrators to gain access to their participating families. Next coaches were contacted in leagues that approved team contact. After coordinating with individual teams, the primary researcher met with families at a team meeting or event location to discuss the purpose of the study. If interested in participating, parents and sibling participants completed consent and assent forms, respectively, followed by sibling participants completing a battery of self-report measures. If a family expressed interest in participating in the study but both children were not present, a data collection session was scheduled.

Measures

Demographic Information. Demographic information was collected (see Table 1), including gender, ethnicity, birth-order, number of siblings, parental marital status (i.e., living situation), and sport seasons (i.e., number of seasons playing organized sport) to better characterize the obtained sample.

Perceived Sport Competence. The sport competence subscale of the Child and Youth Physical Self-Perception Profile (CY-PSPP: Eklund, Whitehead, & Welk, 1997; Whitehead, 1995) was used to measure participants' perception of sport competence. The CY-PSPP consists of 36 items regarding youth physical self-perceptions. The CY-PSPP taps six specific sub-domains: Global Self-esteem, Physical Self-worth, Sport Competence, Body Attractiveness, Physical Strength, and Physical Conditioning. Each sub-domain is measured using six, four-point structured alternative items. First, participants are asked to identify which of two statements bests describes themselves and then mark whether the statement is "kind of true" or "really true" for them (e.g., 'Some kids do very well at all kinds of sports BUT Other kids don't feel that they are very good when it comes to sports'). Each item gives a score from one to four, where higher scores indicate greater beliefs of competence. Though the original subscale has demonstrated good reliability and validity previously (Eklund et al., 1997; Harter, 1985), the measure demonstrated marginal internal consistency in the current study ($\alpha = .68$). Upon reviewing the inter-item correlations it was determined that the removal of any item would not benefit internal consistency. The variable was retained for subsequent analyses, but the reader is encouraged to interpret these analyses with caution.

Sibling Relationship Qualities. Relationship qualities were assessed by the Sibling Relationship Questionnaire (SRQ: Furman & Buhrmester, 1985). The 42-item scale was used to

measure the nature of a child's relationship with her or his sibling. The SRQ consist of four factors; warmth/closeness, relative status/power, conflict, and rivalry. The relative status/power factor was assessed, although as research supports (Buhrmester & Furman, 1990; Furman & Buhrmester, 1985), there is a natural tendency for one younger sibling to attribute more power to their older sibling due to superior age and increased amount of experiences. Sibling warmth and sibling conflict items were rated on a 5-point Likert scale ranging from "hardly at all" to "extremely much". An example sibling warmth item was, "Some siblings do nice things for each other a lot, while other siblings do nice things for each other a little. How much do both you and this sibling do nice things for each other?". An example sibling conflict item was, "How much do you and this sibling bug and pick on each other in mean ways?"

Higher scores on the individual dimensions were associated with higher perceptions of the specific relationship quality. Relative status/power was derived from four factors; dominating over a sibling, nurturing a sibling, dominated by a sibling, and nurturing by a sibling. The ratio of an individual's nurturance of, and dominance over their sibling to the amount of nurturance and dominance the sibling received from their sibling composed the relative status/power score. Therefore, positive scores indicate perceptions of having higher status or power in the relationship, negative scores indicate the belief that the sibling has more power in the relationship, and scores of zero were indicative of egalitarian relationships. These values represent acts of power such as issuing commands, but also represent the status awarded by one sibling being a caretaker relative to the other. Also, upon reviewing the rivalry items it was determined that they represented perceptions of parental favoritism and not sibling rivalry and therefore were not included in further analyses. Internal consistencies were acceptable for

Sibling Warmth (α = .91), Sibling Conflict (α =.80), and Relative Status/Power (α = .77) dimensions.

Social Comparisons. Sibling-based sport comparisons were measured using the Iowa-Netherlands Comparison Orientation Measure (INCOM: Gibbons & Buunk, 1999). The INCOM consists of 11 items tapping the tendency to make ability and opinion comparisons. Original items of the INCOM were modified to reflect sport comparisons with a sibling to measure the participants' tendency to engage in comparisons with a sibling. For example, "I often compare myself with others with respect to what I have accomplished in life." was modified to, "I often compare with my sibling with respect to what I have accomplished in sport." Items were rated on a 5-point Likert scale ranging from "I strongly disagree" to "I strongly agree". Higher scores were associated with a higher tendency to compare with one's sibling in sport. Internal consistencies were acceptable for the overall measure of comparison tendency (α = .72).

Please see Appendix C for survey packet.

Data Analysis

Data screening and descriptive analyses were conducted in line with recommended best practice (see Tabachnick & Fidell, 2007). An important consideration when studying sibling relationships is the interdependence of the data. Interdependence occurs when one person's cognitions, emotions and behaviors affect those of a partner. As a result, observations of the individual may provide information regarding the linked partner (Cook & Kenny, 2005). Measurements attained reflect the contribution of the two children (i.e., the respondent and their sibling), although the function of those contributions can be quite different. Accordingly, to determine the influence of sibling comparisons and relationship qualities on sport competence perceptions an actor-partner interdependence model of distinguishable members was used

(Kenny, Kashy, & Cook, 2006). The actor-partner model was used to determine how members of the dyad, older and younger siblings, influence their own outcomes (actor effects) and their sibling's outcomes (partner effects). All analyses were conducted using SPSS for Windows, version 21; an α level of .05 was used throughout.

Results

Descriptive Statistics

Means, standard deviations, and bivariate correlations for all study variables are provided in Table 3. The results from the questionnaires revealed that the participants reported above the midpoint on all variables of interest indicating high perceptions of sport competence, the existence of an affectively charged relationship (relatively high scores on all relationship variables), and a tendency to compare with their sibling target.

Table 3
Descriptive Summary and Correlation of Variables (N=94)

Variables	1	2	3	4	5
1. Sport Competence	-				
2. Sibling Warmth	-0.04	-			
3. Sibling Conflict	-0.10	-0.38**	-		
4. Sibling Status/Power	-0.10	-0.08	0.31**	-	
5. Comparison Tendency	0.16	0.24*	0.24*	-0.22*	-
M	2.99	3.12	3.27	0.21	2.99
SD	0.54	0.69	0.77	0.58	0.69
Alpha	0.68	0.91	0.80	0.77	0.72

*p<.05
**p<.01

Correlations were computed in order to shed light on the nature of the associations between the variables under investigation, independent of the proposed dyadic structure of the

data (see Table 3). A significant negative correlation was found between sibling warmth and sibling conflict, (r = -.38, p < .01). A significant positive correlation was found between relative power and sibling conflict, (r = .31, p < .01). Due to the transformation of the sibling status/power variable, the interpretation of this correlation suggests that increases in sibling conflict are associated with an increased reporting of status/power in the sibling relationship. A significant positive correlation was also observed between the tendency to compare and sibling warmth, (r = .24, p < .05). Lastly, a significant negative correlation was observed between the tendency to compare and sibling status/power, (r = -.22, p < .05).

Dependent t-tests were conducted to compare reporting from older and younger siblings (see Table 4). Three significant differences were found between younger and older siblings. First, a significant difference was found for reporting of sibling conflict by younger siblings (M= 3.06, SD= 0.78) compared to their older sibling (M= 3.48, SD= 0.66), t(46) = 2.82, p<.01. Second, a significant difference was identified for siblings reporting of relative power. Younger siblings reported that their older sibling held more power in their relationship (M= -1.33, SD= 1.62), this was further supported by the older siblings' self-reporting higher relative power than their younger sibling (M= 1.75, SD= 1.46), t(46) = 8.85, p<.01. Lastly, younger and older siblings differed in their reporting of comparison tendency. Younger siblings (M= 3.07, SD= 0.65) indicated that they were more likely to compare with their older sibling than vice versa (M= 2.86, SD= 0.58), t(46) = 2.06, p<.05.

Table 4

Correlations, Interdependence Correlations, and Dependent t-test Statistics (N= 47)

Variables	1	2	3	4	5
1. Perceived Sport Competence	**.05**	-.01	-.13	-.08	.26*
2. Sibling Warmth	-.07	**.53***	-.31**	-.15	-.01
3. Sibling Conflict	-.03	-.47**	**-.03**	.16	-.13
4. Sibling Power	-.06	.03	.18	**-.19***	-.08
5. Comparison Tendency	-.02	.44**	-.18	-.05	**.36***
Younger Sibling *M(SD)*	3.03(.59)	3.15(.70)	3.06(.78)	-1.33(1.62)	3.07(.65)
Older Sibling *M(SD)*	2.95(.51)	3.10(.70)	3.48(.66)	1.75(1.46)	2.86(.58)
Dependent *t*	*ns*	*ns*	2.82**	8.85**	2.06**

Note. Values above the diagonal represent younger sibling correlations. Values below the diagonal represent older sibling correlations. Values on the diagonal represent interdependence correlations.

*$p<.20$

**$p<.05$

Dyadic Analysis

Before conducting further analyses, it is necessary to test for nonindependence in the data. Pearson's correlation coefficients were calculated based on each dyad members reporting of variables of interest. These correlations were used to determine the degree of interdependence (Table 4). Tested against Kenny, Kashy, and Cook's (2006) suggested significance value ($p<.20$) correlations for the tendency to compare ($r = .36$, $p<.05$) sibling warmth ($r =.53$, $p<.05$), and relative power ($r = -.19$, $p=.20$) demonstrated interdependence. While sport competence did not demonstrate interdependence ($r = .05$, $p>.20$), the dyadic analyses allow for the modeling and estimation of variables as interdependent. Moreover, Kenny and colleagues (2006) stress that interdependence is not exclusively an empirical question. Therefore, with a theoretical and conceptual basis supporting the treatment of siblings as interdependent dyads, subsequent dyadic analyses were applied to all variables.

Next, actor-partner models, which accounted for the interdependence of study variables, were employed to determine the relationships between specific predictors (i.e., tendency to compare, warmth, conflict, relative status/power) and the dependent variable, perceived sport competence. Each variable was standardized prior to analysis. Actor and partner effects of an indistinguishable model were explored to determine if an individual's comparison tendency influenced their own, and their paired sibling's sport competence perceptions. Results revealed no significant actor or partner effects.

Subsequent dyadic models were evaluated to determine if the relationship between the tendency to compare, markers of relationship quality, and perceived sport competence were using birth position (i.e., younger or older sibling) as a distinguishable characteristic within the dyad. A significant three-way interaction was found between birth position, comparison tendency, and sibling warmth, $t(75) = -2.11$, $p < .05$ (see Figure 1). Younger siblings with a greater tendency to make sibling comparisons and higher warmth perceptions reported higher sport competence perceptions. All other simple slopes were not significant. Investigation of the potential three-way interaction of gender, comparison tendency, and relationship quality, did not reach significance, $t(75) = -1.92$, $p<.05$.

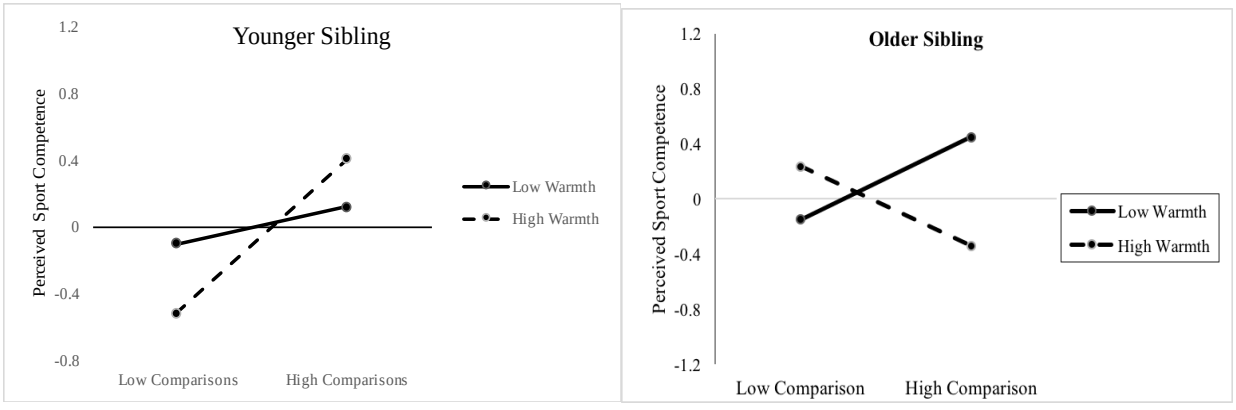


Figure 2. Birth Position by Comparison Tendency by Sibling Warmth Interaction Predicting Perceived Sport Competence.

Discussion

The purpose of the current study was to examine the association between sibling-based sport comparisons, sibling relationship qualities, and perceived sport competence. Our first hypothesis was that the overall tendency to make sibling-referenced comparisons would be significantly associated with sport competence perceptions in the sibling dyad. Though a body of literature posits social comparisons as integral features in developing perceptions of competence for youth (e.g., Horn & Hasbrook, 1987; Horn & Weiss, 1991) the utility of a sibling comparison target was not directly supported. This may be explained, in part, by better understanding the internalization process, contrast and assimilation effects, and the use of proxies for self-evaluations.

The proposed internalization process that would occur from frequent interactions with one's sibling may be dampened in sport settings. With the exception of twins, each individual in the sibling dyad is typically exposed to a different social setting created by his or her team. For example, when youth participate in practices and competitions, their setting consists of teammates, opponents, and coaches. Interactions with these proximal social agents may be the basis from which perceived sport competence is derived. This increased exposure to peers and coaches has the potential to reduce the internalization of sibling-based behaviors, norms, and evaluations. Further, the separation created by participating on different teams may implicitly highlight discrepancies in ability. These discrepancies may foster contrast effects, whereby the individual identifies and bases comparisons on being different from one another. Moreover, Festinger's social comparison theory suggests that as the perception of differences between siblings increases there is less likelihood of inferring competence beliefs based on the interactions with a sibling.

Our second hypothesis was predicated on the potential moderation of an individual's comparison tendency and perceptions of sport competence by markers of the relationship quality (i.e., warmth, conflict, and power) between siblings. Sibling warmth was expected to strengthen the relationship between sibling comparisons and perceptions of sport competence. Siblings seen as companions were believed to serve as sources of information to enhance one's own perceived sport competence. Sibling conflict was expected to dampen the relationships between sibling comparisons and perceptions of sport competence as relationships high in conflict would lead to less time spent together, lower opportunities for internalization, and increased contrast effects leading to lower perceived sport competence. No formal hypotheses were proposed for sibling power/status, instead sibling power/status was observed to better understand its contribution to sibling sport competence beliefs.

In support of our hypotheses regarding sibling warmth and conflict moderators, correlations were in expected directions. Sibling warmth was associated with an increased tendency to compare with one's sibling, and increased levels of sibling conflict were associated with a lower tendency to compare. Actor-partner interdependence modeling was conducted using both an indistinguishable and distinguishable member design. The indistinguishable design allowed for the assessment of moderation without the effect of birth position (i.e., older or younger sibling). The distinguishable design accounted for the effect of birth position and its potential influence in the model. When dyadic moderation analyses were conducted using a distinguishable member design sibling warmth significantly moderated the association between comparison tendency and perceived sport competence. Follow up analyses suggested that for younger siblings, high comparison tendency and sibling warmth predicted higher levels of

perceived sport competence. This three-way interaction demonstrated partial support for our second set of hypotheses concerning the influence relationship markers.

The collective influence of comparison tendency and sibling warmth on perceived sport competence for younger siblings supports our pervious contentions that warmer relationships would facilitate comparisons for self-improvements and self-enhancements. One possible explanation for the lack of support of this finding for older siblings is the psychosocial changes that occur to the individual and the broader family unit as an individual approaches and goes through adolescence. Savin-Williams and Berndt (1990) have suggested that interactions with one's family generally decrease over time as children approach adolescence. During this same period, there is a general increase in emphasis placed on peer relationships. Therefore, it is plausible that the prominence of peers may have surpassed that of familial relationships our sample of older siblings (M_{age} = 10.9 years). In contrast, for younger siblings (M_{age} = 8.5 years) the importance of other social relationships has yet to transcend that of family relationships.

Future empirical pursuits should continue to explore the contributions siblings make to sport experiences of young athletes and address limitations of the current study. Studies adopting developmental designs are needed to better understand how social relationships change over time (Horn, 2004). For instance, future empirical endeavors should aim to further understand the potential function of age in the use of sibling-based comparisons for competence information. Adopting developmental designs to identify when siblings are influential in forming perceptions of sport competence would provide researchers and families more detailed information regarding the importance of familial relationships in sport experiences of youth.

Additionally, investigating how social relationships (e.g., peer relationships, sibling relationships, coach relationships) combine and predict perceived sport competence of youth

would highlight the social environment where youth engage is sport behaviors. Examining a range of social relationships would further our understanding of how different relationships exert distinct forms of influence, which shape sport experiences of youth (Ullrich-French & Smith, 2006). Of note, the present investigation was conducted at one point in time. Studies designed to assess changes associated with sibling relationships in the physical domain over time are needed to better understand how this relationship develops and influences the sport experiences of youth. While our findings demonstrate how the sibling relationship may influence sport competence perceptions, a logical area for future investigation would be sibling contributions to motivation in the physical domain. Lastly, further investigating sibling constellation (e.g., sex-composition) variables will highlight the differences among siblings and allow researchers to better understand characteristics of siblings that potentially influence sport experiences.

With these limitations and potential avenues for future investigations, the current study makes important contributions to the sport and exercise psychology literature. Our primary contribution focuses on how sibling relationships inform youth experiences in physical activity. Demonstrating the influence that siblings have on the development of competency beliefs in sport provides an initial step to understanding how sibling relationships shape sport experiences of youth. Additionally, by using a dyadic design to account for the interdependence of data, support was found suggesting the salience of sibling comparisons in forming perceived sport competence for younger siblings. Overall, the findings support the need for continued investigation designed to understand the importance of sibling relationships to youth and their sport experiences.

CHAPTER 4: STUDY THREE

A Developmentally Informed Examination of Sibling Relationships and Perceived Sport Competence

Sibling relationships possess a variety of characteristics that have been explored by scholars. For example, researchers have previously investigated structural or constellation characteristics such as age differences, birth order, and dyad sex composition (Riggio, 2000; 2006). Additionally, features of sibling relationships that may be more difficult to observe have been examined, such as the amount of parental attention, sibling conflict, modeling, and deidentification (Brody, 1998; Buhrmester & Furman, 1990; Whiteman & Christiansen, 2008). While each characteristic contributes to the uniqueness of sibling relationships, there has been limited investigation of the setting in which these relationships operate. Sport is rarely considered when examining sibling relationships. Sport provides a context to observe siblings in a competitive and comparison-laden environment, one offering the opportunity for youth to gauge their competence. These perceptions of competence are influential concerning the emotions and motivated behaviors to sustain physical activity involvement (Weiss & Ebbeck, 1996). Therefore, the aim of the current study was to better understand the association between sibling comparisons in sport and physical competence perceptions.

A number of theories have been developed to explain motivated behaviors, with many emphasizing perceived competence as a core contributor (Weiss & Amorose, 2005). Youth with higher perceptions of competence in a particular domain will be more motivated to participate in that domain, will work harder to become more competent, and will enjoy their participation more. In contrast, children with low perceptions of competence will exhibit low motivation, persistence, and enjoyment (Weiss, Ebbeck, & Horn, 1997). Given the importance of perceived

competence to understanding motivated behavior and well-being, researchers have examined how children form competence perceptions in a host of achievement domains (e.g., social, academic, and physical). These researchers have attempted to identify the particular types of information youth use to judge their competence.

Harter's (1978; 2002) competence motivation theory informs research on children's selection of competence information sources. She contends that mastery attempts in a specific domain, and their subsequent successful or unsuccessful outcomes, are subjected to both internal and external evaluations. Internal evaluations are based on sources of information that reside within the individual, such as the amount of effort exerted, achievement of self-set goals, or attraction toward an activity. External evaluation is primarily embedded in the feedback and reinforcement offered by significant others and through social comparisons. Therefore, adaptive development involves the internalization of performance standards, and this process, in part, depends on well-functioning social relationships in achievement settings.

In sport and physical activity settings, a wide array of information sources exists that youth use to form competence perceptions, spanning environmental sources and personal criteria (Weiss et al., 1997). Environmental sources of information include social evaluation by peers, coaches, and parents; comparison to peers; and performance-based criteria, such as game statistics or outcomes of an event. Personal criteria that youth may rely on for competence information include self-improvement, perceived effort, ease of learning a new skill, and attraction to or enjoyment of an activity. Though sources of information coexist in sport and physical activity settings, considerable variation in preference or dependence upon these criteria has been observed (Horn, Glenn, & Wentzell, 1993; Horn & Hasbrook, 1987; Horn & Weiss, 1991; Weiss, et al., 1997). Specifically, preference for adult feedback declines from middle to

late childhood, and in turn, preference for peer comparison and evaluation increases during late childhood to early adolescence. Moving past early adolescence, self-referenced criteria such as the degree of self-improvement, achievement of self-set goals, and attraction to physical activity become more preferred. Altogether, youth who are approaching and beginning to go through adolescence heavily rely on competence information provided by others, which typically is operationalized as parents, peers, and coaches.

There are several reasons to expect sibling interactions to contribute to the development and internalization of competence beliefs in the physical domain (Gamble, Yu, & Card, 2010). First, siblings spend a great deal of time engaged in shared activities and come to know each other very well, establishing an intimate bond. This translates into opportunities for engaging in play, for emotional and instrumental support, and for disagreements (Howe, 2011). Second, there are substantial differences in sibling relationship qualities (i.e., sibling warmth and conflict), which are in turn linked to the kinds of interactions observed between children. Examining sibling relationship qualities more closely, researchers have suggested that warmth and conflict are not simply the opposite ends of a continuum but can coexist to give children a variety of experiences (Dunn, 1994; McGuire, McHale, & Updegraff, 1996). Both warmth and conflict in sibling interactions have been linked to youth development (Howe, 1991; Youngblade & Dunn, 1995). For example, internalizing information from a sibling is likely to occur when the relationship is warm, characterized as caring, positive, and supportive. In warm sibling relationships, positive messages are expected to occur more often and be more readily embraced than harsh or negative messages. The expectation of prosocial behaviors in warm sibling relationships should lead to more positive self-perceptions (Gamble et al., 2010). Moreover, if a sibling relationship is characterized as warm, the information gathered from domain specific

interactions (e.g., academics, social, and physical) should become more salient. On the other hand, in a hostile or negative relationship the information gathered from sibling interactions may not be readily internalized into self-perceptions (Gamble et al., 2010). Finally, age differences between siblings can result in different expressions of their relationship, which change the dynamics of both cooperation, conflict, and comparisons between siblings (Dunn & Plomin, 1990; Jensen, Pond, & Padilla-Walker, 2015). Extending these findings to the physical domain, one may expect sibling relationships to operate in a similar manner.

Social learning mechanisms such as modeling and social comparison may explain sibling influence in the development of sport competencies (Samek & Rueter, 2011; Whiteman et al., 2007). According to social learning theory (Bandura, 1977), individuals learn new behaviors and norms from observing (i.e., modeling) and comparing themselves to others around them. Children routinely observe the standards and behaviors of not only parents, but also siblings (Bandura, 1991; Brim 1958). Most research grounded in social learning theory suggests that by virtue of their everyday interactions, siblings promote both positive and negative developmental outcomes through modeling and abundant interactions (McHale, Updegraff, & Whiteman, 2012).

Several conditions facilitate internalization of information from modeled behaviors (Bandura, 1977; Whiteman et al., 2007). First, the model must attract the attention of others. One way to attract attention is through frequent interaction. Due to the large amount of time that siblings spend with one another, brothers and sisters can serve as potentially salient models (McHale & Crouter, 1996). Possessing appealing qualities such as nurturance or compassion also attracts attention. Younger siblings have been shown to engage in more shared activities with older siblings that are compassionate compared to those that are seen as hostile (Furman & Buhrmester, 1985). Alternatively, if sibling interactions are considered negative or conflictual

there is a decreased likelihood for the siblings to spend time together, and less opportunity for modeling to occur (Gamble et al., 2010).

Motivation to learn and perform a behavior also facilitates internalization of modeled information. Siblings can be a source of motivation through direct and vicarious reinforcement (Miller, 2011). Through direct interactions with their older siblings, youth learn behaviors and outcomes that can be immediately reinforced. Through vicarious reinforcement, younger siblings observe their older siblings' behaviors and attend to what outcomes are reinforced by peers, parents, and others. By extension, this positions older siblings to play a significant role in younger siblings' development of new skills and competencies in the physical domain.

Social learning theorists additionally emphasize the process of change over time. As a function of age, individuals develop physically, socially, and cognitively (Miller, 2011). Physical maturation over time allows for reproducing more complex behaviors. As a child becomes older they are additionally exposed to an exponential number of social environments, behaviors, and encounter numerous models. Experience with the social world prompts interpersonal development through interactions with others, learning new behaviors, and the appropriate settings for those behaviors. These interactions with the social world become more complex and demanding as the child ages and new expectations for behavior are imposed. Over time, individuals' cognitive development allows them to better understand their social world, behavior expectations, and judge their ability to interact competently with their environment (Miller, 2011). Collectively, these factors demonstrate the importance of age in developing competency beliefs, but also stress the salience of interactions with social agents.

Previous work suggests that the sibling relationship associates with perceptions of competence in the physical domain for a younger sibling (Study 2). Specifically, our results

suggested that younger siblings who have a higher tendency to compare and perceive the relationship with an older sibling to be warmer report higher perceptions for sport competence. There are two possible interpretations for this finding. First, in line with previous work (Horn et al., 1987; Horn et al., 1993; Weiss et al., 1997), it is plausible that our subsample of younger siblings (M_{age} = 8.5 years) had not reached an age where sources of competence information beyond the family had become prominent. An older sibling would therefore be a meaningful source of information because of the limited number of information sources. Alternatively, having a sport-involved older sibling may be a valuable source of competence information for a younger sibling, regardless of the presence of additional sources of competence information. That is, one's position as a younger sibling is more salient to this finding than age. Building on previous work, the purpose of the current study was to explore the associations of sibling-based sport comparisons, sibling relationship qualities, and perceived sport competence, with specific consideration of participants of ages ranging from middle-to-late childhood through early adolescence. We pursued this aim using both traditional and supplemental person-centered analyses.

In our traditional analysis, we hypothesized that a greater tendency to make sibling-based sport comparisons would be associated with higher sport competence perceptions. This association was also hypothesized to differ in magnitude as a function of sibling relationship qualities and age. Our hypothesis was grounded in the assumption that siblings are salient comparison targets for internalization processes that can shape perceptions of sport competence. Sibling warmth was expected to associate with higher perceived sport competence, as this quality is linked to greater interactions and allows for more constructive comparisons. Sibling conflict was expected to associate with lower perceived sport competence due to fewer interactions and

opportunities for internalization. Greater age was expected to tie with weaker associations among predictor variables and perceived sport competence, as older participants would have a broader range of potentially salient competence information sources than younger participants. Sibling role modeling and shared activities were also examined given their ties to sibling relationship qualities and competence internalization processes, with parallel hypotheses regarding moderation by age.

Supplemental analyses, adopting a person-centered (i.e., ideographic) approach to sibling relationships in the physical domain, were conducted because they may augment our understanding of the experiences of young athletes with siblings. As previously outlined, sibling relationship qualities are intertwined and do not exist on a single continuum (Dunn, 1994; McGuire et al., 1996). Therefore, specific configurations of relationship qualities may have an impact on the nature and types of interactions between siblings, resulting in different experiences in physical activity settings. Comparison tendency was used as a third clustering variable because comparisons tend to be especially influential in close relationships (Tesser, 1988). Researchers have outlined two possible experiences of comparing with a close other. First, comparisons with a more successful target has the potential to be particularly distressing and be related to relational conflict. Siblings may envy that their older brother or sister is better at sports, or a leader amongst peers. Alternatively, individuals may respond more positively when their comparison target outperforms them or has desired qualities (Pinkus, Lockwood, Schimmack, & Fournier, 2008). When individuals are close or compassionate with their comparison target, they may include the target as part of their own identity (Aron, Mashek, & Aron, 2004), taking on the partner's characteristics and perspectives. To the extent that one takes on the target's perspective, an individual may empathize and experience the other's successes

and failures as their own. Therefore, comparisons to a sibling may prompt individuals to interpret the comparison in ways that protect their relationship. For example, individuals may choose to focus on the benefits of the comparison for the partner rather than the self-evaluative costs to themselves. As a result, comparisons to an older sibling may be linked to positive outcomes.

Based on sibling relationship quality and social comparison literatures, distinct profiles were expected to exist and differentially relate to perceptions of sport competence, sibling role modeling, and shared activities, respectively. We hypothesized that profiles expressing relatively higher sibling warmth would show higher reports of perceived sport competence, modeling, and shared activities. Profiles expressing relatively higher conflict were expected to show lower reports on these variables. Profiles relatively high or low on both warmth and conflict were expected, but no hypotheses were forwarded as to how such profiles would link to reports of perceived competence, modeling, and shared activities. Lastly, similar to our earlier hypothesis, we expected profiles expressing higher warmth and comparison tendencies to be linked to higher reports of perceived sport competence.

Method

Participants

Participants consisted of 207 (97 girls, 110 boys; $M_{age} = 10.5 \pm 1.58$ years) sport-involved younger siblings. To be included in the sample the younger sibling was required to be 8 to 13 years old and to have an older sibling within four years of age. This sample was targeted to gain insight on youth self-perceptions during a developmental period akin to identity formation, newfound cognitive abilities, and changing social connections and expectations (Gamble et al., 2010). If multiple older siblings were within four years of age, the sibling closest in age to the

participant was identified as the older sibling referent in the study. Table 5 contains a summary of demographic information on the participants.

Table 5
Demographic Information (N = 207)

Target Child Sex	53.1% Male
Sibling Sex	69.9% Male
Ethnicity	87.4% Caucasian
Living Situation	91.8% Live with both Parents

	Minimum	Maximum	Mean *(SD)*
Age	8	13	10.50 (1.58)
Sibling Age	9	17	13.00 (1.61)
Birth order	2	8	2.56 (0.94)
Number of Siblings	1	7	1.92 (1.16)
Sport Seasons	1	33	7.56 (4.94)
Sport Involvement	0	25	8.65 (5.46)
Sibling Sport Involvement	1	30	11.04 (5.78)

Procedures

Following approval from the Institutional Review Board participants were recruited from youth recreational sport leagues and tournaments. Local recreational sport leagues were contacted about the potential involvement of their participating families in the proposed study. Upon receiving league consent, coaches and teams were contacted. After coordinating with individual teams that provided consent for recruitment the primary researcher met with families at a team meeting or event location to discuss the purpose of the study. If interested in participating, parent consent and child assent was obtained and then children were asked to complete a questionnaire packet tapping variables of interest. Parents were asked to provide information regarding the general sport involvement of the participating child and their next oldest sibling. If a family expressed interest in participating in the study but could not complete

the questionnaire packets during the initial meeting, a later data collection session was scheduled. Upon completion of the measures, families were thanked and children were provided with a modest token of appreciation (i.e., t-shirt, poster, pencils).

Measures

Demographic Information. Demographic information regarding gender, ethnicity, birth year, parental marital status, and sport participation (e.g., identify primary sport, length of participation) were collected.

Perceived Sport Competence. The sport competence subscale of the Child and Youth Physical Self-Perception Profile (CY-PSPP: Eklund, Whitehead, & Welk, 1997; Whitehead, 1995) was used to measure participants' perception of athletic ability. The CY-PSPP consists of 36 items regarding youth physical self-perceptions and tapping six specific sub-domains: Global Self-esteem, Physical Self-worth, Sport Competence, Body Attractiveness, Physical Strength, and Physical Conditioning. Each sub-domain is measured using six, four-point structured alternative items. Participants are asked to identify which of two statements bests describes themselves and then to mark whether the statement is "kind of true" or "really true" for them. An example item from the CY-PSPP was, "Some kids do very well at all kinds of sports, BUT, Other kids don't feel that they are very good when it comes to sports." Each item is scored from one to four, with higher scores indicating greater beliefs of competence. The general measure and specific subscales have previously demonstrated good reliability and validity for use with young children (Eklund et al., 1997). In Study 2 and the current study the sport competence scores of the CY-PSPP have shown marginal internal consistency ($\alpha = .68$; $\alpha = .52$, respectively). Therefore, in addition to the sport competence subscale of the CY-PSPP, the sport competence subscale from the Physical Self-Description Questionnaire (PSDQ; Marsh, 2002)

was used. This subscale consists of six items rated on a 6-point Likert scale where participants respond to statements with; “False”, “Mostly false”, “More false than true”, “More true than false”, “Mostly true”, and “True”. An example item from the PSDQ was, “Most sports are easy for me.” Scores on this measure demonstrated good internal consistency reliability (α = .79) and therefore this measure was utilized throughout the study analyses.

Sibling Relationship Qualities. Relationship qualities were assessed using the sibling positivity and sibling conflict subscales of the Sibling Relationship Inventory (SRI: McHale, 1992). The 12 items were used to measure the nature of a child’s relationship with his or her older sibling. Sibling warmth and conflict items are rated on a 5-point Likert scale ranging from “never or hardly at all” to “always”. An example warmth item was, “What about doing nice things like helping or doing favors for your sister/brother? How often do you do these kinds of things?” An example of a conflict item was, “How often does your sister/brother get mad or angry with you?” Higher scores on the individual dimensions are associated with higher perceptions of the specific relationship quality. Both sibling warmth (α = .72) and sibling conflict (α = .72) scores demonstrated acceptable internal consistency reliability.

Social Comparisons. Sport-based sibling comparisons was measured using the Iowa-Netherlands Comparison Orientation Measure (INCOM: Gibbons & Buunk, 1999). The INCOM consists of 11 items tapping the tendency to make ability and opinion comparisons. Original items of the INCOM were modified to measure the tendency to make sibling-based sport comparisons. For example, “I often compare myself with others with respect to what I have accomplished in life.” was modified to, “I often compare myself with my sibling with respect to what I have accomplished in sport.” Items were rated on a 5-point Likert scale ranging from “I strongly disagree” to “I strongly agree”. Higher scores correspond to a higher tendency to

compare with one's sibling in sport. Internal consistency of scores on the modified comparison measure was found to be acceptable in the current study (α = .75).

Modeling and Shared Activities. The Sibling Influence Scale (Whiteman et al., 2010; Whiteman et al., 2007) consisted of five items tapping role modeling and three items tapping shared activities. These items were modified to refer to the sport setting. For example, the modeling item, "My brother/sister sets an example for how to behave.", was modified to "My brother/sister sets an example for how to behave in sports." An example shared activities item, "My brother/sister includes me in his/her activities away from home.", was modified to "My brother/sister includes me in his/her sports away from home." Response options fell on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree". Modeling demonstrated good internal consistency reliability (α = .83), whereas shared activities scores showed marginal internal consistency (α = .65). Item analyses of the shared activity measure showed that deletion of items would offer minimal gains in internal consistency. Thus, no items are dropped and findings related to this measure should be interpreted with caution.

Data Analysis

Data screening and descriptive analyses were conducted in line with recommended best practice (e.g., assessment of missing values, univariate and multivariate outliers, normality, etc.; see Tabachnick & Fidell, 2013). Hierarchical multiple regression analyses (Cohen & Cohen, 1983) were conducted to examine main effects and interactions of age, sibling relationship, and comparison tendency variables predicting perceived sport competence, sibling role modeling, and shared activities, respectively. Predictor variables were grand mean centered before calculating interaction products to address lack of scale invariance and multicollinearity of lower and higher order terms (Aiken & West, 1991). The predictor variables included age, sibling

relationship indices (warmth, conflict), and comparison tendency and the interactions among them. The regression analyses consisted of four steps. Age, sibling warmth, sibling conflict, and comparison tendency variables were entered in the first step. Two-way, three-way, and four-way interactions were entered in the second, third, and fourth steps, respectively. To address whether the addition of interaction terms to the model added to prediction of the outcome variable, change in R^2 was examined. Significant interaction terms were graphed with high and low scores created at one standard deviation above and below the mean (Aiken & West, 1991), and were interpreted by assessing significance of simple slopes and by visual inspection.

Cluster analysis was conducted to investigate potential profiles of sibling relationships in sport using the sibling warmth, conflict, and comparison tendency variables. A two-step process was used for determining the sibling profiles (Hair et al., 1998). First, hierarchical cluster analysis using Ward's linkage method and squared Euclidean distance as the similarity measure was conducted to provide insight to the possible number of clusters represented in the data. Second, k-means cluster analyses using simple Euclidean distance as the similarity measure were conducted with a researcher-specified number of clusters informed by the first step. Upon settling on the final solution, a z-score criterion of ± 0.5 was used to represent relatively high or low scores on clustering variables. Resulting profiles were then compared for differences on perceived sport competence, sibling role modeling, and shared activities using a two-way multivariate analysis of variance (MANOVA). Univariate follow-up tests (ANOVA and post hoc analyses) were conducted upon obtaining a significant multivariate finding.

Results

Descriptive Statistics

Means, standard deviations, and bivariate correlations for all study variables appear in Table 6. Participants reported near or above the midpoint on all variables of interest, indicating high perceptions of sport competence, moderate sibling warmth and conflict, and a tendency to compare with their sibling target. Analyses of variance (ANOVAs) revealed no significant gender differences on study variables.

Table 6

Descriptive Summary and Correlation of Variables

	1	2	3	4	5	6	7
1. Age	-						
2. Sibling Warmth	.02	-					
3. Sibling Conflict	-.15*	-.34**	-				
4. Comparison Tendency	.06	.36**	-.09	-			
5. Sibling Role Modeling	.00	.35**	-.24**	.47**	-		
6. Shared Activities	.15*	.42**	-.34**	.34**	.57**	-	
7. Perceived Sport Competence	.08	.16*	-.05	.19**	.10	.26**	-
Range	8-13	1-5	1-5	1-5	1-5	1-5	1-6
M	10.50	2.91	2.77	3.29	3.35	3.35	4.73
SD	1.58	.67	.76	.57	.84	.87	.75
Alpha	-	.72	.72	.75	.83	.65	.79

Notes: *p<.05, **p<.01

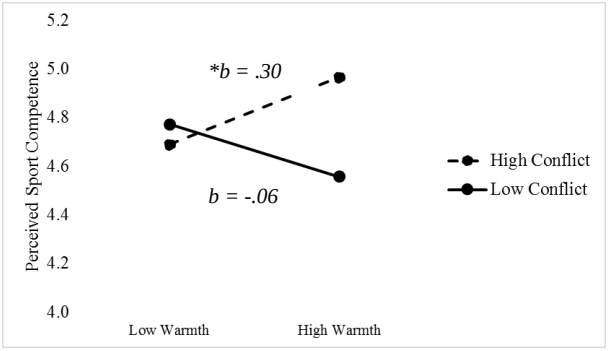
Of the demographic variables, number of seasons in sport was positively related to age (r = .30, p < .01), shared activities (r = .14, p < .05), and perceived sport competence (r = .18, p < .01). Also, age difference of siblings was positively related to sibling conflict (r = .14, p < .05), and negatively related to shared activities (r = -.14, p < .05).

Regarding the correlations between primary study variables, significant positive correlations were found between perceptions of sport competence and sibling warmth (r = .16, p < .05), comparison tendency (r = .19, p < .01), and shared activities (r = .26, p < .01). Significant positive relationships were found between sibling warmth and comparison tendency (r = .36, p < .01), sibling role modeling (r = .35, p < .01), and shared activities (r = .42, p < .01). Sibling warmth was also found to have a significant negative relationship with sibling conflict (r = -.34, p < .01). Significant negative correlations were found between sibling conflict and sibling role modeling (r = -.24, p < .01) and shared activities (r = -.34, p < .01). Significant positive correlations were found between comparison tendency and sibling role modeling (r = .47, p < .01) and shared activities (r = .34, p < .01). Significant positive correlations were found between age and shared activities (r = .15, p < .05), and negatively to sibling conflict (r = -.15, p < .05). A significant positive correlation was found between sibling role modeling and shared activities (r = .57, p < .01). Broadly, these associations were similar in magnitude and direction to findings outside of the physical domain (e.g., Cole & Kerns, 2001; Gamble et al., 2010; Senguttuvan, Whiteman, & Jensen, 2014).

Hierarchical Regression Analysis

For perceived competence, the first step of the hierarchical analysis was significant (F(4, 202) = 2.73, p < .05; see Table 7), explaining 5% of the variance. The main effect of comparison tendency was the only significant predictor (b = .19, p < .05) The second step of the analysis

revealed a significant two-way interaction between sibling warmth and sibling conflict, (b = .24, F (10, 196) = 2.03, p < .05), though the overall change in variance explained did not reach significance (ΔR^2 = .04, F(6,196) = 1.53, p = .17). Because we considered 4% additional explained variance to be meaningful, we plotted and tested the simple slopes (see Figure 3) while warning the reader to interpret the finding cautiously. A positive association was found between sibling warmth and perceptions of sport competence for those higher in sibling conflict (b = .30, SE = .13, p < .05) but not for those reporting lower sibling conflict (b = -.06, SE = .13, p > .05). Investigation of higher-order interaction terms in subsequent regression steps did not yield significant change in prediction of perceived sport competence.



Note. * p < .05

Figure 3. Sibling Warmth by Sibling Conflict Interaction

For role modeling, the first step of the hierarchical regression analysis was significant (F(4, 202) = 20.02, p < .01; see Table 8), explaining 28% of the variance. In line with our hypotheses, sibling warmth and comparison tendency were positively related to role modeling, whereas sibling conflict was negatively related to role modeling. Age was not significantly related to role modeling. Investigation of interaction terms in subsequent regression steps did not yield significant change in prediction of role modeling.

For shared activities, the first step of the hierarchical regression analysis was significant (F(4, 202) = 19.29, p < .01; see Table 9), explaining 28% of the variance. In line with our

hypotheses, sibling warmth and comparison tendency were positively related to shared activities, whereas sibling conflict was negatively related to shared activities. Age was not significantly related to shared activities. Investigation of interaction terms in subsequent regression steps did not yield significant change in prediction of shared activities.

Table 7

Summary of Hierarchical Regression Models for Variables Predicting Perceived Sport Competence (N = 207)

	Model 1			Model 2			Model 3			Model 4		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Intercept	4.73**	.05	.00	4.75**	.06	.00	4.74**	.06	.00	4.75**	.06	.00
Age	.04	.03	.07	.04	.03	.08	.05	.04	.11	.05	.04	.11
Sibling Warmth (SW)	.13	.09	.11	.12	.09	.11	.14	.09	.12	.14	.09	.12
Sibling Conflict (SC)	.01	.07	.01	.02	.07	.02	.02	.07	.02	.03	.08	.03
Comparison Tendency (CT)	.19*	.10	.15	.20*	.10	.15	.18*	.11	.13	.17	.11	.13
Age x CT				.00	.07	.00	.01	.07	.01	-.01	.08	-.01
Age x SW				.01	.06	.02	.02	.06	.02	.02	.06	.03
Age x SC				-.06	.05	-.09	-.06	.05	-.10	-.05	.05	-.09
SW x SC				.24**	.12	.14	.22	.12	.13	.23	.13	.14
CT x SW				.08	.14	.04	.07	.15	.04	.04	.16	.03
CT x SC				-.22	.14	-.12	-.22	.15	-.12	-.23	.15	-.13
CT x SW x Age							-.05	.11	-.05	-.06	.11	-.06
CT x SC x Age							.03	.10	.02	.03	.10	.03
CT x SW x SC							.04	.08	.04	.05	.08	.05
SW x SC x Age							-.08	.21	-.03	-.09	.21	-.04
CT x SW x SC x Age										-.09	.14	-.06
R^2		.05			.09			.10			.10	
F for change in R^2		2.73*			1.53			.27			.36	

*p <.05

**p <.01

Table 8

Summary of Hierarchical Regression Models for Variables Predicting Sibling Role Modeling (N = 207)

	Model 1			Model 2			Model 3			Model 4		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Intercept	3.35**	.05	.00	3.37**	.06	.00	3.37**	.06	.00	3.37**	.06	.00
Age	-.03	.03	-.05	-.03	.03	-.05	.00	.04	-.01	.00	.04	-.01
Sibling Warmth (SW)	.19*	.09	.15	.19*	.09	.15	.21*	.09	.16	.21*	.09	.17
Sibling Conflict (SC)	-.18*	.07	-.16	-.18*	.07	-.16	-.18*	.07	-.16	-.18*	.07	-.16
Comparison Tendency (CT)	.61**	.10	.41	.61**	.10	.41	.61**	.11	.41	.62**	.11	.42
Age x CT				-.08	.07	-.09	-.07	.07	-.08	-.07	.08	-.07
Age x SW				.06	.06	.07	.05	.06	.07	.05	.06	.07
Age x SC				.02	.05	.03	.02	.05	.03	.02	.05	.03
SW x SC				-.04	.12	-.02	-.04	.12	-.02	-.04	.12	-.02
CT x SW				-.03	.14	-.02	-.06	.15	-.03	-.06	.16	-.03
CT x SC				.25	.14	.12	.19	.15	.09	.19	.15	.10
CT x SW x Age							-.08	.10	-.06	-.07	.11	-.06
CT x SC x Age							-.13	.10	-.10	-.13	.10	-.10
CT x SW x SC							.07	.08	.07	.07	.08	.07
SW x SC x Age							.06	.20	.02	.06	.20	.02
CT x SW x SC x Age										.01	.14	.01
R^2		.28			.31			.31			.31	
F for change in R^2		20.02**			1.02			.57			.01	

*p<.05

**p<.01

Table 9

Summary of Hierarchical Regression Models for Variables Predicting Shared Activities (N = 207)

	Model 1			Model 2			Model 3			Model 4		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Intercept	3.35**	.05	.00	3.32**	.06	.00	3.33**	.06	.00	3.33**	.06	.00
Age	.06	.03	.10	.06	.03	.10	.05	.04	.09	.05	.04	.09
Sibling Warmth (SW)	.35**	.09	.27	.36**	.09	.27	.34**	.09	.26	.35**	.09	.27
Sibling Conflict (SC)	-.24**	.07	-.21	-.24**	.08	-.21	-.24**	.08	-.21	-.26**	.08	-.22
Comparison Tendency (CT)	.34**	.10	.22	.34**	.10	.22	.38**	.12	.25	.40**	.12	.26
Age x CT				-.04	.07	-.04	-.05	.07	-.05	.01	.08	.01
Age x SW				.02	.06	.03	.02	.06	.02	.01	.06	.01
Age x SC				-.01	.05	-.01	.00	.05	.00	-.02	.05	-.02
SW x SC				-.11	.13	-.05	-.08	.13	-.04	-.10	.13	-.05
CT x SW				.09	.15	.04	.09	.16	.04	.14	.16	.07
CT x SC				.11	.15	.05	.08	.15	.04	.11	.15	.05
CT x SW x Age							.02	.11	.01	.05	.11	.04
CT x SC x Age							-.11	.10	-.08	-.12	.10	-.09
CT x SW x SC							-.02	.08	-.01	-.04	.09	-.03
SW x SC x Age							.16	.21	.06	.19	.21	.07
CT x SW x SC x Age										.21	.15	.12
R^2		.28			.28			.29			.30	
F for change in R^2		19.29**			0.31			.65			1.95	

*p <.05

**p <.01

Cluster Analysis

Agglomeration coefficients resulting from the hierarchical cluster analysis suggested a potential four or five cluster solution. Subsequent k-means analyses were conducted specifying 3, 4, 5, and 6 clusters respectively and examined relative to redundancy across clusters, conceptual interpretability, and extant work on sibling relationship profiles (McGuire et al., 1996). The 4-cluster solution was deemed most interpretable and is reported here. Profiles that emerged from this solution were largely consistent with the structure proposed by McGuire and colleagues (1996). Table 10 contains the means, standard deviations, and standardized scores (also represented in Figure 4) for the sibling relationship variables by profile. Labels are assigned in the interest of helping the reader and are informed by the extant literature, however they are tentatively forwarded and do not necessarily represent absolute group characteristics.

Table 10
Means, Standard Deviations, and Standardized Scores for Sibling Relationship Profiles Resulting from k-Means Cluster Analysis

		Sibling Warmth		Sibling Conflict		Comparison Tendency	
Cluster	**n**	**M (SD)**	**z**	**M (SD)**	**z**	**M (SD)**	**z**
Hostile	76	2.27 (.35)	-.96	3.31 (.52)	.71	3.07 (.57)	-.38
Intense	42	3.34 (.43)	.65	3.21 (.42)	.58	3.17 (.41)	-.21
Low Conflict	45	3.06 (.46)	.22	1.87 (.38)	-1.20	3.11 (.36)	-.31
Harmonious	44	3.44 (.55)	.80	2.36 (.47)	-.55	3.96 (.32)	1.18

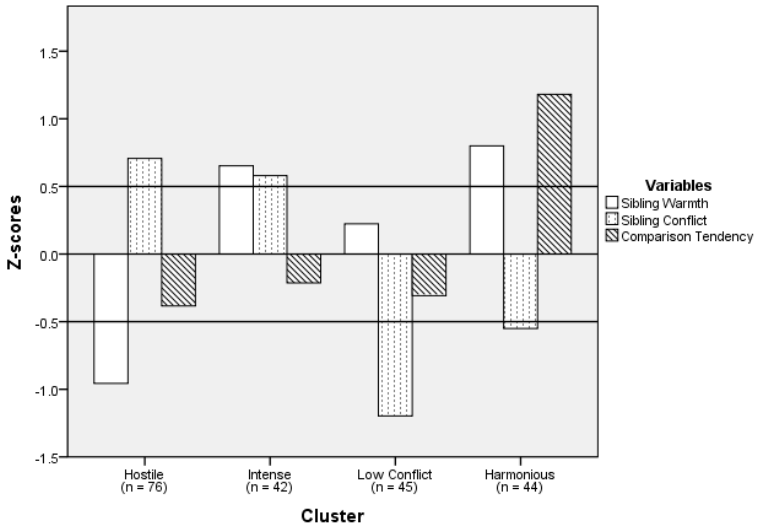


Figure 4. Four Cluster Solution of Sibling Warmth, Sibling Conflict, and Comparison Tendency

The first cluster (n = 76; 36.7%) was labeled the *Hostile* profile because respondents in this group reported relatively high sibling conflict and relatively low sibling warmth, while holding average comparison tendencies. The second cluster (n = 42; 20.3%) was labeled the *Intense* profile because respondents in this group were characterized by relatively high sibling warmth and sibling conflict. Respondents in the *Low Conflict* profile (n = 45; 21.7%) reported relatively low sibling conflict and held average perceptions of sibling warmth and comparison tendencies. Respondents within the *Harmonious* profile (n = 44; 21.3%) held relatively high perceptions of sibling warmth and comparison tendencies along with relatively low perceptions of sibling conflict. Chi-square analyses showed non-significant differences in sibling age difference (i.e., age gap between siblings), gender, and the siblings' gender composition (i.e., same-sex or mixed sex siblings) across profiles; $\chi^2(24) = 30.61$, $p > .05$, $\chi^2(3) = 3.00$, $p > .05$, $\chi^2(3) = 5.34$, $p > .05$ respectively.

A 2 x 4 MANOVA was conducted to examine possible age (i.e., younger, 8-10 yrs. old; older, 11-13 yrs. old) and sibling relationship profile differences on perceived spot competence, sibling role modeling, and shared activities. A significant main effect of sibling relationship profiles was observed (Pillai's trace = .28, $F_{9,597} = 6.87$, $p < .05$, $\eta_p^2 = .09$), whereas the age main effect was not significant (Pillai's trace = .02, $F_{3,597} = 1.21$, *ns*) and the age by sibling relationship profile interaction was not significant (Pillai's trace = .07, $F_{9,597} = 1.50$, *ns*). Follow-up ANOVAs revealed sibling relationship profile differences for all three dependent variables ($p < .01$; see Table 11). Post hoc comparisons ($p < .05$) were conducted to assess the nature of these differences (also see Table 11). Participants in the *Harmonious* cluster reported significantly higher perceptions of sport competence than those in the *Hostile* and *Low Conflict* clusters, but not the *Intense* cluster. Participants in the *Hostile*, *Intense*, and *Low Conflict* clusters were not significantly different from one another on perceptions of sport competence. For sibling role modeling, those in the *Harmonious* profile scored significantly higher than all other clusters. Additionally, those in the *Hostile* profile reported significantly lower sibling role modeling than those in the *Low Conflict* profile, but not the *Intense* profile. Participants in the *Intense* and *Low Conflict* profiles were not significantly different on sibling role modeling. Lastly, the same group differences observed for role modeling reports were also found for reports on shared activities.

Table 11

Univariate F, Effect Size, and Cluster Means, Standard Deviations and Standardized Scores for Dependent Variables

			Clusters							
			Hostile (n = 76)		Intense (n = 42)		Low Conflict (n = 45)		Harmonious (n = 44)	
Variable	$F_{3,199}$	η_p^2	M (SD)	Z	M (SD)	Z	M (SD)	Z	M (SD)	Z
Perceived Sport Competence	4.77**	.07	4.60 (.77)[a]	-.18	4.79 (.72)[ab]	.07	4.61 (.74)[a]	-.17	5.05 (.67)[b]	.43
Sibling Role Modeling	14.59**	.18	3.03 (.81)[a]	-.38	3.17 (.88)[ab]	-.22	3.49 (.69)[b]	.16	3.95 (.66)[c]	.70
Shared Activities	17.23**	.21	2.98 (.81)[a]	-.42	3.19 (.82)[ab]	-.18	3.44 (.80)[b]	.11	4.04 (.64)[c]	.79

Notes: *p <.05, **p <.01; LSD post hoc comparisons conducted for variables with significant univariate F . Cluster differences (p <.05) on variables indicated by non-shared superscripts (*a* representing the lowest value and *c* representing the highest value).

Discussion

The purpose of the current study was to explore the associations of sibling-based sport comparisons, sibling relationship qualities, and perceived sport competence, with specific consideration of participants of ages ranging from middle-to-late childhood through early adolescence. Our findings further support the substantial body of work suggesting that siblings influence development through the formation of competence beliefs in achievement domains, modeling, and engaging in shared activities (McHale et al., 2012; Whiteman et al., 2011). Given the central role that social comparisons play in the development of competence beliefs (Weiss et al., 1997) and the propensity for siblings to serve as comparison targets (Gamble et al., 2010), the contributions that sibling comparisons make in the physical domain warrant close examination.

Prior work focusing on social comparison theory suggests that some individuals are more likely to make comparisons than others, and relationship characteristics may foster and discourage such comparisons (Goethals & Darley, 1977; Suls et al., 2002). Overall, our findings were in line with these suggestions. Consistent with our expectations, siblings who reported higher sibling warmth made more comparisons with their older sibling. As suggested by previous social comparison literature, when younger siblings perceived that they had a higher level of compassion in their relationship, they may perceive themselves to be more similar with one another, and make more constructive or adaptive comparisons (Gamble et al., 2010; Mussweiler, 2003).

Social comparison theory further suggests that individuals may utilize both upward and downward comparisons. For instance, it is thought that individuals seek social comparisons with "worse-off" others when they have concerns regarding self-worth, or efficacy (e.g., Blanton,

Buunk, Gibbons, & Kuyper, 1999). However, they also seek comparisons with "better-off" others under conditions in which the desire for self-improvement is salient. Implicit in each of these comparison directions is the assumption that people choose different comparisons targets for different reasons. For example, younger siblings tend to ascribe higher power or status to an older sibling; therefore, we may expect that younger siblings will often utilize upward comparisons with a sibling in the physical domain (Buhrmester & Furman, 1990; Furman & Buhrmester, 1985; Gamble et al., 2010). A sport-involved older sibling is often more physically mature and experienced in sport settings, making for a "better-off" comparison target that a younger sibling can learn from. Additionally, witnessing a sibling succeed may increase the motivation of the younger sibling to improve (Blanton et al., 1999). While the present study did not examine the direction of sibling comparisons, the positive association between comparison tendency and perceived sport competence suggests comparisons were used for self-improvement. Future studies should target the direction of comparisons being made and their potential links to different sport experiences.

The findings further suggest that perceptions of sibling warmth inversely relate to reporting of sibling conflict. Often the sibling relationship is one of emotional intensity, so it is important to consider both warmth and conflict. The cross sectional, variable-centered approach of the initial analyses may not have captured these dynamic characteristics. Additionally, our findings suggest that sibling warmth was linked with higher perceptions of sport competence, sibling role modeling, and engaging in shared activities. As expected, these relationships were in opposite directions or unrelated with sibling conflict. An individual's propensity to compare with a sibling in sport was positively linked to sibling role modeling, participating in shared activities,

and perceptions of sport competence. These associations support our assumption that comparison tendency would be indicative of the internalization process, and an adaptive sibling relationship.

Beyond the descriptive patterns of our sample, we hypothesized that sibling-based social comparisons would predict youth athlete perceptions of sport competence. Consistent with our expectation, young athletes who had a higher propensity to engage in sport-based sibling comparisons reported higher sport competence perceptions. While this was a relatively small effect, our finding compares to effects obtained in work examining peer and parental contributions to competence perceptions (e.g., Ullrich-French & Smith, 2006). To advance our understanding of sibling contributions to perceived sport competence, the evaluation of sibling relationships in tandem with other social actors is needed. Such studies would demonstrate the potential (lack of) utility of sibling relationships while accounting for additional social interactions.

Counter to recent findings suggesting that sibling comparisons can lead to maladaptive outcomes (e.g., higher levels of depressive symptoms; see Jensen, Pond, & Padilla-Walker, 2015), it seems that sibling based comparisons in the physical domain lead to more adaptive outcomes. These findings support Mussweiler's (2003) contention that individuals with higher propensity to compare may be more likely to focus on similarities between themselves and the comparison target, which can develop adaptive relationships with the target.

While siblings provide a constant frame of reference for comparisons, the rationale of those comparisons may have meaningful implications. Proponents of social comparison theory suggest comparisons are generally made for three reasons: to determine rank to another, to bolster self-efficacy, and to learn new abilities (Festinger, 1954). Our findings suggest that in the physical domain, sibling-referenced comparisons are predominately used for adaptive outcomes

(e.g., boost self-efficacy, learn new skills). Though our measure of comparison tendency did not capture these potential differences, future work should aim to understand the potential motives underpinning comparisons in physical domain.

Central to our investigation was the hypothesis that age would influence how sibling-based sport comparisons associated with perceptions of competence, sibling role modeling, and shared activities. The findings suggest that age was not a significant contributor to these underlying associations. Therefore, a younger sibling's relationship with an older sibling in the physical domain holds distinct value across late childhood and early adolescence. Moreover, sport settings may provide an environment were sibling relationships remain salient as younger siblings approach and go through adolescence. These findings are in line with previous research (see Blazo et al., 2014) suggesting that younger siblings tend to perceive sport as a way to increase interactions with their older sibling by engaging in shared time together at sporting events (e.g., tournaments and travel games).

Previous findings related to changes in sibling closeness and conflict across childhood and adolescence have been somewhat discrepant. The present findings support Raffaelli's (1989) work showing a lack of age trends in how sibling relationship qualities are expressed. While the present findings demonstrate the utility of sibling relationship characteristics in the physical domain, they generally do not support previous work suggesting increases in cooperation and conflict (Vandell, Minnett, & Santrock, 1987), and declines in companionship (Buhrmester & Furman, 1991), between siblings across middle childhood through adolescence. The present investigation assumed a linear relationship between age and sibling-based comparisons, such that as children became older their sibling comparisons would wane in importance for competence information. In lacking support, our findings may suggest that sibling relationships in the

physical domain could be better understood as dynamic and fluctuating in importance. Future investigations should address how sibling relationships potentially change in discontinuous ways over time, and how these changes influence the physical activity experience of youth.

Why age was not a significant contributor to the underlying relationship between sibling comparisons and perceived sport competence might also be explained by the relative sport skills and physical maturation of siblings. Sibling relationships tend to become more egalitarian over time as the younger sibling becomes more physically, emotionally, and cognitively mature (Furman & Buhrmester, 1985; Buhrmester & Furman, 1990). As a younger sibling ages, the disparity in physical maturity between siblings is likely to diminish. This development on the part of the younger sibling may lend itself to increased comparisons with an older sibling because they are perceived as increasingly similar. Alternatively, a younger sibling could surpass the abilities of the older sibling, making the older sibling a less useful comparison target that others of higher ability. The present investigation did not target this developmental phenomenon, however this topic warrants further investigation. A younger sibling with advanced skills may no longer use the older sibling for self-improvement comparisons. This experience may elicit different interactions from the older sibling, who no longer occupies a position of superior status or power. This experience may foster maladaptive interactions between the siblings, and experiences of conflict and jealousy may become more prominent.

Along this same vein is the assumption that an older sibling offers comparative value for a younger sibling. The present findings support that sibling sport comparisons are important to younger siblings' perceptions of sport competence, but further assessing the skill level of an older sibling may shed light on the utility of making comparisons with an older sibling in sport. For example, if a younger sibling believes that the older sibling is not skilled at sports, the

comparative value of the older sibling for self-improvement would diminish. Alternatively, the comparative value for self-enhancement comparisons (i.e., bolster self-efficacy) may be in place. Future investigations should evaluate the comparison target's skill level as a way to better understand the types of comparisons being made.

Research on sibling modeling suggests that closer relationships between siblings are linked to greater modeling and similarity (Rowe & Gulley, 1992; Gamble et al., 2010). Inherent in these findings is that greater comparison occurs among siblings who have warm relationships. Differentiation has also been thought to be linked to better relationships as marked by less conflict (Schachter et al., 1976) but recent work notes that differentiation is actually linked to higher levels of sibling conflict (Whiteman et al., 2014), which may also be predicted by sibling comparisons. As suggested by Whiteman and colleague's (2014), modeling and differentiation are not necessarily polar opposites and many youth that engage in higher levels of comparison may be more apt to model their sibling and have warmer relationships, and others may differentiate and have more conflict.

Findings also suggested a significant interaction between sibling relationship qualities such that sibling warmth positively related to perceived sport competence for those reporting higher sibling conflict but not lower sibling conflict. While speculative, this intense emotion in the sibling relationship may highlight competitions in sport settings, but also reflect a willingness to learn and support one another's athletic development. This is similar to extant findings suggesting that affectively charged sibling relationships can lead to adaptive outcomes (Howe, 1991; Youngblade & Dunn, 1995). This finding is novel to the physical domain and may suggest that having an emotional relationship with a sibling in sport leads to an adaptive form of competition between siblings. These findings highlight the competitive nature of sport, with the

general provision that sibling relationships allow for perspective taking, modeling, and learning in an achievement context.

In addition to a traditional variable-centered approach, a person-centered approach was used to better understand the potential sibling relationship profiles that may exist in the physical domain. To our knowledge, this is the first cluster-analysis of sibling relationship profiles in sport. The clusters were based on sibling warmth, sibling conflict, and comparison tendency. These variables were selected to highlight the differential profiles that may be linked to various outcomes such as perceived sport competence, sibling role-modeling, and shared activities. By middle childhood, youth can reliably rate the degree of warmth and conflict in their sibling relationship. Researchers have previously used these reports to identify four types of sibling relationships: hostile (high conflict and low warmth) are the most negative, compared to affectively intense (high-warmth and high-conflict), harmonious (high-warmth and low-conflict), and uninvolved (low-warmth and low-conflict) relationships (McGuire et al., 1996).

The emergent profiles extended McGuire and colleague's (1996) previous findings to the physical domain. The profile differences exhibited medium to large effects (i.e., $\eta_p^2 = .07 - .21$), suggesting that the distinct expression of the sibling relationships has potential practical significance. For instance, individuals exhibiting a *Harmonious* profile have an adaptive sibling relationship that fosters perceptions of sport competence, sibling role modeling, and shared activities. While our measures did not investigate the rationale for comparisons (i.e., to determine rank, learn new skills, bolster self-efficacy), this profile was linked with higher reporting of comparisons and perceptions of sport competence suggesting that more constructive comparisons were being made.

Alternatively, the *Hostile* sibling relationship profile was associated with the lowest reporting on perceptions of sport competence, sibling role modeling, and shared activities. Although this profile appears to be maladaptive for younger siblings, it represented the greatest proportion of participants (36.7%). This profile personifies individuals that perceive a level of hostility that leads to less interactions between the siblings and is likely detrimental to the younger sibling's sport experience.

The *Intense* and *Low Conflict* profiles were statistically similar in their links to perceived sport competence, sibling role modeling, and shared activities. This is surprising given the profiles are expressed very differently. The *Intense* profile is characterized by relatively high ratings of both sibling warmth and conflict, but the *Low Conflict* profile expressed average sibling warmth and relatively low conflict. This suggests that sibling relationships can be expressed or experienced in alternative pathways, yet reach similar outcomes.

Consistent with the general aim of the present study, the interaction of sibling relationship profiles and age was investigated as they relate to a set of dependent variables (i.e., perceived sport competence, sibling role-modeling, and shared experiences). The age by sibling relationship profile interaction was not significant. These findings further suggest that age is not a contributing factor to the experience of sibling relationships in sport for younger siblings.

Despite the interesting findings, our study is not without limitations. First, because our data was cross-sectional we were unable to examine the direction of effects. This limitation is particularly important given the findings pertaining to sibling warmth and conflict. Sibling relationships unfold over time and without longitudinal data we were unable to fully understand the expression of sibling relationships. Moreover, the present investigation examined a limited age range (i.e., 8-13 years) developmentally. Previous investigations suggest that this age range

may be narrow concerning sport development (Côté, Baker, & Abernethy, 2003; Wylleman, Alfermann, Lavallee, 2004). Youth engagement in sport is characterized by sampling, specializing, and investment stages. These stages generally span from childhood to late adolescence. Therefore, the present sample is likely to consist of individuals at different stages of sport development. Additionally, our sample included only one sibling. Given our regression analyses were designed to further explore the role of age in sibling relationships in sport, the examination of sibling relationship profiles may benefit from also investigating profiles that exist for a paired older sibling. This would allow researchers to explore the potential implications of congruent and disparate profiles, and their links to individual outcomes. In addition, the expression of sibling relationships does not occur in a vacuum but are often influenced by other social interactions. The design of the current study did not take into account the probably impact that parents have on sibling relationships. Researchers are urged to continue to utilize a systems approach and to disentangle expression of sibling relationships, while also examining the role that parents play in shaping sibling interactions.

In conclusion, the current study makes multiple contributions to the literature regarding sibling relationships in the physical domain, and sibling-based sport comparisons. To our knowledge, this is one of the first studies to investigate sibling relationships in the physical domain and their association with sport-related constructs such as perceived sport competence. Additionally, this is the first examination of sibling relationship profiles in the physical domain, which were linked to differential perceptions of ability and overt behaviors often expressed by siblings (i.e., role modeling and engaging in shared activities). Collectively, our findings are insightful as they highlight a seemingly ubiquitous relationship that has apparent implications for youth sport experiences.

CHAPTER 5: GENERAL DISCUSSION

Extensive research has provided a better understanding of the contributions that families make to the physical activity experience of youth (e.g., Brustad, 1996, 2010; Côté, 1999; Partridge et al., 2008; Saelens & Kerr, 2008). Studying families as they operate in physical activity settings has allowed researchers to observe both positive and negative developmental outcomes (Brustad et al., 2001; Côté, 1999; Weiss & Raedeke, 2004). More specifically, this work has shown that families are instrumental in instilling physical activity habits across the lifespan. Families also act as gatekeepers to physical activity experiences as they provide and constrain opportunities for engagement. The family can also undermine positive physical activity engagement by fostering behaviors related to moral disengagement, and placing emphasis on winning instead of personal development. Altogether, this work has contributed to understanding the health and well-being in young people and warrants continued investment in the interest of developing effective health promotion strategies and well-functioning families.

The majority of work on families in the physical domain has focused on the role of parents. Siblings are integral actors within families, possessing shared life experiences, and engaging in meaningfully interactions that influence development (Howe & Recchia, 2014; Whiteman, McHale, & Crouter, 2007), making the study of their contributions in physical activity settings potentially valuable. The studies within this dissertation were designed to fill three notable knowledge gaps, including: (1) the absence of literature reviews regarding siblings in physical activity settings, (2) an understanding of sibling contributions to perceptions of sport competence, and (3) the potential role of age in the experience of sibling relationships and sport related outcomes.

The present dissertation aimed to fill these gaps by creating a comprehensive summary of the extant literature siblings in physical activity settings and by adopting developmentally-informed designs to further understand the contributions siblings make to perceptions of competence in sport. Collectively, the results of this dissertation provide a roadmap to the seemingly disjointed literature on siblings in physical activity, highlight the salience of sibling-based comparisons to youth sport experiences, and explored the importance of age relative to how sibling relationships are expressed in an achievement setting. The following discussion will summarize the findings of this dissertation project, while also sharing practical and theoretical implications for both child development and physical activity literatures. Lastly, important future directions will be suggested.

Addressing the first knowledge gap, Study 1 was designed to create a structured and concise summary of the published work pertaining to siblings in physical activity settings. The goals of this summary was threefold: (1) to provide a framework to understand literature across diverse samples and settings, (2) to provide greater understanding of the contribution siblings make to physical activity experiences, and lastly (3) to identify areas for researchers to pursue in the future. The resulting systematic review included fifty-nine published papers spanning a wide variety of research questions. Across these papers, five core themes were identified. First, the review suggests that in broad-based assessments of the family, the *presence* of siblings was associated with the engagement of more physical activity experiences and higher physical activity rates. Moreover, family member *participation* in physical activity leads to increased individual physical activity engagement. Second, sibling focused investigations yielded similar findings, but also highlighted the influence of birth order and time expenditures in structured and unstructured activities. These findings suggested that firstborns consistently engage in greater

levels of physical activity than their younger siblings. In addition, siblings were found to co-participate in more organized physical activity than any other family relationship. Third, sibling relationships in physical activity settings can lead to both positive and negative experiences. Positive experiences include pride, support, and encouragement, while negative experiences included jealousy, rivalry, expectations, and differential treatment. Fourth, the sex composition of sibling pairs has been often studied but lacks consistent findings. Lastly, researchers have compared sibling performance in sport (e.g., performance statistics) as well as investigated the experience of sibling comparisons. The findings consistently demonstrated that older siblings had longer, more successful sport careers, but the qualitative experience of comparisons varied. Overall, the review comprising Study 1 demonstrates that a foundation of literature exists pertaining to siblings in physical activity settings, but a coherent picture of sibling significance in physical activity is not evident. Additionally, persistent lines of research on siblings in the physical domain are not common. Thus, there is value in identifying lines of research that will make meaningful contributions to understanding the role of siblings in sport and physical activity.

A potentially important line of research would address sibling contributions to perceived competence in the physical domain, as competence perceptions are critical to motivated behavior and well-being (e.g., Horn, 2004; Weiss et al., 1997, Weiss & Amorose, 2006). Study 2 was pursued accordingly. Sport was targeted because it is an important setting of physical, social, and cognitive development (Fraser-Thomas, Côté, & Deakin, 2005; Weiss & Raedeke, 2004). Given the importance of significant others in the development of competence beliefs through processes such as performance comparisons and evaluative feedback, social comparisons between sport-involved siblings were investigated. In order to account for the variability in how sibling

relationships are expressed (Furman & Buhrmester, 1985; McGuire et al., 1996), relationship qualities were additionally investigated as potential moderators of how sibling-based social comparisons inform perceptions of competence. With aims to understand both actors in a sibling relationship, sibling dyads were utilized which allowed for the modeling of potential interdependence in sibling relationships. Sibling-based sport comparisons and sibling warmth predicted perceptions of sport competence for younger siblings, but not paired older siblings. This finding provided initial support for sibling contributions to perceptions of sport competence while also motivating the assessment of age as a potentially influential component of how sibling relationships contribute to sport experiences.

Study 3 was designed as a developmentally-informed extension of Study 2 where focus was placed on the potential role of age in explaining younger siblings' use of sibling-based comparisons to inform their perceptions of sport competence. Given that the social environments of young people flourish as they approach and go through adolescence, Study 3 assessed if the significance of sibling relationships persisted or waned in influence across late childhood and early adolescence. The results suggested that age was not a contributing component to sibling sport comparisons. Additionally, support was found for the affective nature of sibling relationships where individuals experiencing higher levels of both sibling warmth and conflict were related to higher sport competence perceptions. While speculative, the findings may suggest that sibling relationships in the physical domain may be characterized by expressions of companionship and support that transform competitive experiences into learning experiences for siblings.

Additionally, a person-centered approach was adopted to investigate the potential existence of sibling relationship profiles based on sibling warmth, sibling conflict, and

comparison tendency. Similar to extant literature (McGuire et al., 1996), four distinct sibling relationship profiles were found. The four profiles were characterized as *Hostile* (high warmth, low conflict, average comparisons), H*armonious* (high warmth, low conflict, high comparisons), *Low Conflict* (low warmth, low conflict, average comparisons), and *Intense* (high warmth, high conflict, average comparisons). These initial profiles were characterized by differential outcomes associated with sport competence perceptions, sibling role modeling, and shared activities. These differences were of low to medium effect size, suggesting possible practical significance. Of the four profiles, the *Harmonious* profile resulted in more adaptive outcomes (i.e., relatively higher perceived sport competence, role modeling, and shared activities) while the *Hostile* profile resulted in poorer outcomes (i.e., relatively lower perceived sport competence, role modeling, and shared activities). Interestingly, the *Intense* and *Low Conflict* profiles were expressed differently, but did not have meaningful differences on the associated outcome variables. Exploring the role of age in sibling sport relationship profiles further supported our finding that age was not a significant contributor to youth experiences in sport.

Importantly, the core finding of Study 2 that sibling warmth ties with an enhanced relationship between sibling sport comparisons and perceived sport competence was not replicated in the traditional analyses within Study 3. However, the person-centered analyses in Study 3 identified a profile that demonstrated a similar pattern of associations. Specifically, the *Harmonious* profile expressed high warmth and high comparison tendency, which was associated with the highest reporting of perceived sport competence. Failing to replicate this previous finding across both analytic strategies may suggest that a sibling warmth by comparison tendency interaction is not a robust finding. Alternatively it is possible that the use of different measures of perceived sport competence and sibling warmth across the studies explains the lack

of replication in the traditional analyses. As future investigations on this topic are conducted, the weight of the evidence can be examined as to the persistence of this finding.

The studies comprising this dissertation highlight the importance and extend understanding of several key areas in child development and youth physical activity literatures. Due to various fields contributing to the study of family relationships, interdisciplinary investigations have become increasingly prevalent. The present body of work is in line with this trend, and is situated at the intersection of developmental psychology, sport and exercise psychology, and motivation-based literatures. This position allows the present dissertation to extend our understanding of sibling relationships in multiple disciplines (e.g., psychology, physical activity, child development; Weiss, 2008).

Over time, research pertaining to family and child development has been informed by a number of different theoretical perspectives (e.g., family systems theory; bioecological perspective; conflict theory; for a review see White & Klein, 2008). Family systems theory (Bowen, 1978) was of particular interest in the present dissertation. Family systems theory posits that the members of a family are interdependent, such that the behavior of one member impacts other members of the family. Our focused investigation of the sibling sub-system is in line with the general tenets of family systems theory, while extending the application of family systems theory to physical activity contexts. Additionally, our work assesses the inherent interdependence of sibling relationships to better understand the mutual influence siblings have on one another.

Further assessment of the sibling sub-system highlights links to the internalization of competence information. Developmental work by Harter (1999) suggests that youth utilize an internalization process, whereby the individual comes to own evaluations of his/her personal

judgments about the self. This process is predicated on interactions with social agents, which lead to incorporating the opinions of significant others into personally held views of the self. Research has primarily focused on the role of parents in the internalization process (Aronfreed, 1969; Harter, 1999). The present work extends our knowledge of the development of self-perceptions by suggesting that siblings are meaningful agents of internalization. Specifically, our findings further support Harter's (1999) finding that compassionate or warm relationships lead to self-perceptions that are more readily internalized and positive. This provides further depth to our understanding of the social world that youth engage in, and the importance of significant others in the development of self-perceptions.

Research on youth self-perceptions in achievement domains has suggested that an individual's self-perceptions and their skills, abilities, and competencies link to performance, behavior, and well-being (Horn, 2004). Sport and exercise psychology researchers have previously sought to understand the sources of information that youth use to make self-evaluations of their abilities. These sources include social feedback, comparisons, personal standards, and performance outcomes (e.g., Horn & Hasbrook, 1987; Weiss et al., 1997). The present work further supports comparisons as sources of self-evaluative information. Novel to this area is the finding that sibling sport comparisons made meaningful contributions to sport competence perceptions. For many families, siblings possess unique characteristics that cannot be recreated by others. Similar to parents, siblings can be caretakers, teachers, models, enforcers, but also have shared experiences and resources with a relatively small age difference. Similar to peers, siblings can be close in age, have shared interest, are companions, and confidants. But siblings are nonvolitional, interminable, and have shared family experiences. Therefore, siblings are social agents that serve as lifelong companions, have many shared experiences, and shape the

proximal environment where youth develop. These examples of how a sibling is similar, yet distinct from parents and peers, provide a backdrop for their contributions to physical self-perceptions and physical activity behaviors.

The present dissertation has additional implications for understanding motivational processes and well-being in physical activity settings. The relationship between perceived competence and motivation in sport is not new to social sciences. Harter's conceptualization of competence motivation explains that individuals are motivated in achievement domains (e.g., sport and physical activity) to demonstrate competence (Fox, 1997; Harter, 1978). Many researchers have tested her competence theory and have shown that those who are high in physical competence will be more motivated to participate in sport or physical activity. Our findings suggest that siblings may be instrumental in developing competence perceptions, therefore serving as a facilitating relationship to be active.

Social relationships are central to motivation processes (e.g., Deci & Ryan, 1985; Harter, 1978; Nicholls, 1984). Proponents of self-determination theory (SDT; Deci & Ryan, 1985) posit that to achieve adaptive forms of motivation relatedness, competence, and autonomy needs must be fulfilled. Prior research utilizing SDT has primarily focused on the role of parents, peers, and coaches in facilitating the fulfillment of these psychological needs in sport (e.g., Amorose, 2003; Cox, Duncheon, McDavid, 2009; Hodge & Lonsdale, 2011, Reinboth, Dude, & Ntoumanis, 2004; Ullrich-French & Smith, 2006). Our work suggests a plausible extension to sibling contributions in self-determined forms of motivation. While not directly examined in the present studies, our findings suggest that siblings can serve as meaningful sources of competence information.

In addition to these theoretical implications of the present work, practical implications should be considered. The present study was designed to be largely exploratory, as sibling relationships generally have not been studied in the physical domain. The dissertation purposes were driven by theory and largely operate at the intersection of developmental psychology, child and family development, and sport and physical activity. Although a long-term goal is to have a positive impact on youth physical activity experiences through a greater understanding of relationships in sport settings, there was no intent for the present study to have direct applications. It would be premature to formulate practical interventions based on the present dissertation. This noted, it is fair to speculate that fostering sibling warmth and providing opportunities for shared activities may foster perceived sport competence.

The links between social comparisons and youth perceptions of sport competence enhance our understanding of competence motivation (Fox & Corbin, 1989; Harter, 1978; 2002; Weiss et al., 1997). Competence motivation suggests that individuals are motivated in achievement domains (e.g., physical activity) to demonstrate competence (Fox, 1997; Harter, 1978). Additionally, this theory involves the internalization of performance standards, and emphasizes well-functioning social relationships as salient sources of competence judgments. Though this dissertation cannot provide definitive evidence to justify siblings as the most important sources of competence information, applications aimed at fostering positive sibling relationships should lead to more adaptive experiences in sport across late childhood to early adolescence.

Also evident from the third study was the potential practical significance of the *Harmonious* profile. This profile, characterized by relatively higher sibling warmth and comparison tendencies, along with relatively low sibling conflict, was associated with highest

scores on perceived competence, modeling, and shared activities. Strategies aimed at fostering this profile among siblings may be of specific interests to parents. Given that parents play a pivotal role in shaping sibling interactions, one method to promote a *Harmonious* profile concerns the cultivation of an adaptive motivational climate. Parents emphasizing mastery involvement in sport and play within their household may foster more adaptive sibling relationships as tied to sport. Alternatively, parents that foster ego involvement may exacerbate sibling conflicts (Keegan, Harwood, Spray, & Lavallee, 2009; White, 1996).

Another strategy to foster *Harmonious* relationship profiles centers on how parents intervene during sibling conflicts. While some parents may adopt a hands-off approach to sibling conflicts, parents that intervene and stress perspective taking and reasoning foster more harmonious sibling relationships (Perlman & Ross, 1997). Helping siblings understand one another's feelings and thoughts allows for a deeper relationship to be developed.

While the current dissertation makes meaningful contributions to the study of siblings in physical activity settings, limitations were present. First, across the present studies the data gathered was from samples unrepresentative of all sibling dyads. The samples consisted of primarily White youth from two parent households. Lacking a diverse sample may have resulted in findings uncharacteristic of different ethnicities and family structures.

The use of cross-sectional designs limited the conclusions that could be made. Previous investigations have established that sibling relationships are dynamic and typically fluctuate in their affective expression over time (Brody, 1998; Buhrmester, 1992; Cicirelli, 1995). Therefore, following siblings across the transition from late childhood to adolescence would be particularly informative as there is limited information on family relationships and sources of competence information in sport across this transition.

It is important to note that cluster analysis is a "data driven" technique that explores structures within a given data set (Hair et al., 1998; Johnson & Wichem, 2002). Cluster analysis provided a useful tool to address the exploratory question of whether profiles of sibling relationships existed in sport. The identification of groups, or profiles, emerged from the present *sample.* As such, the profiles do not necessarily represent profiles that exist outside of the sample. Generalization of results from this analysis should be viewed with this in mind.

Additionally, studies were designed to specifically attend to perceptions of competence in sport. Perceived competence was identified because of its central role in motivation-based theories and its links to well-being within and outside of physical activity (Biddle, 1997; Elliot & Dweck, 2005; Wang & Biddle, 2001). While the present studies enrich our understanding of perceived sport competence by incorporating sibling relationships, there are numerous other psychosocial outcomes in sport warranting attention (e.g., sport enjoyment, social support, differential treatment, stress).

The present investigations supported the use of sibling-based sport comparisons as meaningful sources of competence information in the physical domain, yet we were unable to explore the reasoning for these comparisons. Proponents of social comparison theory posit that comparisons are made to determine rank, learn or enhance abilities, and reinforce self-efficacy. Our measure of sibling comparisons emphasized tendency to compare with a sibling in sport rather than reasons that underpin comparisons.

The investigation of sibling relationships captures subsystem interactions in a larger, more complex system. Therefore, the present studies did not account for the reciprocal influence of other family members (Minuchin, 1985). Additionally, the family system is believed to be an open system with permeable boundaries, such that family members can both influence and be

influenced by their environment (Davis & Cicchetti, 2004). Therefore, youth should be studied with reference to their interactions with one another, family members, and other social actors in their proximal environment. Therefore, the next logical step in advancing our understanding of sibling relationships in physical activity settings is to simultaneously examine multiple relationships (i.e., peers, parents, coaches) within theory-informed research designs. Pursuing designs that investigate multiple relationships would help determine if siblings are uniquely important in predicting perceived sport competence or other psychosocial outcomes. Indeed, it is possible that sibling relationships are not especially salient when considered in the broader context of social relationships that exist in sport and physical activity contexts.

Lastly, the third study of the present dissertation utilized an individual's perspective to depict their relationship with a sibling (Study 3). Given our specific aim was to further understand a younger sibling's perspective of their sibling relationship, being able to examine the older sibling's perspective may also be insightful. This would allow researchers to explore the potential implications of congruent and disparate relationship reporting, and their link to individual outcomes.

There are numerous avenues that researchers can pursue to better understand sibling relationships in sport and physical activity. Indeed, our examination of sibling sport experiences has raised more questions than answers. Future investigations of siblings in physical activity settings should address the presented limitations, and advance novel research questions.

Given our initial assumption that age would be impactful to the association between sibling comparisons, sibling relationship qualities, and perceived sport competence was not supported, further understanding of birth position is needed. Previous literature examining sibling relationships across middle childhood and adolescence suggests that there is no uniform

trajectory to how sibling relationships are experienced (Kramer, 2010; Kramer & Gottman, 1992). For example, Kim and colleagues (2006) studied sibling relationships over time and suggested that siblings experience their relationship differently, such that younger siblings generally report more intimacy, regardless of age, while older siblings report higher incidences of conflict in early adolescence. Further exploring the different experiences of sibling relationships in sport relative to being the younger and older sibling warrants investigation.

Additionally, stemming from the present work, researchers may be further interested in understanding sibling relationships and their links to additional experiences in sport. Though the present study examined the association between sibling sport comparison, relationship qualities, and perceived sport competence, we were limited in exploring additional psychosocial outcomes in sport. To better understand the implications of sibling relationships in sport researchers should examine additional adaptive (e.g., self-determined motivation, sport enjoyment, leadership behaviors) and maladaptive outcomes (e.g., burnout, differential treatment) in sport.

A more detailed understanding of the rationale underpinning comparisons made in sport will further enrich our understanding of competence information sources. The present findings suggest a relation link to comparisons, such that an individual's comparison tendency was associated with the sibling warmth they experience. Therefore, the comparisons being made between siblings may be indicative of a closer relationship leading to a willingness to make constructive comparisons (Mussweiler, 2003). Researchers interested in further understanding social comparisons in the physical domain should attend to the relationship, or lack thereof, between the individuals.

As previously outlined, the present studies examined a single sub-system within the larger family unit. This allowed for focused examination of how sibling relationships inform one

another's sport experience but failed to account for the influence of other social actors within the family. Researchers are urged to further utilize a systems approach to understanding sibling relationships in the context of parents, and parent-child relationships (Bowen, 1978; Cox, 2010; Minuchin, 1985). This line of investigation will allow researchers to better understand sibling interactions while accounting for additional family relationships.

When examining the sibling relationship researchers should acknowledge, and possibly address, potentially interdependent data. As with much relationship research, interdependence of data often exists yet is rarely examined. For example, perceptions of sibling relationships are not only based on an individual's understanding of the relationship but also include their interpretations of the relationship with their partner, and their beliefs regarding the partner's understanding of the relationship (Cook & Kenny, 2005; Kashy, Jellison, & Kenny, 2004). Therefore, the investigation of relationships should not be solely based on an individual but ideally include the perceptions of multiple actors. By gathering data from multiple sources, such as the target individual, their peer, their sibling, and their parents, would provide a holistic depiction of significant relationships.

Collectively these dissertation studies substantially contribute to our understanding of siblings in the physical domain. First, the systematic review provides a concise summary of the extant literature pertaining to siblings and physical activity. Given that the majority of sibling-referenced investigations in the physical domain focus on physical activity levels, our understanding of psychosocial outcomes associated with sibling interactions is limited. This review makes apparent the current pockets of knowledge that occupy sibling research in the physical domain while also making suggestions regarding research questions warranting further investigation. Next, the second and third dissertation studies make contributions to our

understanding of sibling interactions in sport contexts by adopting theoretically- and developmentally-informed designs. These studies were informed by both family systems theory (Bengston & Allen, 1993; Bowen, 1978; Minuchin, 1985) and the recommendations of physical activity researchers to use developmentally-informed perspectives to understand the thoughts, perceptions, and experiences of physical activity (Weiss & Bredemeier, 1983; Weiss & Raedeke, 2004). Along with the systematic review, these studies provide a foundation to stimulate additional research on siblings in the physical domain that has meaningful implications for quality youth sport and physical activity experiences.

APPENDICES

APPENDIX A

Data Extraction and Article Summaries

Table 12 Data Extraction and Article Summaries

Study ID	Sample	Basic Design	Key Sibling Variable	Physical Activity Outcome of Interest	Measure	Key Results
1. Abel & Kruger (2007)	312 sets of MLB Baseball Brothers	Archival	1. Birth Order	1. Batting Avg. 2. Career length	Archival performance statistics	1. First borns were found to be high achievers 2. Older brothers had higher batting averagers
2. Atkin, Johnson, Force, & Petrie (2013)	~1500 youth	Longitudinal	1. Number of siblings in home	Physical Activity Level	1. Accelerometery 2. Demographic questinnaire	1. Small increases in sedentary time observed in children with more siblings
3. Ayvazoglu, Oh, & Kozub (2006)	6 Children with varying degrees of vision impairment 6 siblings without impairments 6 males 6 females	Mixed method	1. Impaired child PA 2. Sibling PA	Physical Activity Levels	1. Parent Interviews 2. Child Interviews 3. Accelerometers	1. Sibling physical activity at moderate to vigorous levels occurred 11-53% of the time when the child with visual impairment was active.
4. Bagley, Salmon, & Crawford (2006)	1.215 youth (296 - 5-6 year olds, 919 - 10-12 year olds) and their parents	Cross-sectional	1. Sibling PA 2. Sibling presence 3. Number of siblings	Physical Activity Levels	1. Uni-axial accelerometers 2. Family demographics 3. Television viewing	1. Girls with siblings had higher physical activity levels compared to only-child families. 2. Overall, having siblings was related to higher levels of physical activity and lower levels of television time.
5. Barnett (1984)	106 preschool children	Cross-sectional	1. Number of siblings 2. Birth order	Playfulness	1. Lieberman's Playfullness scale 2. Family structure questionnaire	1. Males in larger families were rated as being more playful 2. Females from large families were rated as being less playful 3. Male children with more sisters exhibited more playful behaviors

Table 12 (cont'd)

Study ID	Sample	Basic Design	Key Sibling Variable	Physical Activity Outcome of Interest	Measure	Key Results
7. Bean, Fortier, Post, & Chima (2014)	N/A	Literature Review	None	Effects of youth sport on siblings	None	1. Siblings are an understudied but influential social agent within sport contexts. 2. Siblings facilitate positive experiences in sport (e.g., social support, companionship) but also contribute to negative experiences (e.g., rivalry, competition).
8. Blazo, Czech, Carson, & Dees (2014)	10 Siblings of college athletes 4 Male 6 Female	Cross-sectional and Retrospective	1. Birth order 2. Age gap 3. Sex composition	Physical activity experience	Phenomenonogical interviews	1. Participants reported comparions with their elder siblings 2. Social expectations are placed on younger siblings 3. Having a gifted sibling in sports led to numerous benefits 4. Prolonged family interaction because of sport participation 5. Envy was a common experience of younger siblings
9. Cislak, Safron, Pratt, Gaspar, & Luszczynska (2012)	18 systematic reviews (375 quantitative articles)	Literature Review	1. Sibling PA	Physical activity participation	Literature Review	1. Positive relationship between sibling physical activity participation and individual physical activity levels.
10. Cleland, Timperio, Salmon, Hume, Telford, & Crawford (2011)	540 youth (190 - 5-6 year olds; 350 - 10-12 year olds) Males = 256 Females = 284	5 Year prospective cohort study	1. Sibling PA 2. Sibling co-participation in PA	Physical Activity Level	1. Survey (created for study) 2. Accelerometer	Girls weekend MVPA was directly related to sibling co-participant in physical activity
11. Cook et al. (2014)	555 adolescents Approximately 280 males Mean age = 14.4 years	Longitudinal	1. Sibling social support 2. Sibling role-modeling	Physical activity level	1. Psychosocial questionnaire tapping: social support, modeling, and physical activity intentions 2. International Physical Activity Questionnaire (IPAQ)	1. Greater support from a sibling resulted in higher physical activity levels 2. High perceieved levels of modeling by a sibling increased levels of physical activity from baseline to follow-up

Table 12 (cont'd)

Study ID	Sample	Basic Design	Key Sibling Variable	Physical Activity Outcome of Interest	Measure	Key Results
12. Côté (1999)	15 individuals from 4 families Fathers/Mothers: 3/4 Age: Not Reported Athlete/Sibling: 4/4 (gender unclear) Age: >18	Qualitative Interviews	N/A - Sibling interview included in design	Family influence on talent development in sport	N/A	Siblings were sited as a source of encouragement in sport. Older siblings were seen as role-models for sport commitment. Alternatively, siblings were also a source of bitterness and jealousy.
13. Crawford et al. (2010)	301 Children (10-12 years old) at 3 time points	Longitudinal	1. Sibling PA	Physical Activity Levels	1. BMI 2. Built environment 3. Demographic information (SES, parental education, etc.) 4. Accelerometery	1. For males and females, having siblings was positively related to MVPA levels
14. Davis & Meyer (2008)	10 same-sex sibling athletes	Cross-sectional	1. Interviews about competing against a sibling	Sibling competition experience	Interviews	1. Sibling competition was different from non-sibling competition. 2. Athletes reported differences in their affective responses, level of emotional involvement, and amount of cooperation. 3. A variety of family constellation variables contributed to the aforementioned differences, both supporting and refuting previous literature on sibling relationships in daily life and sibling relationships in sport. 4. Participants reported the presence of concurrent positive and negative functions within their sibling athlete relationships. 5. Participants described the presence of both rivalry (e.g., motivation to beat sibling) and closeness

Table 12 (cont'd)

Study ID	Sample	Basic Design	Key Sibling Variable	Physical Activity Outcome of Interest	Measure	Key Results
15. Davison (2004)	202 middle school children (110 males, 92 females).	Cross-sectional	None	Identifying sources of physical activity support	1. Activity Support Scale (developed for study), 2. Children's Physical Activity Scale 3. The physical activity subscale of the Physical Self Description Questionnaire	1. Siblings were identified as a significant source of support. 2. Highly active children reported high sibling support. 3. Support from a brother was associated with higher physical activity levels in boys. 4. Both brother and sister support increased physical activity in girls.
16. Duncan, Duncan, Strycker, & Chaumeton (2004)	930 siblings nested within 371 families - 371 target chilren, 559 siblings 51.7% Female Mean Age = 12.2 years	Cross-sectional - Multilevel Linear Modeling	1. Child reports of sibling PA 2. Paretn reports of sibling PA 3. Sibling PA support	Physical Activity Level	1. Target child and Parent PA Questionnaire 2. Target child and Parent Support Questionnaire	Demographic factors at the individual level contributed little to explaining differences in youth physical activity. Older siblings participated in more physical activity than younger siblings, which is contrary to typical findings that physical activity decreases with age, particularly during adolescence. Higher levels of family support were related to higher levels of sibling physical activity. Siblings in higher income families and those in single-parent families had higher levels of physical activity.
17. Duncan, Duncan, & Strycker (2005)	372 youth (M.age = 12.05 years) 50.3% female	Cross-sectional	None	Types of social support in youth sport and physical activity	1. Questionnaires targeting: physical activity, social support, and demographic information	1. Higher levels of physical activity were reported when friends, parents and siblings watched the target child engage in physical activity.
18. Eaton, Chipperfield, & Singbeil (1989)	7,018 families	Longitudinal	1. Birth order	Physical acitvity participation	1. Questionnaires gathered demographic and physical activity information	1. Birth-order and activity levels were negatively related (later-borns were less active). 2. Activity level decreased across successive birth positions for both infants and preschoolers but not for 7-year-olds.

Table 12 (cont'd)

Study ID	Sample	Basic Design	Key Sibling Variable	Physical Activity Outcome of Interest	Measure	Key Results
19. Ebihara, Ikeda, & Myiashita (1983)	1,182 youth (623 males, 559 females) Ages not given	Cross-sectional	1. Birth order	Socialization agents into sport	1. Demographic information 2. Fixed alternative survey regarding socialization to sport	1. Younger siblings were reported as reinforcers of older born sport involvement. 2. Older borns were reported as role-models for socialization to sport for younger siblings.
20. Flowers & Brown (2002)	140 sibling athletes Mean Age = 20.5	Cross-sectinal	1. Birth order	Experience of anxiety in sport	1. Competitive State Anxiety Inventory-2 2. Demographic questionnaire to gather sibling constellation variables.	1. Firstborns reported significantly higher levels of cognitive and somatic state-anxiety
21. Fraser-Thomas, Côté, & Deakin (2008)	20 Swim participants (10 dropouts, 10 currently engaged) Mean age = 16.4 years - dropouts, 18.3 years - engaged	Cross-sectional	None	Sport dropout experience	Interviews	1. Participants that had dropped out from sport reported sibling rivalry as a reason for dropout. 2. Alternatively, siblings were generally reported as having a positive influence.
22. Gledhill & Harwood (2014)	4 adolescent soccer players	Cross-sectional	None	Talent development experience	Interviews	1. Soccer brothers were both positive and negative influences on talent development in soccer.
23. Gomes et al. (2014)	2,661 Portuguese Families 10,644 Individuals	Cross-sectional	1. Sibling physical activity	Dyadic resemblence of physical activity	1. Baecke physical activity questionnaire	1. Intra-generational dyads (sibling dyads) had greater physical activity similarity than inter-generational dyads (parent-child dyad)
24. Greendorfer & Lewko (1978)	95 children (67 male, 28 female) Aged 8-13	Cross-sectional	1. Sport socialization	Sources of socialization to sport	1. Questionnaire developed to assess active sport involvement and significant other influence	1. Parents, rather than siblings, were reported as having significant influence over children of both sexes.
25. Hohepa, Scragg, Schofield, Kolt, & Schaaf (2007)	3,471 high school students (12-18 years old)	Cross-sectional	1. Siblings encouragement	1. Physical activity encouragement	1. Questionnaires targeting demographics, physical activity, perceived encouragement	1. The importance of encouragement from parents, siblings, friends, and schools on physical activity is dependant on the time-specific activity examined. I

Table 12 (cont'd)

Study ID	Sample	Basic Design	Key Sibling Variable	Physical Activity Outcome of Interest	Measure	Key Results
26. Huppertz et al. (2014)	5,095 twins (18-50 years old)	Cross-sectional	1. Examing the potential for exercise behaviors to be heritable	Exercise behaviors	1. Physical activity questionnaire 2. Perceived benefits of exercise questionnaire	1. Found support for exercise attitudes and behaviors being heritable
27. Krombholz (2006)	1,194 preschoolers	Cross-sectional	1. Sibling presence	1. Sport participation 2. Physical abilities	1. Motor skill battery	1. Children with older sisters or brothers performed better than only or firstborn children 2. Children who participated in sports activities outside school outperformed those who did not.
28. Kusy (2009)	1,652 males (10-15 years old)	Cross-sectional	1. Number of siblings	1. Physical activity level	1. Motor skill battery 2. BMI 3. Physical Activity Questionnaire	1. LTPA frequency and duration were very similar regardless of the number of siblings. 2. Somatic parameters and motor fitness level were significantly different depending on the number of siblings.
29. Landers (1970)	102 college students (56 physical education majors, 146 education majors	Cross-sectional	1. Sex composition 2. Birth order	1. Sport participation	1. Sport participation	1. Neither sibling sex composition or birth order significantly predicted sport participation
30. Loucaides, Plotnikoff, & Bercovitz (2007)	1398 urban adolescents 1,290 rural adolescents	Cross-sectional	1. Sibling physical activity	1. Athletic competence 2. Self-efficacy 3. Godin Physical Activity Questionnaire	1. Godin Leisure-Time Exercise Questionnaire 2. Questionnaire packet used to assess variables of interest (e.g., athletic competence, self-efficacy, etc.)	1. Sibling physical activity levels were correlated with participant's physical activity level. Sibling physical activity did not vary across the two locations
31. Maia, Gomes, Trégouët, & Katzmarzyk (2014)	2,661 Portuguese Families 10,644 Individuals	Cross-sectional	1. Sibling physical activity	1. Physical activity levels	1. Baecke physical activity questionnaire	1. Sibling sex differences did not exist in physical activity behaviors 2. Sibling physical activity levels were similar, possibly explained by similar school/Physical education routines.

Table 12 (cont'd)

Study ID	Sample	Basic Design	Key Sibling Variable	Physical Activity Outcome of Interest	Measure	Key Results
32. Martin-Matillas (2011)	2,260 adolescents 1,157 males 1,103 females	Cross-sectional	1. Sibling physical activity	1. Physical activity levels	1. Physical activity questionnaires (authors do not distinguish if using validated measures)	1. Older brothers' physical activity level were associated with male participant physical activity levels. 2. Any significant others' (e.g., brother or sister) physical activity level was associated with female participant activity levels.
33. Martin-Matillas et al. (2011)	3007 survey participants 2200 accelerometery participants	Cross-sectional	1. Family member physical activity encouragement	1. Physical activity levels 2. Physical activity encouragement	1. International Physical Activity Questionnaire for Adolescents 2. Accelerometery	1. Family member physical activity encouragement positively correlated with actual physical activity levles
34. Martin-Matillas et al. (2012)	3,288 adolescents	Multi-Location, Cross-sectional	1. Family members physical activity and encouragement	1. Physical fitness 2. SES	1. Questionnaire packet developed to assess variables of interest	1. Family member physical activity engagement was positively related to cardiorespirtory fitness 2. Mother and sister physical activity engagement was positively related to higher muscular strength
35. McMinn et al. (2011)	2071 children (990 male, 1081 female)	Cross-sectional	1. Number of siblings	1. Physical activity levels	1. Demographic information 2. Accelerometery 3. Questionnaire developed to gather information on 11 family and home environment factors	1. Number of siblings showed no overall association with physical activity levels of children. 2. When examined by ethnicity, there was a significant positive association between number of siblings and physical activity levels in White Europeans.
36. McMinn, Griffen, Jones, & van Sluijs (2013)	1,608 children (9-10 year olds)	Cross-sectional Year 5 data used from a larger longitudinal study	1. Number of siblings in household	1. Physical activity levels	1. Questionnaire developed to gather information on 21 family and home environment factors (1 sibling factor) 2. Accelerometery	1. Weekend MVPA was positively associated with number of siblings in the household
37. Milošević & Veskovic (2013)	203 youth 111 young athletes 92 non-athletes	Cross-sectional	1. Family participation in physical activity	1. Family sport participation	1. Questionnaires developed to assess familial activity levels	1. Significant difference were found regarding sibling participation in sport between the ahtlete and non-athlete samples

Table 12 (cont'd)

Study ID	Sample	Basic Design	Key Sibling Variable	Physical Activity Outcome of Interest	Measure	Key Results
38. Ramanathan & Crocker (2009)	6 adolescent females (10-15 years old)	Cross-sectional	1. Family influence on activity behaviors	1. Understanding how family and culture influence activity participation	Focus group interviews	1. Fathers and brothers were reported as having the most influential activity patterns.
39. Raudsepp & Virra (2000)a	475 adolescents (13-15 year olds)	Cross-sectional	1. Familial activity levels	1. Particiapnt physical activity level	1. 7 Day PAR 2. Questionnaire regarding demongraphic and familial characteristics	1. Physical activity of older brothers was positively related to participant activity levles
40. Raudsepp & Virra (2000)b	375 adolescents (13-14 year olds)	Cross-sectional	1. Sibling physical activity levels	1. Physical activity levels	1. 7 Day PAR	1. Males physical activity was significantly related to fathers and brothers 2. Females physical activity was significantly related to sibling moderate intensity activity
41. Robbins, Stommel, & Hamel (2008)	206 middle school students 105 males 101 females	Cross-sectional	1. Social support of physical activity	1. Sources of social support 2. Physical activity participation	1. Questionnaire used to identify sources of social support and type of social support provided 2. Self-report physical activity participation	1. Boys were more likely to identify fathers than sisters for social support 2. Older girls were less likely than younger boys and girls to name brothers as sources of support 3. Students who selected peers and sisters had more minutes of physical activity
42. Rønbeck & Vikander (2011)	350 cross-country skiers	Cross-sectional	1. Sibling influence on talent development	1. Correlates of talent development	1. Questionnaire developed to investigate sibling and peer development of athletes	1. Athletes attributed athletic development to their siblings that participated in the same sport.
43. Sallis, Prochaska, & Taylor (2000)	108 studies	Meta-analysis	1. Sibling physical activity level	1. Physical activity levels	NA	1. Sibling activity level is positively related to adolescent physical activity levels
44. Schnike et al. (2010)	Wikwemikong Unceded Indian Reserve Community	Cross-sectional	NA	1. The role of the family in sport engagement	Interviews	1. Family members, including siblings were expected to share the responsibilities of having youth continue to participate in sport

Table 12 (cont'd)

Study ID	Sample	Basic Design	Key Sibling Variable	Physical Activity Outcome of Interest	Measure	Key Results
45. Seabra, Mendonça, Thomis, Malina, & Maia (2008)	3352 Portuguese youth (10-18 year olds)	Cross-sectional	1. Sibling physical activity levels	1. Physical activity levles of significant others	1. Physical activity questionnaire	1. Sibling physical activity was associated with adolescent physical activity
46. Seabra, Mendonça, Thomis, Malina, & Maia (2011)	3352 Portuguese youth (10-18 year olds)	Cross-sectional	1. Sibling physical activity levels	1. Physical activity levels	1. Physical Activity Questionnaire 2. Included questions about sibling, peer, and parent physical activity.	1. Adolescents were more likely to participate in high-physical activity if mother and siblings were reported as having high-physical activity levels.
47. Seff, Gecas, & Frey (1993)	841 members of the US Parachute Association Members	Cross-sectional	1. Birth order	1. Leisure time participation in dangerous sports	1. Questionnaires used to assess if birth order was linked to participation in dangerous sports	1. The general finding of empirical research about birth order and dangerous sports and leisure activities suggests that first-born children are least likely to participate in such activities and later-born children are rnore likely to participate in dangerous sports and leisure activities.
48. Senguttuvan, Whiteman, & Jensen (2014)	Adjacent siblings from 326 families	Cross-sectional	1. Sibling relationship qualities	1. Exercise behaviors	1. Surveys were used to assess sibling relationships, parent-child relationships, and health behaviors	1. Sibling intimacy was related to healthy attitudes and greater exercise behaviors 2. Sibling conflict was associated with increased risk of being overweight.
49. Sulloway & Zweigenhaft (2010)	24 studies Included 700 MLB brothers	Meta-analysis	1. Assessed differences between younger and older siblings on baseball performance	1. Statistics associated with baseball performance	N/A	1. Younger siblings were approximately 10.6 times more likely to attempt stealing bases in baseball. 2. Younger siblings were also 3.2 times more likely to succeed in stealing bases than their older sibling. 3. Younger siblings were also found to have higher batting averages.
50. Trent & Spitze (2011)	Approx. 11,149 respondents 19 years or older	Cross-sectional	1. Compared only child families to families with siblings	1. Physical activity engagement	Multiple items concerning sociability behaviors and presence of siblings.	1. Male only-child respondents reported more frequent participation in sports. 2. Results suggest that only-child individuals may experience different gender role socialization processes, including sport and physical activity.

Table 12 (cont'd)

Study ID	Sample	Basic Design	Key Sibling Variable	Physical Activity Outcome of Interest	Measure	Key Results
51. Trussel (2014)	19 youth (9 boys, 10 girls)	Cross-sectional	1. Sibling relationship experiences in sport	1. Positive and negative experiences in sport	Interviews	1. Organized youth sport to enhance opportunities to spend time together, to shape perceptions of fairness and equality, and the implications that occur when living with a star athlete.
52. Tucker (2008)	189 sibling dyads Mean Ages = 14.95 - firstborns, 12.48 - secondborns	Cross-sectional	1. Structured and unstructrured time spent with sibling	1. Type of activity engaged in	Center for Epidemiological Studies Depression Scale (CES-D) 2. General Self-Worth (Harter, 1988) 3. Peer Competence Scale (Hater, 1988), 4. Self-report of structured and unstructured time with sibling	1. Siblings spent an average of 10 hours a week doing structured activities (e.g., sport and hobbieswith one another). 2. Same-sex sibling dyads spent the most time together.
53. van Sluijs et al. (2013)	487 children (4 years old)	Cross-sectional	1. Presence of siblings	1. Physical activity levels	1. Accelerometery 2. Demographic information (seperated into social, environmental, and personal characteristics)	1. MVPA minutes were greater in children with older siblings
54. Videon (2002)	13,869 youth (7th-12th grade students)	Cross-sectional	1. Sibling phyiscal activity participation	1. Participant engagement in sport	Interviews	1. Having an older brother was related to increased sport involvement
55. Weiss & Knoppers (1982)	95 college volleyball palyers	Cross-sectional	1. Potential source of support	1. Degree of influence of socialization agents on active sport involvement	1. Sport socialization questionnaire	1. Brothers were significant agents of sport socialization during the participants childhood and college years
56. Weiss & Barber (1995)	345 collegiate female athletes, and 216 college students Mean Ages = 19.6 years - athletes, 19.6 - non-athletes	Longitudinal	1. Significant other influence in sport involvement	1. Social factors of sport involvement	1. Revised-Female Socialization in Sport Questionnaire	1. Socialization agents (parents, peers, and siblings) increased their encouragement and support across two decades. 2. Athlete participants perceived stronger influences from their mothers, siblings, and peers.

Table 12 (cont'd)

Study ID	Sample	Basic Design	Key Sibling Variable	Physical Activity Outcome of Interest	Measure	Key Results
57. Whiteman, McHale, & Crouter (2007)	191 Sibling Dyads (48 sister-sister, 50 sister-brother, 47 brother-sister, 46 brother-brother) Mean age = 17 years - firstborn, 15 years - secondborn	Cross-sectional	1. Sibling relationship characteristics 2. Sibling athletic interest	1. Athletic interests	1. Home Interviews, 2. 8-item survey to assess sibling influence, 3. 8-item intimacy survey 4. Sibling Negativity Scale 5. Risky Behavior Index 6. Peer Competence Subscale 7. Athletic and Arts Interests survey	1. When secondborn reported strong influence from firstborn, the siblings were more similar in risky behavior, peer competence, athletic interests, and art interests.
58. Wold & Anderssen (1992)	39,086 youth from 9 european countries (11, 13, and 15 year olds)	Cross-sectional	1. Sibling physical activity	1. Physical activity participation	Health Behavior Survey (focusing on sport and other physical activities)	1. Children with parents, peers, and siblings in sport were strongly associated with their own participation. 2. Peers were found to be more strongly related to physical activity than any other family member.
59. Ziviani, Macdonald, Ward, Jenkins, & Rodgers (2006)	6 children and their parents	Longitudinal	None	1. Interviews were used to identify factors responsible for continued involvement in physical activity	Interviews	1. Same-sex older siblings were reported as significantly contributors to continued involvement in sport and exercise

APPENDIX B

Risk of Bias Assessment

Table 13 Risk of Bias Assessment

Study ID	Incomplete Data Addressed	Free of Selective Reporting	Validity of Measures
1. Abel & Kruger (2007)	Yes	Yes	1. Archival performance statistics - Yes
2. Atkin, Johnson, Force, & Petrie (2013)	Yes	Yes	1. Accelerometery - Yes 2. Demographic questionnaire - N/A
3. Ayvazoglu, Oh, & Kozub (2006)	Yes	Unknown	1. Parent Interviews - N/A 2. Child Interviews - N/A 3. Accelerometers - Yes
4. Bagley, Salmon, & Crawford (2006)	Yes	Yes	1. Uni-axial accelerometers - Yes 2. Family demographics - N/A 3. Television viewing time - Yes
5. Barnett (1984)	Yes	Yes	1. Lieberman's Playfulness scale - Yes 2. Family structure questionnaire - Yes

Table 13 (cont'd)

Study ID	Incomplete Data Addressed	Free of Selective Reporting	Validity of Measures
6. Barnett (2008)	Yes	Unknown	1. Structured interviews - N/A
7. Bean, Fortier, Post, & Chima (2014)	Yes	Unknown	1. Literature review - N/A
8. Blazo, Czech, Carson, & Dees (2014)	Yes	Unknown	Phenomenological interviews - N/A
9. Cislak, Safron, Pratt, Gaspar, & Luszczynska (2012)	Yes	Unknown	1. Literature review - N/A
10. Cleland, Timperio, Salmon, Hume, Telford, & Crawford (2011)	Yes	Yes	1. Survey (created for study) - No 2. Accelerometer - Yes
11. Cook et al. (2014)	Yes	Yes	1. Questionnaire tapping: - social support, modeling, and physical activity intentions - No 2. International Physical Activity Questionnaire (IPAQ) - Yes

Table 13 (cont'd)

Study ID	Incomplete Data Addressed	Free of Selective Reporting	Validity of Measures
12. Côté (1999)	Yes	Unknown	1. Interviews - No
			1. BMI - Yes
13. Crawford et al. (2010)	Yes	Yes	2. Built environment - Yes
			3. Accelerometery - Yes
14. Davis & Meyer (2008)	Yes	Unknown	1. Interviews - N/A
			1. Activity Support Scale (developed for study) - No
15. Davison (2004)	Yes	Yes	2. Children's Physical Activity Scale - Yes
			3. The physical activity subscale of the Physical Self Description Questionnaire - Yes

Table 13 (cont'd)

Study ID	Incomplete Data Addressed	Free of Selective Reporting	Validity of Measures
16. Duncan, Duncan, Strycker, & Chaumeton (2004)	Yes	Yes	1. Target child and Parent PA Questionnaire - Yes 2. Target child and Parent Support Questionnaire - Yes
17. Duncan, Duncan, & Strycker (2005)	Yes	Yes	1. Questionnaires targeting: - physical activity, social support, and demographic information - Yes
18. Eaton, Chipperfield, & Singbeil (1989)	Yes	Yes	1. Physical activity questionnaire - Yes
19. Ebihara, Ikeda, & Myiashita (1983)	Yes	Yes	1. Fixed alternative survey of sport socialization - Yes
20. Flowers & Brown (2002)	Yes	Yes	1. Competitive State Anxiety Inventory-2 - Yes
21. Fraser-Thomas, Côté, & Deakin (2008)	Yes	Unknown	Interviews - N/A

Table 13 (cont'd)

Study ID	Incomplete Data Addressed	Free of Selective Reporting	Validity of Measures
22. Gledhill & Harwood (2014)	Yes	Unknown	Interviews - N/A
23. Gomes et al. (2014)	Yes	Yes	1. Baecke physical activity questionnaire - Yes
24. Greendorfer & Lewko (1978)	Yes	Yes	1. Sport involvement questionnaire - No
25. Hohepa, Scragg, Schofield, Kolt, & Schaaf (2007)	Yes	Yes	1. Questionnaires targeting: - physical activity, perceived encouragement - Yes
26. Huppertz et al. (2014)	Yes	Yes	1. Physical activity questionnaire - Yes 2. Perceived benefits of exercise questionnaire - Yes
27. Krombholz (2006)	Yes	Yes	1. Motor skill battery - Yes

Table 13 (cont'd)

Study ID	Incomplete Data Addressed	Free of Selective Reporting	Validity of Measures
28. Kusy (2009)	Yes	Yes	1. Motor skill battery - Yes 2. BMI - Yes 3. Physical Activity Questionnaire - Yes
29. Landers (1970)	Yes	Yes	1. Sport participation - No
30. Loucaides, Plotnikoff, & Bercovitz (2007)	Yes	Yes	1. Godin Leisure-Time Exercise Questionnaire - Yes 2. Questionnaire packet to assess variables of interest (e.g., athletic competence, self-efficacy, etc.) - Yes
31. Maia, Gomes, Trégouët, & Katzmarzyk (2014)	Yes	Yes	1. Baecke physical activity questionnaire - Yes
32. Martin-Matillas (2011)	Yes	Yes	1. Physical activity questionnaires (authors do not distinguish if using validated measures) - No

Table 13 (cont'd)

Study ID	Incomplete Data Addressed	Free of Selective Reporting	Validity of Measures
33. Martin-Matillas et al. (2011)	Yes	Yes	1. International Physical Activity Questionnaire for Adolescents - Yes 2. Accelerometery - Yes
34. Martin-Matillas et al. (2012)	Yes	Yes	1. Questionnaire packet developed to assess variables of interest - No 1. Accelerometery - No
35. McMinn et al. (2011)	Yes	Yes	2. Questionnaire developed to gather information on 11 family and home environment factors - No
36. McMinn, Griffen, Jones, & van Sluijs (2013)	Yes	Yes	1. Questionnaire developed to gather information on 21 family and home environment factors (1 sibling factor) - No 2. Accelerometery - Yes
37. Milošević & Veskovic (2013)	Yes	Yes	1. Questionnaires developed to assess familial activity levels - No

Table 13 (cont'd)

Study ID	Incomplete Data Addressed	Free of Selective Reporting	Validity of Measures
38. Ramanathan & Crocker (2009)	Yes	Unknown	Focus group interviews - N/A
39. Raudsepp & Virra (2000)a	Yes	Yes	1. 7 Day PAR - Yes
40. Raudsepp & Virra (2000)b	Yes	Yes	1. 7 Day PAR - Yes
41. Robbins, Stommel, & Hamel (2008)	Yes	Yes	1. Questionnaire used to identify sources of social support and type of social support provided - Yes 2. Self-report physical activity participation - No
42. Rønbeck & Vikander (2011)	Yes	Yes	1. Questionnaire developed to investigate sibling and peer development of athletes - No
43. Sallis, Prochaska, & Taylor (2000)	Yes	Unknown	Literature review - N/A

Table 13 (cont'd)

Study ID	Incomplete Data Addressed	Free of Selective Reporting	Validity of Measures
44. Schnike et al. (2010)	Yes	Unknown	Interviews - N/A
45. Seabra, Mendonça, Thomis, Malina, & Maia (2008)	Yes	Yes	1. Physical activity Questionnaire - Yes
46. Seabra, Mendonça, Thomis, Malina, & Maia (2011)	Yes	Yes	1. Physical Activity Questionnaire - Yes 2. Included questions about sibling, peer, and parent physical activity - No
47. Seff, Gecas, & Frey (1993)	Yes	Yes	1. Questionnaires used to assess if birth order was linked to participation in dangerous sports - No
48. Senguttuvan, Whiteman, & Jensen (2014)	Yes	Yes	1. Surveys were used to assess sibling relationships, parent-child relationships, and health behaviors - Partially supported
49. Sulloway & Zweigenhaft (2010)	Yes	Unknown	Meta-analysis - Yes

Table 13 (cont'd)

Study ID	Incomplete Data Addressed	Free of Selective Reporting	Validity of Measures
50. Trent & Spitze (2011)	Yes	Yes	Multiple items concerning sociability behaviors and presence of siblings - No
51. Trussel (2014)	Yes	Unknown	Interviews - N/A
52. Tucker (2008)	Yes	Yes	1. Center for Epidemiological Studies Depression Scale (CES-D) - Yes 2. General Self-Worth Scale - Yes 3. Peer Competence Scale - Yes 4. Self-report of structured and unstructured time with sibling - No
53. van Sluijs et al. (2013)	Yes	Yes	1. Accelerometery - Yes
54. Videon (2002)	Yes	Unknown	Interviews - N/A
55. Weiss & Knoppers (1982)	Yes	Yes	1. Sport socialization questionnaire - Yes

Table 13 (cont'd)

Study ID	Incomplete Data Addressed	Free of Selective Reporting	Validity of Measures
56. Weiss & Barber (1995)	Yes	Yes	1. Revised-Female Socialization in Sport Questionnaire - Yes
57. Whiteman, McHale, & Crouter (2007)	Yes	Yes	1. Home Interviews - N/A 2. 8-item survey to assess sibling influence - No 3. 8-item intimacy survey - Yes 4. Sibling Negativity Scale - Yes 5. Risky Behavior Index - Yes 6. Peer Competence Subscale - Yes 7. Athletic and Arts Interests survey - Yes
58. Wold & Anderssen (1992)	Yes	Yes	Health Behavior Survey (focusing on sport and other physical activities) - Yes
59. Ziviani, Macdonald, Ward, Jenkins, & Rodgers (2006)	Yes	Unknown	Interviews - N/A

APPENDIX C

Study Two Questionnaire Packet

Participant ID _____
RESEARCHER USE ONLY

Date: _____

How old are you **Today**? _____

When is your birthday? _____

Your parent or guardian that lives with or spends most of the time with you is…

- ☐ Married
- ☐ Divorced
- ☐ Single/Never Married (Mom)
- ☐ Mom with boyfriend or girlfriend
- ☐ Single/Never Married (Dad)
- ☐ Dad with boyfriend or girlfriend

Your Race/Ethnicity:

- ☐ Caucasian
- ☐ Latino
- ☐ African American
- ☐ Native American
- ☐ Asian American
- ☐ Other

How many brothers or sisters do you have? _____

What is your birth order? (are you the 1st born? 2nd born): _____

What sport or sports do you play? _____

How long have you played these sports? _____

Participant ID _____
RESEARCHER USE ONLY

Child and Youth Physical Self-Perception Profile

Instructions:

- The following statements deal with your interests in physical activity.
- Please read both statements in each row.
- Decide which of the two statements is most like you (left statement vs. right statement).
- Once you pick a side, mark whether this is "REALLY TRUE FOR ME" or "SORT OF TRUE FOR ME" by marking the appropriate box with an X.
- Please choose only ONE answer.
- Remember: ***There are no right or wrong answers; simply choose the one that is best for you.***

Sample

Really True for Me	Sort of True for Me				Sort of True for Me	Really True for Me
	X	Some kids would rather play outside in their spare time	But…	Other kids would rather watch T.V.		

CY-PSPP

1)

Really True for Me	Sort of True for Me				Sort of True for Me	Really True for Me
		Some kids do very well at all kinds of sports	But…	Other kids don't feel that they are very good when it comes to sports		

2)

Really True for Me	Sort of True for Me				Sort of True for Me	Really True for Me
		Some kids feel uneasy when it comes to doing vigorous physical exercise	But…	Other kids feel confident when it comes to doing vigorous physical exercise		

3)

Really True for Me	Sort of True for Me				Sort of True for Me	Really True for Me
		Some kids feel that they have a good-looking (fit looking) body compared to other kids	But…	Other kids feel that compared to most, their body doesn't look so good		

4)

Really True for Me	Sort of True for Me	Some kids feel that they lack strength compared to other kids their age	But…	Other kids feel that they are stronger than other kids their age	Sort of True for Me	Really True for Me

5)

Really True for Me	Sort of True for Me	Some kids are proud of themselves physically	But…	Other kids don't have much to be proud of physically	Sort of True for Me	Really True for Me

6)

Really True for Me	Sort of True for Me	Some kids are often unhappy with themselves	But…	Other kids are pretty pleased with themselves	Sort of True for Me	Really True for Me

7)

Really True for Me	Sort of True for Me	Some kids wish they could a lot better at sports	But…	Other kids feel that they are good enough at sports	Sort of True for Me	Really True for Me

8)

Really True for Me	Sort of True for Me	Some kids have a lot of stamina for vigorous physical exercise	But…	Other kids soon get out of breath and have to slow down or quit	Sort of True for Me	Really True for Me

9)

Really True for Me	Sort of True for Me	Some kids find it difficult to keep their bodies looking good physically	But…	Other kids find it easy to keep their bodies looking good physically	Sort of True for Me	Really True for Me

10)

Really True for Me	Sort of True for Me	Some kids think that they have stronger muscles than other kids their age	But…	Other kids feel that they have weaker muscles than other kids their age	Sort of True for Me	Really True for Me

11)

Really True for Me	Sort of True for Me	Some kids don't feel very confident about themselves physically	But…	Other kids really feel good about themselves physically	Sort of True for Me	Really True for Me

12)

Really True for Me	Sort of True for Me	Some kids are happy with themselves as a person	But…	Other kids are often not happy with themselves	Sort of True for Me	Really True for Me

13)

Really True for Me	Sort of True for Me	Some kids think they could do well at just about any new sports activity they haven't tried before	But…	Other kids are afraid they might not do well at sports they haven't ever tried	Sort of True for Me	Really True for Me

14)

Really True for Me	Sort of True for Me	Some kids don't have much stamina and fitness	But…	Other kids have lots of stamina and fitness	Sort of True for Me	Really True for Me

15)

Really True for Me	Sort of True for Me	Some kids are pleased with the appearance of their bodies	But…	Other kids wish that their bodies looked better shape physically	Sort of True for Me	Really True for Me

16)

Really True for Me	Sort of True for Me	Some kids lack confidence when it comes to strength activities	But…	Other kids are very confident when it comes to strength activities	Sort of True for Me	Really True for Me

17)

Really True for Me	Sort of True for Me	Some kids are very satisfied with themselves physically	But…	Other kids are often dissatisfied with themselves physically	Sort of True for Me	Really True for Me

18)

Really True for Me	Sort of True for Me	Some kids don't like the way they are leading their life	But…	Other kids do like the way they are leading their life	Sort of True for Me	Really True for Me

19)

Really True for Me	Sort of True for Me	In games and sports some kids usually watch instead of play	But…	Other kids usually play rather than watch	Sort of True for Me	Really True for Me

20)

Really True for Me	Sort of True for Me	Some kids try to take part in energetic physical exercise whenever they can	But…	Other kids try to avoid doing energetic exercise if they can	Sort of True for Me	Really True for Me

21)

Really True for Me	Sort of True for Me	Some kids feel that they are often admired for their good looking bodies	But…	Other kids feel that they are seldom admired for the way their bodies look	Sort of True for Me	Really True for Me

22)

Really True for Me	Sort of True for Me	When strong muscles are needed, some kids are the first to step forward	But…	Other kids are the last to step forward when strong muscles are needed	Sort of True for Me	Really True for Me

23)

Really True for Me	Sort of True for Me	Some kids are unhappy with how they are and what they can do physically	But…	Other kids are happy with how they are and what they can do physically	Sort of True for Me	Really True for Me

24)

Really True for Me	Sort of True for Me	Some kids like the kind of person they are	But…	Other kids often wish they were someone else	Sort of True for Me	Really True for Me

25)

Really True for Me	Sort of True for Me	Some kids feel that they are better than others their age at sports	But…	Other kids don't feel they can play as well	Sort of True for Me	Really True for Me

26)

Really True for Me	Sort of True for Me	Some kids soon have to quit running and exercising because they get tired	But…	Other kids can run and do exercise for a long time without getting tired	Sort of True for Me	Really True for Me

27)

Really True for Me	Sort of True for Me	Some kids are confident about how their bodies look physically	But…	Other kids feel uneasy about how their bodies look physically	Sort of True for Me	Really True for Me

28)

Really True for Me	Sort of True for Me	Some kids feel that they are not as good as others when physical strength is needed	But…	Other kids feel that they are among the best when physical strength is needed	Sort of True for Me	Really True for Me

29)

Really True for Me	Sort of True for Me	Some kids have a positive feelings about themselves physically	But…	Other kids feel somewhat negative about themselves physically	Sort of True for Me	Really True for Me

30)

Really True for Me	Sort of True for Me	Some kids are very happy being the way they are	But…	Other kids wish they were different	Sort of True for Me	Really True for Me

31)

Really True for Me	Sort of True for Me	Some kids don't do well at new outdoor games	But…	Other kids are good at new games right away	Sort of True for Me	Really True for Me

32)

Really True for Me	Sort of True for Me	When it comes to activities like running, some kids are able to keep going	But…	Other kids soon have to quit to take a rest	Sort of True for Me	Really True for Me

33)

Really True for Me	Sort of True for Me	Some kids don't like how their bodies look physically	But…	Other kids are pleased with how their bodies look physically	Sort of True for Me	Really True for Me

34)

Really True for Me	Sort of True for Me	Some kids think that they are strong, and have good muscles compared to other kids their age	But…	Other kids think that they are weaker, and don't have such good muscles as other kids their age	Sort of True for Me	Really True for Me

35)

Really True for Me	Sort of True for Me	Some kids wish they could feel better about themselves physically	But…	Other kids always seem to feel good about themselves physically	Sort of True for Me	Really True for Me

36)

Really True for Me	Sort of True for Me	Some kids are not very happy with the way they do a lot of things	But…	Other kids think the way they do things is fine	Sort of True for Me	Really True for Me

Participant ID _____
RESEARCHER USE ONLY

Sibling Relationship Questionnaire

The phrase "this sibling" refers to: _____

A "sibling" is another word for "brother" or "sister". Please answer the following questions about you and your sibling whose name is written above. Please put an "X" in the box next to your choice. For each question you can put only one "X". **Remember, there are no right or wrong answers.**

1. Some sibling do nice things for each other a lot, white other siblings do nice things for each other a little. How much do both you and this sibling do nice things for each other?
   - □ Not at All
   - □ Not too much
   - □ Somewhat
   - □ Very much
   - □ Extremely much

2. Who usually gets treated better by your mother, you or this sibling?
   - □ My sibling almost always gets treated better
   - □ My sibling often gets treated better
   - □ We get treated about the same
   - □ I often get treated better
   - □ I almost always get treated better

3. How much do you show this sibling how to do things he or she doesn't know how to do?
   - □ Not at All
   - □ Not too much
   - □ Somewhat
   - □ Very much
   - □ Extremely much

4. How much does this sibling show you how to do things you don't know how to do?
   - □ Not at All
   - □ Not too much
   - □ Somewhat
   - □ Very much
   - □ Extremely much

5. How much do you tell this sibling what to do?

   □ Not at All
   □ Not too much
   □ Somewhat
   □ Very much
   □ Extremely much

6. How much does this sibling tell you what to do?

   □ Not at All
   □ Not too much
   □ Somewhat
   □ Very much
   □ Extremely much

7. Who usually gets treated better by your father, you or this sibling?

   □ My sibling almost always gets treated better
   □ My sibling often gets treated better
   □ We get treated about the same
   □ I often get treated better
   □ I almost always get treated better

8. Some siblings care about each other a lot while other siblings don't care about each other that much. How much do you and this sibling care about each other?

   □ Not at All
   □ Not too much
   □ Somewhat
   □ Very much
   □ Extremely much

9. How much do you and this sibling go places and do things together?

   □ Not at All
   □ Not too much
   □ Somewhat
   □ Very much
   □ Extremely much

10. How much do you and this sibling insult and call each other names?

□ Not at All
□ Not too much
□ Somewhat
□ Very much
□ Extremely much

11. How much do you and this sibling like the same things?

□ Not at All
□ Not too much
□ Somewhat
□ Very much
□ Extremely much

12. How much go you and this sibling tell each other everything?

□ Not at All
□ Not too much
□ Somewhat
□ Very much
□ Extremely much

13. Some siblings try to out-do or beat each other at a lot of things, while other siblings try to out-do or beat each other a little. How much do you and this sibling try to out-do or beach each other at things?

□ Not at All
□ Not too much
□ Somewhat
□ Very much
□ Extremely much

14. How much do you admire and respect this sibling?

□ Not at All
□ Not too much
□ Somewhat
□ Very much
□ Extremely much

15. How much does this sibling admire and respect you?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

16. How much do you and this sibling disagree and quarrel with each other?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

17. Some siblings cooperate a lot, while other siblings cooperate a little. How much do you and this sibling cooperate with each other?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

18. Who gets more attention from your mother, you or this sibling?

- □ My sibling almost always gets more attention
- □ My sibling often gets more attention
- □ We get about the same amount of attention
- □ I often get more attention
- □ I almost always get more attention

19. How much do you help this sibling with things he or she can't do by him or herself?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

20. How much does this sibling help you with things you can't do by yourself?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

21. How much do you make this sibling do things?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

22. How much does this sibling make you do things?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

23. Who gets more attention from your father, you or this sibling?

- □ My sibling almost always gets more attention
- □ My sibling often gets more attention
- □ We get about the same amount of attention
- □ I often get more attention
- □ I almost always get more attention

24. How much do you and this sibling love each other?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

25. Some siblings play around and have fun with each other a lot, while other siblings play around and have fun with each other a little. How much do you and this sibling play around and have fun with each other?

□ Not at All
□ Not too much
□ Somewhat
□ Very much
□ Extremely much

26. How much are you and this sibling mean to each other?

□ Not at All
□ Not too much
□ Somewhat
□ Very much
□ Extremely much

27. How much do you and this sibling have in common?

□ Not at All
□ Not too much
□ Somewhat
□ Very much
□ Extremely much

28. How much do you and this sibling share secrets and private feelings?

□ Not at All
□ Not too much
□ Somewhat
□ Very much
□ Extremely much

29. How much do you and this sibling compete with each other?

□ Not at All
□ Not too much
□ Somewhat
□ Very much
□ Extremely much

30. How much do you look up and feel proud of this sibling?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

31. How much does this sibling look up to and feel proud of you?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

32. How much do you and this sibling get mad at and get in arguments with each other?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

33. How much do both you and this sibling share with each other?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

34. Who does your mother usually favor, you or this sibling?

- □ My sibling almost always is favored
- □ My sibling often is favored
- □ Neither of us is favored
- □ I am often favored
- □ I almost always am favored

35. How much do you teach this sibling things that he or she doesn't know?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

36. How much does this sibling teach you things that you don't know?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

37. How much do you order this sibling around?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

38. How much does this sibling order you around?

- □ Not at All
- □ Not too much
- □ Somewhat
- □ Very much
- □ Extremely much

39. Who does your father usually favor, you or this sibling?

- □ My sibling almost always is favored
- □ My sibling often is favored
- □ Neither of us is favored
- □ I am often favored
- □ I almost always am favored

40. How much is there a strong feeling of affection (love) between you and this sibling?

- ◻ Not at All
- ◻ Not too much
- ◻ Somewhat
- ◻ Very much
- ◻ Extremely much

41. Some kids spend lots of time with their siblings, while others don't spend so much. How much more free time do you and this sibling spend together?

- ◻ Not at All
- ◻ Not too much
- ◻ Somewhat
- ◻ Very much
- ◻ Extremely much

42. How much do you and this sibling bug and pick on each other in mean ways?

- ◻ Not at All
- ◻ Not too much
- ◻ Somewhat
- ◻ Very much
- ◻ Extremely much

Participant ID _____
RESEARCHER USE ONLY

Social Comparison Measure

Most people compare themselves from time to time with others. For example, they may compare the way they feel, their opinions, their abilities, and/or their situation with those of other people. There is nothing particularly 'good' or 'bad' about this type of comparison, and some people do it more than others. We would like to find out how often you compare yourself with your sibling.

Instructions:

- When answering the following questions think of _____ (your sibling).
- Some of the questions may sound similar, but please answer each question
- Chose how much you agree with each statement below, by circling your answer.

---

1. I often compare myself with my sibling with respect to what I have accomplished in sport.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

2. If I want to learn more about sports I try to find out what my sibling thinks about it.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

3. I always pay a lot of attention to how I do things in sports compared with how my sibling does things in sports.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

4. I often compare how my sibling is doing with how others are doing.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

5. I always like to know what my sibling in a similar situation would do.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

6. I am not the type of person who compares often with my sibling.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

7. If I want to find out how well I've done something, I compare what I have done with how my sibling has done.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

8. I often try to find out what my sibling thinks, who face similar problems as I face.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

9. I often like to talk with my sibling about mutual opinions and experiences.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

10. I never consider my situation in sports relative to that of my sibling.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

11. I often compare how I am doing physically with my sibling.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

APPENDIX D

Study 3 Questionnaire Packet

Participant ID _____
RESEARCHER USE ONLY

Demographic Information Form

Date: _____

Are you a **Boy** or **Girl**? ☐ Boy ☐ Girl Is your older sibling a **Boy** or **Girl**? ☐ Boy ☐ Girl

How old are you **Today**? _____ How old is **your older brother or sister?** _____

Which option below best describes your living situation (check box, then add information):

☐ I live with both of my parents (not step-parents)

☐ I live with my mom and no other adult

☐ I live with my dad and no other adult

☐ I live with my mom and another adult
Describe the other adult (e.g., step-parent, grandparent): _____

☐ I live with my dad and another adult
Describe the other adult (e.g., step-parent, grandparent): _____

☐ I live with an adult or adults who are not my parents
Describe the other adult(s) (e.g., grandparents, foster): _____

☐ I live part of the time in one place, part of the time in another
Check relevant options above or describe here: _____
_____
_____

Which option(s) best describes your race/ethnicity (check all that apply):

☐ African American/Black
☐ Asian American
☐ Caucasian/White
☐ Latino or Hispanic
☐ Native American
☐ Other: _____

How many brothers or sisters do you have? _____

What is your birth order? (are you the 1st born? 2nd born): _____

What sports do you play? _____

How many years have you played these sports? _____
_____

Sport Participation Information

Number of hours involved in sport per week. _____

Number of hours the older sibling is involved in sport per week. _____

Do the children play the same sports? YES NO

Sports are important to my family. (Circle one)

Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree

Participant ID _____
RESEARCHER USE ONLY

The Child and Youth Physical Self-Perception Profile Questionnaire

Instructions:

- The following statements deal with your interests in physical activity.
- Please read both statements in each row.
- Decide which of the two statements is most like you (left statement vs. right statement).
- Once you pick a side, mark whether this is "REALLY TRUE FOR ME" or "SORT OF TRUE FOR ME" by marking the appropriate box with an X.
- Please choose only ONE answer.
- Remember: ***There are no right or wrong answers; simply choose the one that is best for you.***

Sample

Really True for Me	Sort of True for Me	Some kids would rather play outside in their spare time	But...	Other kids would rather watch T.V.	Sort of True for Me	Really True for Me
	X					

CY-PSPP

1)

Really True for Me	Sort of True for Me	Some kids do very well at all kinds of sports	But...	Other kids don't feel that they are very good when it comes to sports	Sort of True for Me	Really True for Me

2)

Really True for Me	Sort of True for Me	Some kids wish they could do a lot better at sports	But...	Other kids feel that they are good enough at sports	Sort of True for Me	Really True for Me

3)

Really True for Me	Sort of True for Me	Some kids think they could do well at just about any new sports activity they haven't tried before	But...	Other kids are afraid they might not do well at sports they haven't ever tried	Sort of True for Me	Really True for Me

4)

Really True for Me	Sort of True for Me	In games and sports some kids usually watch instead of play	But...	Other kids usually play rather than watch	Sort of True for Me	Really True for Me

5)

Really True for Me	Sort of True for Me	Some kids feel that they are better than others their age at sports	But…	Other kids don't feel they can play as well	Sort of True for Me	Really True for Me

6)

Really True for Me	Sort of True for Me	Some kids don't do well at new outdoor games	But…	Other kids are good at new games right away	Sort of True for Me	Really True for Me

Participant ID _____
RESEARCHER USE ONLY

Physical Self Description Questionnaire

This is a chance to look at yourself. It is not a test. There are no right answers and everyone will have different answers. Be sure that your answers show how you feel about yourself. Please do not talk about your answers with anyone else. We will keep your answers private.

The purpose of these questions is to see how people describe themselves physically. In the following questions you will be asked to think about yourself phyically: For example, how good you are at sports. Make sure to answer each question and please do not leave any blank.

Before you start below is an example. I have already answered given an answer to show you how to do it.

Example

I like to read comic books.

False	Mostly False	More False than True	More True than False	Mostly True	True

I put a circle around the answer 'TRUE", This means that I really like to read comic books. If I did not like to read comic books very much. I would have circled "FALSE" or "MOSTLY FALSE"

---

1. **Other people think I am good at sports.**

False	Mostly False	More False than True	More True than False	Mostly True	True

2. **I am good at most sports.**

False	Mostly False	More False than True	More True than False	Mostly True	True

3. **Most sports are easy for me.**

False	Mostly False	More False than True	More True than False	Mostly True	True

4. I have good sport skills.

False	Mostly False	More False than True	More True than False	Mostly True	True

5. I am better at sports than most of my friends.

False	Mostly False	More False than True	More True than False	Mostly True	True

6. I play sports well.

False	Mostly False	More False than True	More True than False	Mostly True	True

Participant ID _____
RESEARCHER USE ONLY

Iowa-Netherlands Comparison Orientation Measure

Most people compare themselves from time to time with others. For example, they may compare the way they feel, their opinions, their abilities, and/or their situation with those of other people. There is nothing particularly 'good' or 'bad' about this type of comparison, and some people do it more than others. We would like to find out how often you compare yourself with your sibling.

Instructions:

- When answering the following questions think of your sibling who is also completing a survey.
- Some of the questions may sound similar, but please answer each question
- Chose how much you agree with each statement below, by circling your answer.

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1. **I often compare myself with my sibling with respect to what I have accomplished in sport.**

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

2. **If I want to learn more about sports I try to find out what my sibling thinks about it.**

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

3. **I always pay a lot of attention to how I do things in sports compared with how my sibling does things in sports.**

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

4. **I often compare how my sibling is doing with how others are doing.**

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

5. **I always like to know what my sibling in a similar situation would do.**

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

6. **I am not the type of person who compares often with my sibling.**

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

7. If I want to find out how well I've done something, I compare what I have done with how my sibling has done.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

8. I often try to find out what my sibling thinks, who face similar problems as I face.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

9. I often like to talk with my sibling about mutual opinions and experiences.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

10. I never consider my situation in sports relative to that of my sibling.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

11. I often compare how I am doing physically with my sibling.

I Strongly Disagree	I Disagree	Neither Disagree or Agree	I Agree	I Strongly Agree

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Sibling Influence Scale

1. My sibling includes me in sports with her/his friends.

Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree

2. My sister/brother sets an example for how to play sports.

Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree

3. My sister/brother tells me how I should behave in sports.

Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree

4. My sibling provides a model for how I should play sports.

Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree

5. My brother/sister includes me in her/his sport activities away from home.

Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree

6. My brother/sister encourages me to get involved in sports.

Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree

7. From watching my brother/sister, I have learned how to play sports.

Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree

8. My brother/sister gives me advice on how to play sports.

Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree

9. Sports are important to me.

Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree

10. Sports are important to my older brother or sister.

Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree

11. How good is your older brother or sister at sport?

Very Bad	Bad	Average	Good	Very Good

Participant ID_____
RESEARCHER USE ONLY

Sibling Relationship Questionnaire

A "sibling" is another word for "brother" or "sister". Please answer the following questions about you and your sibling whose name is written above. Please put an "X" in the box next to your choice. For each question you can put only one "X". **Remember, there are no right or wrong answers.**

1. Brothers and sisters sometimes cause trouble or start fights or arguments with one another, even if they love each other a lot. How often would you say that your sister/brother starts fights or causes trouble for you?
   - □ Never or hardly ever
   - □ A little
   - □ Sometimes
   - □ Pretty often
   - □ Always

2. How often does your sister/brother get mad at or angry with you?
   - □ Never or hardly ever
   - □ A little
   - □ Sometimes
   - □ Pretty often
   - □ Always

3. Kids sometimes hurt their brother or sister on purpose like by pushing, punching, or hitting them. How often does your sister/brother do these kinds of things to you?
   - □ Never or hardly ever
   - □ A little
   - □ Sometimes
   - □ Pretty often
   - □ Always

4. Some kids are mean to their brother or sister sometimes, even if they really care about them. How often would you say your sister/brother does things to you like tease you, bug you, or call you names?
   - □ Never or hardly ever
   - □ A little
   - □ Sometimes
   - □ Pretty often
   - □ Always

5. Kids sometimes go into their brother or sister's room or take their things without permission. How often would you say your sister/brother does this to you?

   □ Never or hardly ever
   □ A little
   □ Sometimes
   □ Pretty often
   □ Always

6. Some kids share secrets with their brothers and sisters, and other kids don't. How often do you share secrets with your sister/brother?

   □ Never or hardly ever
   □ A little
   □ Sometimes
   □ Pretty often
   □ Always

7. What about doing nice things like helping or doing favors for your sister/brother? How often do you do these kinds of things?

   □ Never or hardly ever
   □ A little
   □ Sometimes
   □ Pretty often
   □ Always

8. How much do you teach your sister/brother things or help her/him figure something out?

   □ Never or hardly ever
   □ A little
   □ Sometimes
   □ Pretty often
   □ Always

9. Most kids are affectionate with their brother or sister sometimes even though they fight at other times. How often are you physically affectionate with your sister/brother, such as hugging, kissing, or holding hands?

   □ Never or hardly ever
   □ A little
   □ Sometimes
   □ Pretty often
   □ Always

10. How often do you feel that your sister/brother is pretty cool?

□ Never or hardly ever
□ A little
□ Sometimes
□ Pretty often
□ Always

11. Sometimes kids feel like sharing their things and other times they don't. How often do you share your things with your sister/brother when she/he wants to play with them or borrow them?

□ Never or hardly ever
□ A little
□ Sometimes
□ Pretty often
□ Always

12. How about if your sister/brother is hurt or upset, how often do you try to make her/him feel better?

□ Not at All
□ Not too much
□ Somewhat
□ Very much
□ Extremely much

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