

ABSTRACT

SAYRE-MCCORD, ROBERT NEVIN. The Relationship of Childhood Sport Participation and Adult Sport Participation among Former Division I Varsity Athletes. (Under the direction of Dr. Jason Bocarro).

According to Iso-Ahola's Leisure Repertoire Theory, adult leisure behavior is built upon childhood experiences. Therefore, the foundations for a lifelong healthy, active lifestyle may be set during adolescence. However, current youth sport culture is trending towards an early-specialization structure that limits access to physical activity opportunities through sport. Early sport specialization restricts children's exposure to a diversity of physical activity opportunities, which subsequently limits the variety of skills and experiences those children have to draw on for physical activity as adults. While previous research has established a connection between an individual's participation in sport activities as an adolescent and participation in sport activities as an adult, to our knowledge, no study has been conducted directly linking the number of sports played during childhood to adult physical activity levels. This study sought to determine the relationship between the breadth of an adolescent sporting repertoire and an individual's current physical activity levels. Former collegiate varsity athletes (n=148, response rate=30.3%) who had graduated between 1987 and 1993 were invited to complete a Qualtrics online self-assessment survey that evaluated the breadth of an adolescent sporting repertoire and current adult physical activity levels. Former varsity athletes were chosen because they were guaranteed to *have* an adolescent sporting repertoire, may have had a variety of sports in these repertoires, and were likely to display a variety of adolescent repertoire breadths, depending on the presence and extent of any specialization. Adolescent sporting repertoires were measured using the Sports

and Fitness Industry Association guidelines for consistent, medium-level sport participation, while current adult physical activity levels were quantified using the International Physical Activity Questionnaire. Results indicate that those individuals who played a greater number of sports as adolescents were significantly more likely to meet or exceed CDC recommended levels of physical activity (≥ 30 minutes a day) as adults. This correlation was also shown to be robust to the influence of respondents' race, gender, and socioeconomic status (measured by annual household income). Furthermore, the results indicated that there was a significant jump in the likelihood that an adult met CDC recommended levels of physical activity when their adolescent sporting repertoires contained 5 sports compared to those whose repertoires contained 4 sports. This finding indicates that there may be a specific recommended number of sports that adolescents should participate in to best ensure an active adult lifestyle. This study's findings also supported Iso-Ahola's Leisure Repertoire Theory because they illustrated that a significant portion of respondents engaged in physical activity through sports which they had first participated in as an adolescent. Accordingly, not only may it be important to involve children with a diversity of sporting opportunities, but the specific sports played during adolescence appear to influence those played during adulthood. Consequently, a further examination of the impact of individual versus team sports, and sport-specific long-term viability is merited. The results of this study contribute to the body of literature in youth sport and can serve to guide and inform parents and organizations involved in the delivery of youth sport programs.

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The Impact of Childhood Sport Participation on Adult Sport Participation in Former DI
Varsity Athletes

by
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A thesis submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements for the degree of
Master of Science

Parks, Recreation, and Tourism Management

Raleigh, North Carolina

2014

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ACKNOWLEDGMENTS

Thank you to all the people whose assistance, encouragement, and patience helped me in this research. I'd especially like to thank my advisor, Dr. Jason Bocarro for bearing with me on a winding journey, for encouraging my various interests while also helpfully refocusing my efforts at times when my enthusiasm spiraled out of control. His knowledge and work ethic are an inspiration and I value his dedication not only to good research, but good research that is subsequently put into good practice. Thank you to my committee members: Dr. Jonathan Casper for providing such a positive attitude and comfortable environment to work within, as well as the fortitude to guide me through my statistical analysis steps; thank you to Dr. Karla Henderson for all her crucial work helping me to develop the theoretical backdrop to this research as well as being willing to take on one final master's student; thank you to Dr. Michael Kanters for being an absolute fountain of knowledge and for his willingness to involve me in his own projects that allowed me to gain invaluable hands-on research experience. Additionally, I want to express my gratitude to Dr. Michael Edwards for taking the time out of his busy schedule to help me sort out the best way to approach my data analysis. One of the best aspects of the NCSU PRTM department is how it functions as a cohesive unit, and I'd like to recognize the other members of the faculty and staff with whom I've worked closely and learned from, especially Drs. Edwin Lindsay and Annette Moore, and Anju Singh and Debbie Hurst for always being willing to help me with my questions and navigate the red tape of graduate school.

I'd also like to extend my heartfelt appreciation to my family for their unwavering support and unique, irreplaceable feedback that could have only come from the wonderful

combination of doctor, teacher, engineer and philosopher. A special thank you to my graduate cohort, too numerous to thank everyone individually, but just the right size to provide the ideal NCSU family. Each and every one of you were a fantastic part of my NCSU experience and all of you contributed to this research.

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Chapter One: Introduction

Sport is associated with a myriad of benefits. Sport participation can contribute to psychological and emotional development in many different ways. For instance, social/peer relational success, sportsmanship and its impact on dealing with adverse situations and conflict resolution (e.g., Ellis, 2006; Fraser-Thomas, Cote, & Deakin, 2005; Hedstrom & Gould, 2004), improved self-esteem and decreased stress (e.g., Csikszentmihalyi, 1975; National Center for Education Statistics, 2005), better social integration (e.g., Barber, Eccles, & Stone, 2001; Eccles & Barber, 1999; Weiss & Smith, 2002; Wiersma, 2000), leadership development (e.g., Baron, 2007; Weiss, 2004; Wright & Cote, 2003), engaged citizenship (e.g., Elley & Kirk, 2002), and teamwork (e.g. Baron, 2007; Weiss, 2004) or contributing to overall self-actualization (e.g., Cote, Lidor, & Hackfort, 2009; Fraser-Thomas et al., 2005; Strong et al., 2005). Sport has also been shown to positively affect overall intellectual development (e.g., Fraser-Thomas, Cote, & Deakin, 2005) including academic performance and educational aspirations (e.g. National Center for Education Statistics, 2005).

Perhaps most commonly, sport has been noted as a foundational contributor to physical development (e.g., Hedstrom & Gould, 2004; Fraser-Thomas, Cote, & Deakin, 2005). This includes the mastery of fundamental motor skills and the maximization of physiological development and being a key contributor to short- and long-term fitness (Barnett, Van Beurden, Morgan, Brooks, & Beard, 2008). Additionally, the capacity of youth sport for engaging adolescents in physical activity is also well-documented (e.g., Fraser-Thomas et al., 2005; Green, Smith, & Roberts, 2005; Malina, 2009; Walters, Barr-Anderson, Wall, & Neumark-Sztainer, 2009). Therefore, it seems difficult to overstate the importance of

early-life sport involvement when considering that physical activity is one of the most common and important factors in combating obesity and cardiovascular illness (e.g., CDC, 2012a, 2012b; Steinbeck, 2001; Strong et al., 2005; Warburton, Nicol, & Bredin, 2006).

However, the US and Western Europe are experiencing a concurrent decline in population-level physical activity (Centers for Disease Control, 2012c; Troiano et al., 2008) as well as a shift towards earlier sporting specialization amongst youth athletes (e.g. Baker, Cobley, & Fraser-Thomas, 2009; Fraser-Thomas & Cote, 2006; Hedstrom & Gould, 2004; Malina, 2009, 2010). Because early specialization limits access to, and participation in, a variety of sports for these adolescents, sometimes occurring as early as ages 5 and 6 years old (Hecimovich, 2004), there is concern that early specialization is already contributing to declining in physical activity rates.

Because early specialization restricts adolescents' sporting repertoires to a single sporting experience during the critical formative stages of their development, these athletes may be deprived of the associated mental and physical benefits of varied sport participation. Research has suggested that these athletes may experience difficulties in adulthood when attempting to engage in new, unfamiliar sports or forms of physical activity (e.g., Baker, 2003; Roberts et al., 2001; Vanreusel, et al., 1997). Therefore, finding the appropriate balance between breadth and depth in an adolescent sporting repertoire is crucial. At a time of life when humans are naturally inclined to seek new stimulation and experiences, high-intensity, single-sport youth athletes can display deep but precariously narrow sporting repertoire profiles.

Iso-Ahola's (1980) Leisure Repertoire Theory posits that adult leisure behavior is built upon childhood experiences. The foundations for a lifelong healthy, active lifestyle are laid during adolescence. In the widest section of Iso-Ahola's (1986) Leisure Repertoire model, individuals can survive somewhat unbalanced repertoires, but during the crucial initial life-stages, this imbalance is a serious threat. Therefore, an examination of the long-term impact of repertoire breadth is warranted. Although researchers have tracked the relationship between the number of extracurricular activities participated in and its effects on community involvement (Fletcher & Shaw, 2000), academic achievement (Gerber, 1996), antisocial behavior (Mahoney, 2000), self-perceived competence (Jacobs, Vernon, & Eccles, 2005), and overall positive development (Rose-Krasnor, Busseri, Willoughby, & Chalmers, 2006), to our knowledge, no study has been conducted testing the longitudinal efficacy of the Leisure Repertoire Theory, directly linking the number of sports played during childhood to adult sport participation and physical activity levels.

Purpose of the Study

The Leisure Repertoire Theory, as posited by Iso-Ahola (1980) and updated by subsequent authors (e.g., Bocarro, Kanters, Casper, & Forrester, 2008; Iso-Ahola, Jackson, & Dunn, 1994; Mobily, Lemke, & Gisin, 1991; Zeijl, du Bois-Reymond, & te Poel, 2001) provides both a guiding theory and a theoretical model for the investigation of early-life sports experiences as the foundation for adult physical activity behavior. The original rhombic shape of the model can be improved by expanding it into the third dimension to better capture both the breadth of activity as well as the intensity level of an individual's

leisure pursuit. The Leisure Repertoire Theory has been used both directly and indirectly in studies primarily relating to youth physical activity and relationships to adult exercise levels. Studies assessing the breadth of an activity repertoire have shown that the overall number of activities is typically correlated with positive development (Fletcher & Shaw, 2000; Jacobs et al., 2005; Mahoney, 2000; Rose-Krasnor et al., 2006). However, direct testing of the leisure repertoire itself is almost non-existent (Nilsson, Lofgren, Fisher, & Bernspang, 2006). Accordingly, a direct test of the Leisure Repertoire Theory, through its subset, a Sporting Repertoire, could make a contribution to the leisure, sport development, and the physical activity bodies of knowledge.

Research has been conducted on the connection between general sport participation during adolescence with sport participation during adulthood (e.g., Green et al., 2005; Roberts et al., 1991; Scheerder, et al., 2006; Vanreusel et al., 1991), sport participation during adolescence and physical activity levels during adulthood (Perkins et al., 2004; Tammelin et al., 2003; Telama et al., 2006; Walters et al., 2009), and several researchers have studied the effects of repertoire breadth (e.g., Barnett et al., 2008; Busseri et al., 2006; Cote et al., 2009; Rose-Krasnor et al., 2006). However, there is a gap in the literature regarding the specific examination of number of sports played during adolescence and its relationship to adult sport participation and physical activity levels. Consequently, this study used a survey of former collegiate varsity athletes to assess the breadth of their adolescent sporting repertoires, their adult sport participation, and their adult physical activity levels to examine the effects of the total number of sports played during adolescence on adult sport participation and physical activity levels. Collegiate varsity athletes were a useful sample

population because they were certain to have an adolescent sporting repertoire with a wide variety of types of sporting repertoires ranging from the early-specialized to the diverse, multi-sport athlete, even during their time in college. Based on similar research in this area, the two primary research questions of this study are: What is the relationship between the total number of sports in an individual's adolescent sporting repertoire and that individual's adult sporting repertoire, and what is the relationship between the total number of sports in an individual's adolescent sporting repertoire and that individual's adult physical activity levels?

Significance of the Study

Research has determined a correlation exists between sports played as an adolescent and sporting behavior as an adult (e.g., Green et al., 2005; Roberts et al., 1991; Scheerder et al., 2006; Vanreusel et al., 1991). Similarly, research also indicates that there is a positive relationship between sport participation during adolescence and higher levels of physical activity during adulthood (Perkins et al., 2004; Tammelin et al., 2003; Telama et al., 2006; Walters et al., 2009). Barnett et al. (2008) found that participation in multiple youth sports maximized and enhanced physical development. However, the relationship of the breadth of an adolescent sporting repertoire, measured in number of sports played, to adult physical activity levels has not been studied.

Researchers have noted a trend towards increasingly earlier specialization in youth athletes over the last two decades (e.g., Baker et al., 2009; Cote et al., 2009; Hedstrom & Gould, 2004; Koplan, Liverman, & Kraak, 2005). Because early specialization may restrict adolescent sporting repertoires to a single sporting experience during the critical formative

stages of their development, some authors have suggested that these individuals may experience difficulties when undertaking new, unfamiliar forms of physical activity in adulthood (e.g., Baker, 2003; Roberts et al., 2001; Vanreusel, et al., 1997; Russell & Limle, 2013) or inhibit or retard well-rounded physical growth (Cote et al., 2009). If this is the case then the early-specialization trend may pose a threat to those individuals' adult physical activity levels. Therefore, an examination of the relationship between the breadth of an adolescent's sporting repertoire and their adult physical activity levels is critical, and should be examined for potential long-term implications.

This study will contribute to sport development literature by filling the noted gap in the research base regarding the relationship between adolescent sporting repertoires and adult sporting repertoires and physical activity levels. Furthermore, the study will attempt to do so while controlling for several possible confounding variables (race, sex, and SES), which have been shown to have a significant effect on physical activity levels (e.g., Sallis et al., 1996; Scheerder et al., 2006; Tammelin et al., 2003; Walters et al., 2009). This study's results could be a critical piece of information for parents, recreation programmers, and school administrators who are trying to determine the nature, breadth, and depth of children's sporting participation. Findings may also indicate that the current trend towards early specialization for young athletes is potentially damaging to those individuals' prospects of long-term engagement in sport or physical activity, or that there is no relationship between the two.

Delimitations

This study's scope was delimited by the following conditions:

1. Former North Carolina State University varsity athletes who attended the university and played a sport between 1987 and 1993.
2. Reliance on participants to have access to an email account that the North Carolina State Office of Advancement Services can contact.

Definition of Terms

1. Sport: A skilled, physical activity where an individual or team competes against one another, and was precisely articulated in the questionnaire to only include activities conducted in a formal, structured setting, excluding backyard, street, or pickup play.
2. Adolescence: For the purposes of this study, the term "adolescence" or "adolescent" has been expanded to cover years traditionally associated as part of childhood. This study asked participants to report all sports played in a competitive, structured setting before reaching college. Thus, the term adolescence is meant to encompass any and all of those relevant sport playing years before attending North Carolina State.
3. Adult Physical Activity Levels: Participant's self-reported current levels of physical activity using the IPAQ-LF.
4. CDC Recommended Levels of Physical Activity: Set at 60 minutes of MVPA/day for children and adolescents and 30 minutes of MVPA/day for adults (CDC, 2012c).
5. Leisure Repertoire: Originally defined by Iso-Ahola (1986) as "all activities a person considers potentially usable during [their] daily leisure" (p. 141), but this study uses

the definition updated by Mobily et al. (1991) that described a leisure repertoire as “a collection of activities capable of producing perceptions of competence and psychological comfort.... [A] leisure repertoire represents a ‘library’ of leisure activities that the individual can draw on for the meaningful use of time” (p. 211).

- a. Adolescent Sporting Repertoire: The sports regularly played during an individual’s adolescence. ‘Regularly’ is outlined by the Sports and Fitness Industry Association (formerly the Sporting Goods Manufacturers Association) standards for consistent participation, or ‘CORE’ participation (e.g. playing baseball 50+ times in a year or skiing 15+ times), as to exclude infrequent, casual activities. The breadth of the adolescent sporting repertoire is measured by the total number of sports played.
6. Moderate-to-Vigorous Physical Activity (MVPA): According to the CDC (2012d), moderate physical activity is defined as the expenditure of between 3.0 and 6.0 METs (or 3.5-7.0 kcal/min), while vigorous physical activity is defined as an expenditure of over 6.0 METs (or >7.0 kcal/min).
 - a. MET: “The ratio of exercise metabolic rate. One MET is defined as the energy expenditure for sitting quietly, which, for the average adult, approximates 3.5 ml of oxygen uptake per kilogram of body weight per minute (1.2 kcal/min for a 70-kg individual). For example, a 2-MET activity requires two times the metabolic energy expenditure of sitting quietly” (CDC, 2012d, p. 4).
 7. Youth Sport Specialization: Year-round training for a single sport at the exclusion of other activities (Wiersma, 2000).

Statement of the Problem

This study attempted to determine the relationship between the breadth of an adolescent sporting repertoire, (i.e. the number of sports regularly played during adolescence), and an individual's adult sport participation and physical activity levels. Additionally, when controlling for demographic variables such as race, sex, and socioeconomic status (SES), is there an association between a greater number of sports played during adolescence and adult sport participation and higher levels of physical activity during adulthood? Specifically, is there a specific number of sports played during adolescence that corresponds with those individuals still being active sport participants as adults and meeting or exceeding recommended CDC levels of physical activity? This study addressed these research questions:

1. What is the relationship between childhood/adolescent sport participation and adult sport participation?
2. What is the relationship between childhood/adolescent sport participation and adult physical activity levels?
3. Are specific sports or types of sport significantly more, or less, likely to still be present in an adult repertoire after being present in an adolescent repertoire?

Chapter Two: Literature Review

The purpose of the study is to assess the relationship between the breadth of an adolescent sporting repertoire, as measured in number of sports regularly played during adolescence, and adult sporting repertoires and physical activity levels. Furthermore this study will attempt to follow the precedent set in the research (e.g., Sallis et al., 1996; Scheerder et al., 2006; Tammelin et al., 2003; Walters et al., 2009) of controlling for various demographic variables such as race, sex, and socioeconomic status (SES), which has been shown to also influence adult physical activity levels.

This study uses the Leisure Repertoire Theory as its guiding foundational theory. The literature review will cover the development of the Leisure Repertoire Theory, including its antecedents and influences, as well as tracking its definitional development since its inception, including the important concept of substitutability. It will then describe the applications of the Leisure Repertoire Theory, both direct and indirect, in the field of physical activity, sport, and recreation. Lastly, I will cover some of the research on sport specialization, whose findings act as the catalyst for this study by underlining the importance of studying the effects of adolescent sporting repertoire breadth on adult sport participation and physical activity levels.

The Creation, Development, and Application of the Leisure Repertoire Theory

The Leisure Repertoire Theory was first developed by Iso-Ahola in his 1980 book, *The Social Psychology of Leisure and Recreation*. While not the first leisure researcher to use the word repertoire, Iso-Ahola provided the first comprehensive definition and model. This

theory has subsequently provided either the direct or indirect basis for studies and foundational approaches in disciplines ranging from Child and Youth Development, Gerontology, and Disability Studies, to Sports and Physical Activity, Public Health, and Recreation and Leisure.

Precursors and Influences to the Leisure Repertoire Theory. Research conducted without context is misguided. It would be a mistake, therefore, to study an individual or a society's leisure without viewing it as actions and moments within an overarching pattern over the course of time. As Gergen (1973) pointed out, social behavior is a product of a past experiences and cannot be assessed without providing adequate historical context. Both Gergen and Iso-Ahola (1980) saw Social Psychology as a historical inquiry. They agreed that it could not be comprehensive to view recreation, leisure, and physical activity only as a product of the now, but rather as a construct that has a past, present and future.

One theme Iso-Ahola (1980) clearly addressed in *The Social Psychology of Leisure and Recreation* was impact of past behavior on future behavior. Iso-Ahola cited several outdoor activity and leisure studies as evidence of the relationship between youth and adult leisure behavior. For example, Brim (1966) asserted that it was unlikely for adults to learn a new leisure behavior that they had not participated in during adolescence. Brim also noted that the life cycle contained crucial periods during early childhood and adolescence for learning leisure attitudes and behaviors that would not be present or accessible during adulthood. Spreitzer and Snyder (1976) examined the impact of youth sport involvement on adult sport participation. They tried to assess the overall meaning of sports within the adults'

lives as well as how much they followed and participated in sports. Their study indicated that youth participation was an overriding determinant of adult sport participation as athlete and spectator. Sofranko and Nolan (1972) tracked outdoor sporting activities and found a strong correlation between the 700 participants' hunting and fishing activities in the past year and their previous participation in these activities during their youth. Based on the evidence presented in these studies, Iso-Ahola (1980) concluded that a diversity of play activities in childhood would lead to a variety of adult leisure pursuits. Whether active or inactive, diverse or narrow, "childhood play lays the foundation for leisure and recreation behavior in one's later life" (Iso-Ahola, 1980, p. 129).

The Leisure Repertoire Theory. If a child's actions form the basis of their future activity, then these actions can be considered the building blocks of future behavioral structures. While new additions may be made that do not directly relate to earlier behavior blocks, these additions are often organized around and integrated into the existing behavioral foundation. Iso-Ahola's first description of a leisure repertoire was "all activities a person considers potentially usable during [their] daily leisure" (Iso-Ahola, 1980, p. 141). This definition implies that one does not have to have participated in that leisure activity before for it to still be considered by an individual as a viable leisure pursuit, which must be accurate because otherwise it would be categorically impossible to ever try something new. Instead, past leisure experiences provide the knowledge and capacity to branch out into new areas. Iso-Ahola explained: "every leisure experience in itself directly modifies one's self-determination and perceived competence" (p. 133). Consequently, Iso-Ahola stated, "the more extensive the perceived leisure repertoire, the better the psychological state" (p. 181).

This may be an overstatement of the importance of quantity versus quality, but it underscores the importance of having a variety of options to draw on for the better chance of finding a fulfilling activity.

While Iso-Ahola provided a useful definition, Mobily et al., (1991) proposed a modification of the leisure repertoire as “a collection of activities capable of producing perceptions of competence and psychological comfort.... [A] leisure repertoire represents a ‘library’ of leisure activities that the individual can draw on for the meaningful use of time” (p. 211). This library consists of activities that individuals perceive themselves as competent in undertaking, and which subsequently provide psychological comfort. Competence is internally measured against the individual’s peers while comfort is derived from a self-evaluation of the individual’s performance compared to internal standards (Mobily et al., 1991). Further, Bocarro et al. (2008) said that the leisure repertoire consists of regular activities that an individual performs well. The repertoire, therefore, hinges on the personal comfort and satisfaction that derives from the leisure activities and the desire for comfort and satisfaction acts as the driving force which expands and reduces the repertoire based on perceived self-actualization within individual activities.

The leisure repertoire is not an ever expanding construct, however. During middle adulthood various limitations as well as psychological shifts begin to narrow the repertoire (Iso-Ahola, 1980). An activity that an individual excels at may fall out of favor due to physical decline (e.g., sports), financial restrictions (e.g., loss of a job), or time restriction (e.g., marriage, having a child). Perhaps the activity runs its course of interest for the

participant. This pattern (depicted in Figure 1) also tends to follow Csikszentmihályi's (1975) description of the natural psychological flow of humans' desire for novelty and familiarity.

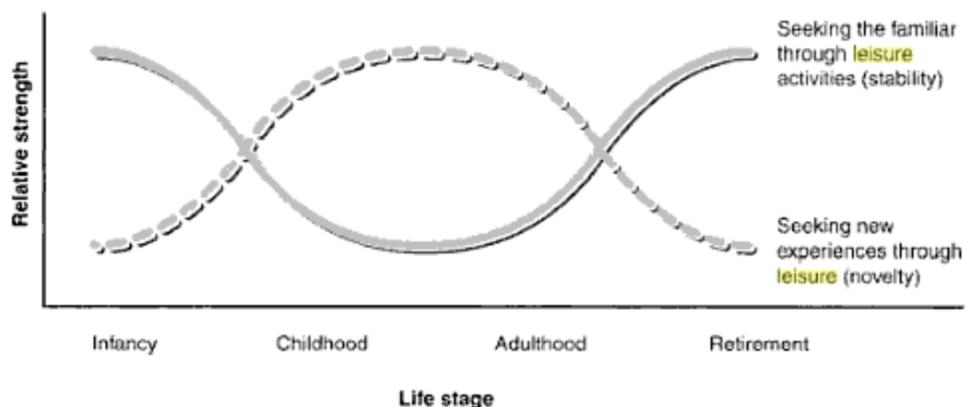


Figure 1: Human's Desire for the Novel and the Familiar

(Iso-Ahola, 1980, p. 176)

A desire for the familiar early in life is a restricting factor on the breadth of the leisure repertoire. However, as self-confidence builds and experience increases, the innate human tendency to seek out novelty during childhood and young adulthood leads to a widening of the repertoire. Eventually, humans tend to settle into familiar, comfortable routines. People's beliefs about what they are good at and enjoy doing, understandably tends to lead them to pursue that limited number of activities and interests. As the other limitations of age increase, the leisure repertoire typically begins to narrow, as illustrated in Figure 2. Exceptions to the rule always exist and the Leisure Repertoire Theory only provides a description of the likely path of an individual's leisure pursuits over the lifetime.

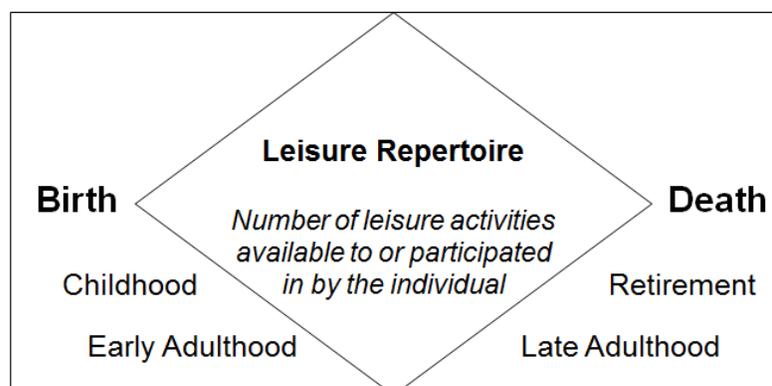


Figure 2: Iso-Ahola's Leisure Repertoire Model

(Iso-Ahola, 1980, p. 176)

Baltes, Staudinger, and Lindenberger (1999) provided a similar explanation for the trajectory of the leisure repertoire. They described the widening period as occurring when an individual samples a variety of possible activities during their developmental stages, and then subsequently selects a handful of chosen activities to invest in. These decisions result in an early period focused on the breadth of a repertoire, followed by a period dedicated to depth, a description that was supported by Rose-Krasnor et al (2006). While Figure 2 adequately conveys the central idea of the Leisure Repertoire Theory, it is ultimately an overly simplistic one. Like Baltes et al. (1999) and Rose-Krasnor et al. (2006), Iso-Ahola (1980) noted that leisure repertoires can “be broad, but may lack in depth, while that of others may be narrow but deep” (Iso-Ahola, 1980, p. 141). Owners of broad and shallow repertoires “participate in a great number of activities but perhaps more superficially in each of them; the latter in turn concentrate on a few activities requiring very intensive participation” (Iso-Ahola, 1980, p.

141). The former may be an athlete who plays several different sports in a recreational setting while the latter would describe an athlete who has specialized in one sport and dedicates a large amount of time to intense, sport-specific training. Given this description, a leisure repertoire comprises both width and depth and necessitates a three-dimensional model to most accurately convey the comprehensive scope of an individual's leisure engagement. Picture two perpendicular diamonds, as pictured in figure 2, set along the same horizontal axis; one reflecting breadth, the other reflecting depth. Someone who spends the majority of their time on one or two intensive pursuits or hobbies, a "serious leisure career" as described by Roberts (1999, p. 19), would have a narrow but deep repertoire. Someone who enjoys a number of activities and may constantly be trying new things, even for short periods of time, would have a wide but fairly shallow repertoire. In most cases, one model is not recommended over the other, depending on which approach contributes most to the individual's psychological health and well-being. In some instances, however, breadth is better than depth. Breadth may be more important than depth during the formative segments of adolescent sporting repertoires. Without a sufficient number of different sports, an adolescent's repertoire would lose a disproportionately large means of access to physical activity when a sporting career ends, and leave a correspondingly larger hole within the repertoire that would need to be substituted for.

Substitutability. One of the additions of Iso-Ahola's further examinations into the Leisure Repertoire Theory was the notion of substitutability. Iso-Ahola (1980) touched on this concept in his initial presentation of the theory, noting that "if a person's current activity, which [they are] asked to replace, is part of a wide leisure repertoire, it is easier for them to

substitute the activity, as compared to a person whose current activity is part of a narrow leisure repertoire” (p. 141). Iso-Ahola authored two papers on the theory of substitutability (Iso-Ahola, 1986) and the ability to replace leisure activities over the lifespan (Iso-Ahola et al., 1994). In the former, Iso-Ahola detailed the difficulties presented by altering the leisure repertoire, especially on the secondary narrowing slope of Figure 2. In the Iso-Ahola et al. paper, the notion of the lifespan and the particular introduction and loss of leisure activities during later years was explored. The ease in ability to substitute from a wide repertoire compared to a narrow repertoire illustrated the potential threat posed by a limited adolescent sport repertoire.

This hypothesis was underscored by Walters et al.’s (2009) work on high school athletes. Walters and her co-authors followed 1709 adolescents during their time in high school and then followed up five years later. They discovered that the high school athletes were more likely to have a steeper decline in MVPA than the non-athletes in their post-high school lives. This discrepancy could be explained by the removal of the athletes’ primary sport from their leisure repertoire, leaving a physical activity hole that they struggle to fill later in life. Walters et al. also cited the need for further research on the subject. Participating in a variety of activities during the crucial early developmental stages of an individual’s leisure repertoire may be more important, even at the expense of in-depth engagement, because it provides a deeper reservoir of activities from which to draw on later in life.

Applications of the Leisure Repertoire Theory

The Leisure Repertoire Theory has been used fairly widely across several different fields, but it most frequently appears in research on recreation, with several direct champions such as Roberts (e.g. Roberts et al., 1991; 1999). Research has showed that youthful participation in sport is a predictor of lifelong participation and that sport and physical activities engaged in as an adult were far more likely to be initially played and undertaken as children. Several researchers have shown this to be true using longitudinal studies as well as recall and self-assessment surveys.

Childhood Recreation and Sporting Repertoires. Since its inception, the concept of the Leisure Repertoire has most often been applied to physical activity and recreation. In their review of physical education programmes in England and Wales, Green et al. (2005) affirmed the Leisure Repertoire Theory, finding that adolescent participation in sporting activities corresponded with lifelong participation in those activities and that this indicated the need for a wider variety of sporting opportunities. In their case study of leisure careers, Roberts et al. (1991) noted that 65% of the sports that respondents would ever play regularly were initially played during their childhoods. Additionally, the sports and games first played during childhood and early adulthood became the basis for the later-life sporting activities of the respondents. Long-running sporting careers, while often necessitating a shift from one sport to a sport of lesser intensity, almost always featured a jump to a sport that had also been added to the leisure repertoire while young, and not to a new sport entirely. That is to say, individuals were considerably more likely to change sports to a sport they had already

participated in in the past. Similarly, Roberts and Brodie (1992) observed that leisure past-times typically narrowed to several preferred, retained activities. When later-life shifts in the sporting repertoire occurred, the shifts tended to be internal ones within the repertoire to another sport previously played, and did not include external additions.

While the Leisure Repertoire Theory has been prominently and specifically used in the studies above, it still has not been widely applied in name. The basic concepts, however, have become common themes in leisure and physical activity research. For example, research has indicated that outdoor recreation participation in youth is directly related to adult participation in the same activity (McGuire, Dottavio & O'Leary, 1987; O'Leary, Behrens-Tepper, McGuire & Dottavio, 1987). Roberts (1999) stated that "the best predictor of any individual's future uses of leisure is that same person's past behaviour" (p. 138). Powell and Dysinger (1987) noted that there was almost no literature on the topic and that consequently there was a great need for further research and a refocusing of public policy on diverse sport participation and physical activity during childhood. Since Powell and Dysinger's call for research several studies have found a positive association between participation in youth sports and increased physical activity later in life (e.g., Perkins et al., 2004; Taylor et al., 1999; Telama et al., 1997; Telama et al., 2006). Scott and Willits (1989; 1998) discovered that participation in leisure activities as an adolescent were strong predictors of participation as adults, even when controlling for gender, education, and income. Other studies specified ages, ranging from 9 to 18 years old, when long-term leisure habits were developed or by which time long-term indicators were reliable (Roberts, 1999; Telama et al., 1997; Telama et al., 2005). These studies underscored "the importance of getting youth involved in sport

activities so that they develop lifelong habits that include physical fitness” (Perkins et al., 2004, p. 516). While early involvement may not be the only method of encouraging and supporting adulthood physical activity, the research shows it may be the most crucial one.

Longitudinal Studies. In addition to the above studies, several researchers conducted longitudinal studies in an effort to track the correlation between youth and adult physical activity over the years. Kuh and Cooper (1992) examined a stratified sample of 3500 men and women from birth until the age of 43 years. Their results showed a higher likelihood of participating in physically active leisure activities if teachers had rated the study respondents as having “above average ability at school games” at 13 years of age, or having a “high energy level” at 15 years of age (p. 116). Tammelin et al. (2003) surveyed 7,794 Finns at ages 14 and 31 about their sport participation and physical activity levels. They observed a positive correlation between the frequency of sport engagement during adolescent (though not overall number of sports played) and adult physical activity levels. They also discovered that “adolescent participation in ball games increased participation in ball games in adulthood, especially in males, while participation in cross-country skiing, running, and orienteering provided the greatest stimulation to carry over of some endurance sport to adulthood” (p. 22). Busseri et al. (2006) built on the work of Cote (1999) and Rose-Krasnor et al. (2006), and conducted a longitudinal study of high schoolers’ repertoire breadths and their subsequent developmental paths. They found that the breadth, and importantly *not the intensity* of activity participation, had a reciprocal relationship with positive growth and development. Specifically, participation in several sports as adolescents exhibited optimal physiological development. The authors subsequently called for further exploration into the

effects of repertoire breadth on development. Their conclusions supported the findings of Lerner, Freund, De Stefanis, and Habermas (2001) who also championed the importance of repertoire breadth over depth. Barnett et al. (2008) administered an array of motor skills tests to 928 children and followed up with them six years later and found that those who had participated in multiple youth sports displayed the greatest aptitudes for composite motor control, cardiorespiratory fitness, and locomotor skill. In turn, the authors concluded that the adolescent with the highest composite motor skills were also the ones most likely to become fit, healthy adults. Vanreusel et al. (1991) conducted a longitudinal study of socialization into sport from youth to adulthood, and found, similar to Yang (Likes-Research Center Report, 1997), that time spent playing youth sports was the most critical indicator of sport involvement as an adult. In a study of 257 women 32-41 years of age who had participated in a physical activity study 20 years earlier, Sheerder et al. (2006) confirmed that sport participation in late adolescence tracked moderately high to adulthood. Furthermore, youth involvement was a better predictor of adult sport involvement than education or parental socioeconomic status. Thompson et al. (2003) conducted one-on-one interviews with 16 men and 15 women and then followed up with interviews 25 years later. They discovered that childhood physical activity behaviors and attitudes influenced adult physical activity preferences and activities. Engstrom (1991) addressed studies beginning in 1968, and also found that childhood physical activity both inside and outside of school were crucial to maintaining physical activity in adulthood. The nature of these longitudinal studies depended less on retrospective attribution and assessment by the subjects, and the results further

underscored the possibilities of the Leisure Repertoire Theory.

The Threat of Inactivity. In addition to monitoring sporting behavior and physical activity, researchers using the Leisure Repertoire Theory such as Roberts (1999) noticed a parallel connection in inactivity between youth and adulthood. This connection was confirmed by Scheerder et al. (2006) who found that inactivity during youth was a predictor of inactivity during adulthood. Vanreusel et al. (1997) noted that childhood activity was a predictor of late adolescent activity and that the late adolescent years played an especially “crucial linking role between youth and adulthood” (p. 384) related to physical activity. Vanreusel and his coauthors’ longitudinal study (1997) also discovered that there was nearly as strong a relationship between inactivity as well as activity at the youth compared to adult levels. Roberts et al. (1991) noted that “the longer a break [from playing sports lasts], the lower the chances [are] of a resumption, and the greater the likelihood of any resumption proving short-lived. Conversely, the longer the length of uninterrupted sport careers, the greater the likelihood of the players continuing” (p. 267). Furthermore, “long-term abstainers from sport were often effectively locked-out. Breaking into totally new leisure activities in later-life can mean surmounting numerous obstacles - maybe restructuring daily and weekly routines, acquiring new knowledge and skills, and entering new social networks” (p. 267). This finding, especially, lends credence to the Leisure Repertoire Theory because it indicates that if there was no activity addition to the repertoire, that resource cannot be drawn on later. Adding a new activity in adulthood means overcoming the obstacles presented, by adding an

entirely new aspect to the repertoire.

The Influence of Race, Sex, and Socio-Economic Status. Several studies into the relationship between adolescent and adult leisure behavior, and specifically the effects of adolescent sport participation on adult physical activity levels, have noted the influence of demographic variables and SES on the data (e.g., Scheerder et al., 2006; Scott & Willits, 1989, 1998; Tammelin et al., 2003; Walters et al., 2009). Walters et al. (2009) noted that for males and females' adolescent participation in high school sport as well as average MVPA were positively associated with SES. Even though MVPA declined after high school for both genders, and more sharply for participants who had played a sport in high school compared to those who did not, "SES had a significant moderating effect on the change in MVPA over time for boys who participated in organized sports, with low SES boys showing a steeper decline in MVPA between time periods than higher SES boys" (p. 268). In Tammelin et al.'s (2003) longitudinal examination of Finns' adolescent sport participation and adult physical activity levels, the authors were careful to control for familial social class. Scott and Willits (1989, 1998) also took care to control for gender, education, and income in their research on the connection between adolescent and adult leisure activities. It is important therefore to control for the mitigating effects of SES within my sample.

The Problems Posed By a Limited Adolescent Sporting Repertoire

Finding the appropriate balance between breadth and depth in the leisure repertoire is crucial. In the widest, central section of Iso-Ahola's model, individuals can survive somewhat unbalanced repertoires, but during the crucial initial life-stages, if substituting

from a limited repertoire is as difficult as the research indicates, this imbalance may be a threat. Hedstrom and Gould (2004) discussed the dangers inherent in a “professionalized approach to initial youth sports involvement,” including “skipping the critical romance phase, and overemphasizing winning, rankings, single sport involvement and downplaying the role of fun” (p. 39). At a time of life when humans are naturally inclined to seek new stimulation and experiences, high-intensity, limited-sport youth athletes can display deep but potentially dangerously narrow leisure repertoire profiles.

Roberts and Brodie (1992) argued for the childhood pursuit of breadth in lieu of depth. Under the leisure repertoire they argued that the number of sports learned and participated in, not the volume of time spent playing, was what mattered. More sports increased overall exposure and immersion as well as increased chances that sports would be maintained into adulthood. Vanreusel et al. (1997) also observed that “subjects with a competitive sport profile show both an earlier and a higher dropout rate than subjects with a recreational sport profile” (p. 377). Accordingly, “subjects with a recreational sport participation style appear to have better chances for continued sport involvement from youth to adulthood than subjects with a competitive sport participation style” (Vanreusel et al., 1997, p. 377). Russell and Limle (2013) found that while “self-reported exercise frequency (aerobic exercise and resistance training) in young adulthood was not influenced by whether participants specialized in a single sport as youth... those who specialized in a single sport as youth were less likely to actively participate in sport as a young adult” (p. 82). Consequently, the authors concluded that early specialization in youth sport may have negative repercussions for sport participation in adulthood. Russell and Limle also argued for the

importance of the breadth of an adolescent repertoire, stating that “early sport diversification is linked to a longer sport career and has positive implications for long-term involvement” (p. 82). Similarly, Cote et al. (2009) advocated for “early sampling” (p. 10) of sport, a strategy specifically supported by Kirk (2005), in a deliberate effort to widen adolescent sporting repertoires because they feared that limited sport exposure would stunt physical and motor skill growth and inhibit learning. These findings may be a concern when combined with Koplan et al.’s (2005) observation that in today’s society, the number of options is decreasing for students who are not advanced athletes. Given Iso-Ahola’s (1980) earlier observation about the comparative difficulty of replacing an activity in a narrow leisure repertoire compared to replacing an activity in a wide profile, sports might be particularly hard to substitute for children with narrow adolescent repertoires.

If there is difficulty in replacing or substituting sports from a narrow adolescent sporting repertoire, then assessing how narrow is too narrow is important. Therefore, determining the effects of the breadth of an adolescent sporting repertoire on adult sport participation and physical activity levels is necessary. While there is research connecting sport participation during adolescence with sport participation during adulthood, and several researchers have studied the effects of repertoire breadth, there is a gap in the literature in the specific examination of number of sports played during adolescence and adult sport participation and physical activity levels. Gerber (1996) explored the relationship between African-American and White public school students’ ($N=10,944$) participation in number extracurricular activities and academic achievement. Jacobs et al. (2005) examined the effects of the breadth of a leisure repertoire on self-perceived competence in those activities.

Mahoney (2000) conducted a longitudinal study on 695 participants from early childhood to age 24 years, and determined that the total number of extracurricular activities was positively associated with reduced criminal arrest and drop-out rates. Rose-Krasnor et al. (2006) acknowledged the importance of the breadth of the activity repertoire on positive development, and determined whether intensity of participation was an interrelated factor. Although the researchers discovered that intensity was moderately related to breadth, they concluded that breadth was the only significant influencer of development. However, they also determined that the effects of a wide activity repertoire on risk behaviors and academics plateaued once an individual reached a breadth of five or six different activities. Accordingly, this study sought to ascertain the nature of the relationship between adolescent sporting repertoire breadth and adult sport participation, sporting repertoire breadth, and adult physical activity levels. Additionally, this study tested whether certain sports were more likely to be retained from adolescence to adulthood.

Individual or “Lifetime Sports

Prior to this study, some debate surrounded whether or not different sports are more suitable to lifelong participation. Taylor, Blair, Cummings, Wun, and Malina (1999) suggested, “what is often lacking in studies of inter-age relationships is a distinction between...individual versus team sports” (p. 118). The question is whether activities such as jogging, swimming, tennis, and golf, activities that are more frequently engaged in by individuals over 55 than football or basketball, have a higher chance of encouraging lifelong activity. Powell and Dysinger (1987), Sallis, Zakarian, Hovell, and Hofstetter (1996), and

Sallis and McKenzie (1991) found that individual sports may have more carryover effect than team sports, a notion supported by the popular image of sports like running, swimming, tennis and golf as so-called “lifetime” sports. Similarly, adolescent engagement in endurance sports positively correlated to adult participation in endurance sports, especially among women. Sallis et al. (1996) and Powell and Dysinger (1987) postulated that sports that could be performed without the necessity of a team structure were more likely to carry over into adulthood. Tammelin et al.’s (2003), results, however, indicated that this may not be the case, at least amongst males, for whom team ball games showed significant carryover potential. Given the research discussed above, showing the advantages of developing a wide sporting profile and the difficulties of substituting a new sport for an old, intensely played one, this study attempted to answer whether specific styles of sports can matter.

The term “lifetime sport” appears frequently in both popular and social science literature but it appears to be accepted as a tautology without an established definition or regulated guidelines. The phrase is typically used to describe a sport that can be played during adulthood, especially, as is often found in the field of gerontology, during more advanced old age. However, this sense of lifetime overlooks the importance of the ability to play at a younger age. Certain sports, such as running or swimming or even skiing are conquerable from an early age, while other sports such as soccer or baseball (t-ball) are at least recognizable in their basic forms at young ages, while the physical and motor control demands of some sports, i.e., basketball, lacrosse, or tennis necessitate further advancement before the sport truly resembles its intended state. That being said, the vast majority of sports can feasibly be begun at an early enough age to be included in an adolescent repertoire.

Iso-Ahola's Leisure Repertoire Theory posits that adult leisure behavior is predicated on childhood experiences, and there is a wealth of research to support the connection between adolescent sport participation and adult sport participation (Scheerder et al., 2006; Sofranko & Nolan, 1972; Tammelin et al., 2003; Vanreusel et al., 1991) and adult physical activity levels (e.g., Engstrom et al., 1991; Kuh & Cooper, 1992; Perkins et al., 2004; Taylor et al., 1999). However, research (Iso-Ahola, 1986; Iso-Ahola et al., 1994) also notes the difficulties of replacing a removed activity from a repertoire containing a small number of activities, which indicates that the current early-specialization trend for youth athletes (e.g. Baker, Cobley, & Fraser-Thomas, 2009; Fraser-Thomas & Cote, 2006; Hedstrom & Gould, 2004; Malina, 2009, 2010) may endanger the chances of long-term sport engagement for adolescents with narrow sporting repertoires (e.g., Baker, 2003; Roberts et al., 2001; Vanreusel, et al., 1997; Russell & Limle, 2013). These effects may be somewhat mitigated, however, by the presence of certain sports or types of sport within the adolescent repertoire that are more conducive to long-term engagement (e.g., Sallis & McKenzie, 1991; Tammelin et al., 2003). Consequently, research on the effects of adolescent sporting repertoire breadth is needed.

Chapter Three: Methods

The purpose of this study was to test the Sporting Repertoire, a subset of the Leisure Repertoire Theory, and to assess the connection between adolescent and adult sporting behavior. This study sought to assess the relationship between the breadth of an adolescent sporting repertoire, as measured by the number of sports regularly participated in, and that individual's adult sporting engagement. More specifically, this study aimed to determine if there was a positive relationship between the size of an adolescent sporting repertoire and the size of an adult sporting repertoire, as well as the individual predictive effect of each sport in an adolescent repertoire. Furthermore, this study evaluated the relationship between the breadths of adolescent sporting repertoires and adult physical activity levels. Additionally, this study aimed to determine whether there is a positive relationship between the size of an adolescent sporting repertoire and that individual's adult physical activity levels. All of the study methods and protocol were approved by the North Carolina State University Institutional Review Board (see Appendices F-I).

Sample Population

An online survey was administered to former North Carolina State varsity athletes using Qualtrics software. Former athletes in their early- to mid-40s were targeted. To garner responses from this age range, varsity athletes who competed at North Carolina State and graduated between 1987 and 1993 formed the sample population. This sample was selected because they are removed from any professional or extended competitive careers and are engaging in the next phase of their lives, which include families, children, and other careers.

An examination of the major professional US sporting leagues indicated that no former North Carolina State athletes from these years are still playing.

Varsity athletes were chosen as the sample population for several reasons. First, former elite college athletes are likely to *have* an adolescent sporting repertoire, may have a variety of sports in these repertoires, and may display a variety of adolescent repertoire breadths, depending on the presence and extent of any specialization. Secondly, this convenience sample was both easily accessible, and given their affiliation with North Carolina State and North Carolina State Athletics, were deemed likely to participate in the study.

The North Carolina State Office for Advancement Services provided access to their alumni contact lists for athletes from the study's target years. Athletes listed as having graduated between 1987 and 1993 and having at least one sport entry in their account were selected. Individuals who had requested that they not be contacted by the North Carolina State Office of Advancement Services as well as those individuals who the Office had targeted as potential donors were removed from this initial group, leaving an initial sample population of 571 individuals. Due to inaccuracies about the sporting status of the individuals (i.e. club athlete or graduate assistant with team), incorrect email addresses, or emails bounced by spam filters, this number was reduced to 488. Of this 488, 149 (30.5%) of the eligible athletes contacted completed the survey.

Instrumentation

The survey was designed to assess respondents' adolescent sporting repertoires, measure respondents' current sporting engagement and physical activity levels, and collect specific demographic information (see Appendix E). Dillman et al. (2009) suggested that online surveys begin with an engaging welcome screen, followed by a simple, interesting opening question. The welcome screen displayed the two Wolfpack mascots, in an attempt to further capitalize on the athletes' connection with North Carolina State (Lonsdale, Hodge, & Rose, 2006), and the first question of the survey asked respondents which varsity sport they had played while at North Carolina State. Athletes, especially retired athletes, generally display a willingness to think about and discuss their athletic careers and for the majority if not all of these athletes, these careers culminated at the collegiate level, so I believed this question will be both straightforward and appealing to the participants. Additionally, it helped to eliminate erroneous members of the contact list provided by the North Carolina State Office of Advancement Services who were incorrectly listed as former varsity athletes.

Leisure and physical activity literature (e.g., Scheerder et al., 2006; Scott & Willits, 1989, 1998; Tammelin et al., 2003; Walters et al., 2009) suggests that certain demographic factors can affect adult physical activity levels. Therefore, my survey collected demographic information including age, sex, race/ethnicity, and current family structure and income. Apart from the question regarding current household annual income, this information was collected using standardized questions from the US Census, to enable controlling for these confounding factors during analysis. The question regarding income was amended from the census version because the researchers felt that the given brackets would not adequately

differentiate between individuals so instead the tiers were broken into \$15,000 brackets. These questions were located at the end of the survey, per Dillman et al.'s (2009) recommendations.

To capture respondents' adolescent sporting repertoires, the participants were asked to list the various sports they had played as children. Their participation in these sports were required to meet the Sports and Fitness Industry Association (formerly the Sporting Goods Manufacturers Association) standards for "regular" participation (e.g. participating in gymnastics 50+ times or playing soccer 26+ times in a year) as to exclude infrequent, casual activities (Sporting Goods Manufacturing Association, 2012).

IPAQ-Long Form. Using a questionnaire to assess physical activity levels means relying on self-reported data, which inherently raises reliability questions. A recall questionnaire was used because of its low cost, low burden, and general acceptability to both the researcher and subject (Mathews, 2002). My survey relied on the International Physical Activity Questionnaire-Long Form (IPAQ-LF) to measure adult physical activity levels. The IPAQ was developed in the late 1990s as a tool to reliably measure physical activities across different countries. It has a long- and short-form (LF, SF) and it has been tested numerous times for reliability and validity in various countries with mixed results. Some researchers have found that the IPAQ-SF does not meet minimum acceptable validity standards and its reliance on self-reported levels results in an over-estimation of physical activity (e.g., Lee et al., 2011). However, the majority of the research testing the IPAQ-SF indicated that it is an optimum self-report tool for physical activity (e.g., Craig et al., 2003; Hallal et al., 2010; Vandelanotte, De Bourdeaudhuij, Philippaerts, Sjostrom, & Sallis, 2005; Wollin, Heil,

Askew, Mathews, & Bennett, 2008). Consequently, I initially planned to use the IPAQ-SF for brevity reasons, but during pilot testing it became apparent that the completion time for the questionnaire using the IPAQ-LF still fell within acceptable limits (<10-15 minutes), so the IPAQ-LF was chosen for its more comprehensive cataloguing of physical activity.

Data Collection Procedures

Pilot Testing. Before contacting potential respondents, per Dillman, Smyth, and Christian's (2009) protocols for online surveys, the questionnaire was pilot tested on a group of three current North Carolina State varsity athletes to assess general survey comprehensibility and completion time. Pilot testing was critical to gauging the face validity of the instrument as well as the survey structure and syntax. I monitored the pilot testers to determine the time it took to complete the survey to ensure that the final survey would not take respondents more than 5-10 minutes to complete. Pilot testers displayed an average survey completion time of 9 minutes. Finally, I conducted a brief focus group with the pilot testing sample the day after taking the survey to determine if they had suggestions or concerns, or possibly shared experiences I needed to examine. All members of this group felt that the survey was straightforward and easy to comprehend, was not overly burdensome on the respondent, and that the method of assessing adolescent sporting repertoires accurately reflected their sporting participation at that time.

Preliminary Contact and Incentives. Dillman et al. (2009), suggest that before distributing the survey researchers should establish preliminary contact with potential respondents by sending them a brief personalized invitation to participate in the study.

However, I combined this invitation with the initial contact emails to capitalize on potential interest in the study by providing a link to the survey (see Appendix A). The email was delivered through Qualtrics at 10 am on a Monday, in order to try to have it appear at the top of recipients' inboxes as they were settling in at their workplace to start the week, but after they had presumably addressed any leftover emails from the weekend. The initial contact email had a formal, introductory tone and was sent with the subject line "Help the Wolfpack and Win a Prize!" The sender was listed as North Carolina State instead of my name in an attempt to benefit from the institutional affiliation of the athletes (Lonsdale, Hodge, & Rose, 2006). The invitation also informed recipients that participation entered respondents into a lottery drawing for three \$50 online gift cards (for ease of distribution to and redemption by the winners). Dillman et al. recommended offering a token cash incentive up front as the most effective method of increasing response rates by as much as 14%. However, given my budget and sample size, this recommendation would have created an untenable financial burden. Therefore, I opted for lottery drawings, Dillman et al.'s second-most effective method of encouraging participation.

Survey Distribution. Nine days after preliminary contact, non-respondents and those who had begun but not completed a survey, received a follow up email reminding them of the survey and encouraging their participation (see Appendix B). This email listed myself as the sender in lieu of North Carolina State, and was delivered at 1pm on a Wednesday to vary delivery time from the previous contact email. Following the "dynamic strategy" described by Sauermann and Roach (2013, p. 273) wherein the wording and tone of follow-up emails is varied, this survey took a friendly reminder tone but still was a formal, albeit personalized,

invitation. Dillman et al. (2009) recommended using an alternative form of communication such as postal mail for this follow up response to cover for a lack of response based on communication method. However, mailed surveys were too expensive and time-intensive to be an option.

A second follow-up email was sent twenty days after the first follow-up to the participants who still had not responded or had begun but not completed a survey (see Appendix C). This email was sent at 4pm on a Tuesday, and was highly personalized, introducing a competition between the varsity teams to see which team could generate the most responses. I was able to personalize the email with the recipients' name and sport so that I could encourage them to assist their former [insert sport here, i.e. soccer, football, baseball] teammates in this competition. Furthermore, the subject line was changed to "please take seven minutes for Wolfpack athletics research!" because Trouteaud (2004) found that including a plea as a part of the subject line significantly increased the odds of a recipient responding. Research (e.g., Callegaro, Kruse, Thomas, & Nukulij 2009; Couper, 2008; Porter & Whitcomb, 2003) has underscored the importance of the subject line as the critical first impression for email contact in online surveys and consequently, after using a more formally capitalized subject line in the prior two messages, I altered this subject line to use all lowercase letters in an effort to mimic an informal email sent between two more familiar contacts. While direct causation conclusions from this method cannot be drawn, there was certainly a correlation as this wave of responses far outstripped any other post-contact wave, and constituted 43% of all responses. More tellingly, I received substantially more personal email replies from this contact email, with content ranging from confirming

that the recipient had taken the survey, to asking questions about the research and/or whether the results would be available, to simply wishing me well with the data collection. The tone of these emails often implied that the individual felt more of a connection between the two of us.

The third and final follow-up email was sent out nine days after the previous email at 8pm on a Thursday, in an attempt to catch potential respondents who might be checking their email in the lull following dinner before retiring to bed (see Appendix D). This follow-up email followed the outline of the previous email, being highly personalized and with a similar, but less pleading and more appreciative tone to the subject line: “I’d love eight minutes of your time for my Wolfpack athletics research!” The email also attempted to capitalize on the holiday spirit of giving to encourage potential respondents to share their contributions.

Potential respondents were given an additional week after the final follow-up email to respond before the survey was closed, all respondents were thanked, the lottery drawing was held, and the gift cards were distributed. Therefore, the complete timeline between the initial invitation email and the final follow up lasted approximately six weeks.

Coding

During the coding process for the questionnaire responses, several choices were made about how to treat the data. There were five respondents who were multi-sport varsity athletes in college. Their responses were duplicated to create two separate entries, one for each varsity sport, to be able to better analyze the sports separately. Several respondents

clearly misunderstood that the IPAQ asks for hours and minutes of physical activity for one value and instead would input values such as both 2 hours and 120 minutes. However, there were several instances where respondents would input values such as 1 hour and 90 minutes. When this was the case the lower of the two values was selected as the final value because of the demonstrated trend in physical activity self-report tools of respondent over-reporting (e.g. Craig et al., 2003; Hallal et al., 2010; Vandelanotte et al., 2005; Wollin et al., 2008).

To use standardized measures of consistent participation, the Sports and Fitness Industry Association's standards for "CORE" participation ("Regular" or "Frequent" designations) were used as the minimum threshold to determine whether the sport was a part of the individual's repertoire (Sporting Goods Manufacturing Association, 2012). At the time of the questionnaire creation these standards were drawn from the 2012 Sporting Goods Manufacturing Association's Topline Participation Report. However, since the creation and distribution of the questionnaire, several issues have emerged or decisions have been made that must be noted. The CORE participation numbers listed by the SFIA for indoor soccer and slow-pitch softball (13+) have half the required participation rates of outdoor soccer and fast-pitch softball (26+). No reasoning could be found for this decision. Water polo, diving, and rowing/crew are all sports not listed by the SFIA but since every other water sport listed uses an 8+ designation, this standard was applied to these sports as well. Similarly, the SFIA does not list marathon separately, so it was given the 2+ designation used for Triathlon.

Lastly, respondents were encouraged to enter any sports that they felt were part of their repertoire, either during adolescence or adulthood that were not already listed. Two respondents listed additional sports in their adolescent repertoires: badminton and horseback

riding. Due to the physical activity levels and potential for competitive structure for each sport, both were added to the total number of sports in that individual's adolescent repertoire. Adult repertoires also featured supplementary user additions. The questionnaire repeatedly emphasized the importance that only sports played in a structured, competitive setting should be counted as a part of an individual's repertoire. This choice was made because competitive, structured sports are likely to be coached with a deliberate emphasis on skill development, while the nebulous nature of backyard or pickup games makes it difficult to accurately compare them amongst individuals (Hirvensalo, Lintunen, & Ratanen, 2000). Generally, respondents were given the benefit of the doubt for the physical activity requirements and potential for competitive structure of their added sports. This resulted in sailing, waterskiing, crossfit, horseback riding, and kayaking (assumed to be competitive, whitewater) added as additional sports. Indoor cycling was not added as it was not substantially different from outdoor cycling (the respondent also checked that they cycled outdoors), nor was fishing (due to the lack of physical activity standards to be considered a sport for this study). Walking, yoga, and hiking were also not added, despite the potential for physical activity, because of the lack of potential competitive structure.

Due to the lack of variability and diversity among respondents, some of the variables were excluded or modified. Both race and SES were removed as SES was not normally distributed, and there were not enough African-American, Asian, or Latino respondents to be able to re-classify the variable as White or Non-White. However, family structure was recoded into married/partnered or single and the presence of children in the home was

recoded into present or not-present, and included, along with gender, in a binary logistic regression model.

Analysis

The data from the questionnaire were analyzed using the Statistical Package for Social Sciences (SPSS) Version 22.0 software. To best illustrate the sample population, descriptive statistics from the six demographic questions were calculated. This study's primary research questions regarded the relationship between adolescent sporting repertoire breadth and adult sporting repertoire breadth and physical activity levels. In order to create snapshot answers to the relationships in question, Pearson correlation coefficients were calculated.

Given the established impact of various demographic variables on sport participation, a binary logistic regression was used to model these relationships (e.g., Perkins, Jacobs, Barber, & Eccles, 2004; Scheerder et al., 2006; Tammelin et al., 2003; Walters et al., 2009). A binary logistic regression was used to model the relationship between the continuous interval independent variable, adolescent sporting repertoire size, and the dichotomous yes/no dependent variables (adult sport involvement, meeting CDC recommended levels of physical activity in adulthood, meeting CDC recommended levels of physical activity in adulthood through intentioned recreational pursuits). Gender, family structure and the presence of children in the home were the demographic variables included in the binary logistic regression model.

Certain sports may be easier to substitute than others owing to a relative ease of engagement, or re-engagement. Accordingly, respondents' repertoires were analyzed using McNemar's Chi-Square test to see which, if any, sports had a significant continuity within an individual's sporting repertoire. McNemar's Chi-Square test was chosen because of its efficacy in analyzing 2x2 tables of paired, dichotomous data points (participation in a specific sport at both adolescence and adulthood, coded as yes/no), to determine the marginal homogeneity of the relationship between a row's and corresponding column's proportions (Malkin, 2002). Because not all of the sports listed on the questionnaire were included in either, or both, adolescent and adult sporting repertoires, these missing sports were not analyzed.

Chapter Four: Results

The sample population for this study was largely homogenous. Results indicated that a majority of the respondents were white (87.8%), married or in a long-term partnership (88.2%), and had one or more children living at home (79.0%). However, these percentages may not be reflective of the total sample since 16.7% of respondents preferred not to answer the demographic questions.

Respondents' average age was 46 years old and 63.7% were male. Over three quarters (77.4%) of respondents had an annual income exceeding \$120,000, well above the 2012 US median income of \$51,017 (US Census Bureau, 2013), which places them squarely in the upper-middle class bracket according to common US standards (Gilbert, 2002; Thompson & Hickey, 2005).

Findings

This research sought to directly assess the tenets of the Leisure Repertoire Theory, using a Sporting Repertoire. Specifically, this study analyzed whether adult sporting behavior is built upon adolescent sporting engagement. To do this, this study examined the relationship between the breadth of an individual's adolescent sporting repertoire, measured by number of sports engaged in, and the breadth and existence of an adult sporting repertoire. Additionally, the impact of the breadth of the adolescent repertoire was examined in relationship to that individual's adult physical activity levels.

The Relationship between Adolescent and Adult Sporting Repertoires. The sample population did provide a wide range of adolescent sporting repertoires. Participants

reported adolescent sporting repertoires consisting of between 0 and 11 sports, with a mean of 3.5, and a standard deviation of 2.062 (Table 1).

Table 1:

Adolescent Repertoire Frequencies

| | Adolescent Repertoire Size | # of Respondents | Percent of Respondents |
|-------------|----------------------------|------------------|------------------------|
| | 0 | 3 | 2.0 |
| | 1 | 21 | 14.1 |
| | 2 | 29 | 19.5 |
| | 3 | 33 | 22.1 |
| | 4 | 19 | 12.8 |
| | 5 | 24 | 16.1 |
| # of Sports | 6 | 6 | 4.0 |
| | 7 | 6 | 4.0 |
| | 8 | 5 | 3.4 |
| | 9 | 2 | 1.3 |
| | 10 | 0 | 0.0 |
| | 11 | 1 | .7 |
| | Total | 149 | 100.0 |

Adult sporting repertoires displayed a much narrower variability, ranging from 0 to 3 sports, with a mean of 0.69 and a standard deviation of 0.872. Over half of the respondents were no longer engaged in sport as adults (Table 2).

Table 2:

Adult Repertoire Frequencies

| Adult Repertoire Size | Frequency | Valid Percent |
|-----------------------|-----------|---------------|
| 0 | 79 | 53.4 |
| 1 | 43 | 29.1 |
| 2 | 19 | 12.8 |
| 3 | 7 | 4.7 |
| Total | 148 | 100.0 |
| Missing | 1 | |

Note: N=149

A side-by-side comparison of adolescent and adult sporting repertoire frequencies is pictured in Figure 3:

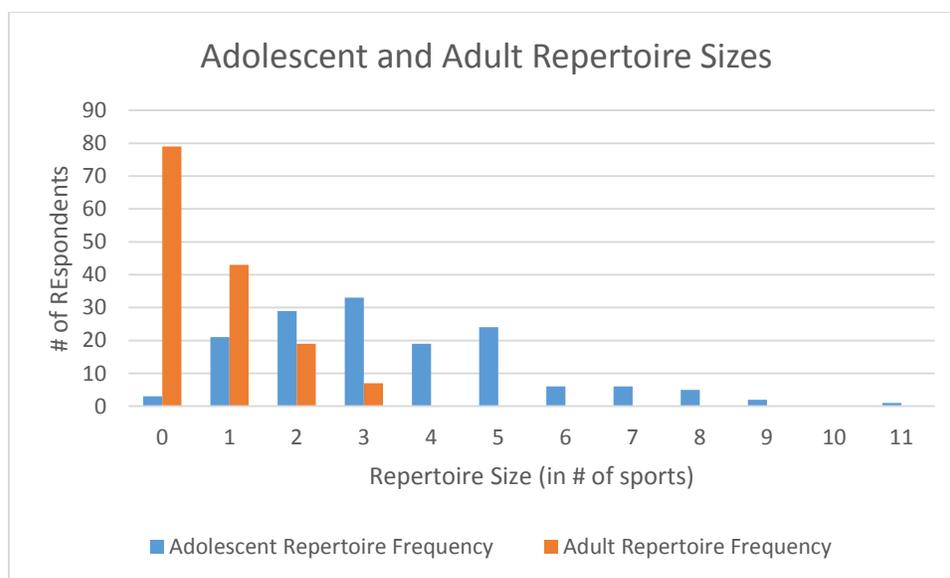


Figure 3: Adolescent and Adult Repertoire Size Distribution

The Pearson correlation coefficient was calculated in order to provide snapshot answers to the relationship between the size of the adolescent sporting repertoire and size of adult sporting repertoire (see Table 3).

Table 3:

Adolescent Sporting Repertoire Size as a Predictor of Adult Sporting Repertoire Size

| Total # of Sports Played in Childhood | # of Sports played as an Adult | Pearson Corr. Coeff. | Sig. (2-tailed) |
|---------------------------------------|--------------------------------|----------------------|-----------------|
| | | .169 | .041* |

Note: N=148, *=P<0.05

There was a significant, positive correlation between the number of sports played during adolescence and the number of sports played during adulthood; a larger adolescent repertoire significantly predicted a larger adult repertoire. The connection between adolescent sporting repertoire size and adult sport engagement merited further exploration so this relationship was modeled to confirm the results of the Pearson tests, while controlling for demographic factors (see Table 4).

Table 4:

Adolescent Repertoire Size as a Predictor of Adult Sport Involvement

| | B | S.E. | Wal d | Sig. | OR |
|--------------------------------|------|------|-----------|--------------|--------------|
| Adolescent Repertoire Size | .206 | .100 | 4.21 6 | .040* | 1.228 |
| Children Present in Home | .008 | .514 | .000 | .987 | 1.008 |
| Married/Partnered or Single | .384 | .649 | .350 | .554 | 1.468 |
| Gender | .083 | .412 | .041 | .840 | 1.087 |

Note: *= $P < 0.05$

When controlling for demographic factors, the breadth of the adolescent sporting repertoire was still a significant predictor ($p = 0.040$) of adolescent sporting participation. The regression model indicates that each sport in an individual's adolescent sporting repertoire resulted in that individual being 1.2 times as likely to still be an active sport participant.

The Relationship between Adolescent and Adult Physical Activity Levels. The relationship between adolescent sporting repertoire size and adult physical activity levels was also assessed by calculating the Pearson correlation coefficient (see Table 5).

Table 5:

Adolescent Sporting Repertoire Size as a Predictor of Meeting CDC Recommended Physical Activity Levels

| | | Pearson Corr. | Sig. (2-tailed) |
|-----------------------------|--------------------------------|---------------|-----------------|
| | | Coeff. | |
| Total # of Sports Played in | Total PA/Day | .008 | .922 |
| Childhood | Recreational Minutes of PA/Day | -.022 | .789 |

Note: N=148, *=P<0.05

Results indicated that there was not a significant relationship between the number of sports played during adolescence and the total number of minutes of adult physical activity ($p = 0.922$) or the total minutes of adult physical activity gained through intentional recreational pursuits ($p = 0.789$). Additionally, regression models were created to illustrate this relationship while controlling for demographic variables, and these models confirmed that adolescent sporting repertoire size was not significantly related to adult physical activity levels ($p = 0.219$) (see Tables 6 & 7).

Table 6:

Adolescent Repertoire Size as a Predictor of Meeting CDC Recommended Physical Activity Levels as an Adult

| | B | S.E. | Wal d | Sig. | OR |
|--------------------------------|-------|------|-----------|------|-------|
| Adolescent Repertoire Size | -.124 | .101 | 1.51 1 | .219 | .884 |
| Children Present in Home | .649 | .543 | 1.43 0 | .232 | 1.914 |
| Married/Partnered or Single | -.185 | .721 | .066 | .798 | .831 |
| Gender | .525 | .480 | 1.19 8 | .274 | 1.691 |

Note: *=P<0.05

Table 7:

Adolescent Sporting Repertoire Size as a Predictor of Meeting CDC Recommended Physical Activity Levels through Intentioned Recreational Physical Activity as an Adult

| | B | S.E. | Wal d | Sig. | OR |
|--------------------------------|------|-------|----------|------|-------|
| Adolescent Repertoire Size | .106 | .147 | .525 | .469 | 1.112 |
| Children Present in Home | .129 | .881 | .022 | .883 | 1.138 |
| Married/Partnered or Single | .337 | 1.190 | .080 | .777 | 1.401 |
| Gender | .177 | .697 | .064 | .800 | 1.193 |

Note: *=P<0.05

Specific Sport Carryover from Adolescence to Adulthood. The carryover viability from adolescence to adulthood of different sports may not be the same, however. Accordingly, respondents' repertoires were analyzed using McNemar's Chi-Square test to see which, if any, sports had a significant continuity within an individual's sporting repertoire. Full results by sport are listed in Table 8.

Table 8:

Sport Continuity from Adolescence to Adulthood

| Adolescent Sport → Adult Sport | Adolescent N ↓ | Adult N → | Total N | McNemar Test – Exact Sig. |
|--|-------------------|--------------|---------|------------------------------|
| Baseball → Baseball | 0 | 0 1 | | .000* |
| | 1 | 85 0 | 85 | |
| | | 61 2 | 63 | |
| Baseball → Softball (slow-pitch) | 0 | 0 1 | | .000* |
| | 1 | 85 0 | 85 | |
| | | 52 11 | 63 | |
| Basketball → Basketball | 0 | 0 1 | | .000* |
| | 1 | 70 1 | 71 | |
| | | 60 17 | 77 | |
| Bi/Triathlon → Bi/Triathlon | 0 | 0 1 | | .039* |
| | 1 | 139 8 | 147 | |
| | | 1 0 | 1 | |
| Bi/Triathlon → Cross Training (e.g. CrossFit, P90X) | 0 | 0 1 | | .003* |
| | 1 | 135 12 | 147 | |
| | | 1 0 | 1 | |
| Bi/Triathlon → Running (marathon) | 0 | 0 1 | | .375 |
| | 1 | 143 4 | 147 | |
| | | 1 0 | 1 | |
| Bi/Triathlon → Running (cross country, road, or trail) | 0 | 0 1 | | .000 |
| | 1 | 114 33 | 147 | |
| | | 1 0 | 1 | |
| Diving → Swimming | 0 | 0 1 | | .115 |
| | 1 | 128 14 | 142 | |
| | | 6 0 | 6 | |

Note: * $p < 0.05$

Table 8:

Continued

| Adolescent Sport → Adult Sport | Adolescent N ↓ | Adult N → | Total N | McNemar Test – Exact Sig. |
|---|----------------------|------------------------------|-----------|------------------------------|
| Football (tackle) → Football (tackle) | 0 1 | 0 1 98 0 49 1 | 98 50 | .000* |
| Football (tackle) → Football (flag) | 0 1 | 0 1 96 2 46 4 | 98 50 | .000* |
| Golf → Golf | 0 1 | 0 1 95 26 5 22 | 121 27 | .000* |
| Running (cross country) → Cross Training (e.g. CrossFit, P90X) | 0 1 | 0 1 122 12 14 0 | 134 14 | .845 |
| Running (cross country) → Running (marathon) | 0 1 | 0 1 130 4 14 0 | 134 14 | .031* |
| Running (cross country) → Running (cross country, road, or trail) | 0 1 | 0 1 108 26 7 7 | 134 14 | .001* |
| Running (cross country) → Bi/Triathlon | 0 1 | 0 1 126 8 14 0 | 134 14 | .286 |
| Skiing (downhill) → Skiing/Snowboarding (downhill) | 0 1 | 0 1 133 4 4 7 | 137 11 | 1.000 |
| Soccer → Soccer (indoor) | 0 1 | 0 1 110 0 34 4 | 110 38 | .000* |
| Soccer → Soccer (outdoor) | 0 1 | 0 1 110 0 34 4 | 110 38 | .000* |
| Swimming → Swimming | 0 1 | 0 1 110 2 24 12 | 112 36 | .000* |
| Tennis → Tennis | 0 1 | 0 1 117 7 15 9 | 124 24 | .134 |

*Note: *p<0.05*

Table 8:

Continued

| Adolescent Sport → Adult Sport | Adolescent N ↓ | Adult N → | Total N | McNemar Test – Exact Sig. | |
|---|-------------------|--------------|---------|------------------------------|-------|
| Track & Field (track events) → Cross Training (e.g. CrossFit) | 0 | 104 | 9 | 113 | .000* |
| Track & Field (track events) → Running (marathon) | 0 | 109 | 4 | 113 | .000* |
| Track & Field (track events) → Running (road, or trail) | 0 | 91 | 22 | 113 | .883 |
| Track & Field (track events) → Bi/Triathlon | 0 | 105 | 8 | 113 | .000* |
| Volleyball (court) → Volleyball (court) | 0 | 134 | 0 | 134 | .000* |
| Weightlifting → Weightlifting | 0 | 123 | 8 | 131 | .648 |
| | 1 | 11 | 6 | 17 | |

Note: * $p < 0.05$

Results showed that Football, Basketball, Soccer, and Swimming/Diving all showed a significant decline in participation from adolescence to adulthood. Additionally, Baseball also displayed a significant decline, both from participation in baseball as an adolescent to participation in Baseball, Slow-, or Fast-Pitch Softball as an adult.

Cross Country runners were significantly likely to continue with some form of general running (either road or trail). However, the carryover from Cross Country running to Cross Country running was the only significant sport-specific correlation. Cross Country runners did not become Marathoners, Tri- or Biathletes, Track runners, or participate in

Cross Training (i.e. CrossFit, P90X, etc). The 12 Cross-Fit, 4 Marathon, and 8 adult Tri/Biathloners all came from athletes who were not Cross Country runners during their adolescence. Not a single one of the 35 adolescent Track & Field-Track athletes or 24 Track & Field-Field athletes, while significantly likely to continue running in adulthood, still participated in Track or Field events.

In addition to running, Golf actually displayed significant growth in participation from adolescence to adulthood suggesting that while its sporting profile enables lifetime participation, it is not a sport that must be played early enough to be engaged in at an older age. Similarly, while Tennis participation declined, it did not do so significantly, and nearly half of the adult tennis players (7 of 16) first engaged in the sport after adolescence.

Chapter Five: Discussion

While the Leisure Repertoire Theory has been specifically and tangentially used in physical activity research, and some research has focused on the positive effects of repertoire breadth (Cote et al., 2009; Jacobs et al., 2005; Mahoney, 2000; Rose-Krasnor et al., 2006), direct testing of the Leisure Repertoire Theory, especially within sport is absent (Nilsson, Lofgren, Fisher, & Bernspang, 2006). This study sought to directly test the Leisure Repertoire Theory, through the use of a Sporting Repertoire, by examining the relationship between the breadth of an adolescent sporting repertoire and the existence and breadth of an adult sporting repertoire. Additionally, this study aimed to delineate the relationship between adolescent sport participation, measured through total sports played, and adult physical activity levels, in an effort to determine if there was a target size for an adolescent sporting repertoire that would significantly enable an individual to be more likely to hit CDC recommended targets for daily physical activity in adulthood.

Iso-Ahola (1980) felt that adult behavior was built on childhood experiences, something that has been supported in a sport context by several authors (e.g. Green et al., 2005; Roberts et al., 1991; 1999). These findings are similar to other studies on repertoire breadth (e.g., Barnett et al., 2008; Busseri et al., 2006; Jacobs et al., 2005; Rose-Krasnor et al., 2006), wherein results have showed the overall positive effects of greater repertoire breadth within a specific domain, in this case sport.

Results did not indicate a significant relationship between adolescent sporting repertoire breadth and adult physical activity levels. However, findings demonstrated a significant positive correlation between the number of sports played during adolescence and

the number of sports played during adulthood. Additionally, when controlling for gender, family structure, and the presence of children in the home, it was determined that each sport engaged in during adolescence resulted in an additional, cumulative 20% chance that that individual would still be engaged in sport as an adult. Furthermore, results indicated that specific sports showed either a significant decline in participation (baseball, basketball, football, soccer, swimming, and volleyball), significant retention from adolescence to adulthood (running), or even significant growth (golf). Given the importance of sport to combating obesity (e.g. Koplan, Liverman, & Kraak, 2005; Steinbeck, 2001) this underscores the overall importance of the breadth of childhood participation in sport, supporting the conclusions of Cote et al. (2009) and Kirk (2005) who advocated for early sampling of sport.

Even though results of this study showed that the diversity of an adolescent repertoire was not related to adult physical activity, sport still has a demonstrated role in providing physical activity outlets for individuals (e.g., Roberts et al., 1991; Tammelin et al., 2003; Vanreusel et al., 1997; Walters et al., 2009). The lack of connection between the two in this study may be related to the sample population and some of the difficulties experienced by elite-level athletes, which is a limitation of this study. For instance, burnout is a phenomenon associated with elite athletes (e.g. DeFreese & Smith, 2013; Lonsdale, Hodge, & Rose, 2006; Malina, 2009; Vanreusel et al., 1997), and it may be one explanation for the level of sport disengagement shown by the sample population. No direct conclusions can be drawn here, however, because participants were not questioned about their motives for remaining engaged or disengaging from sport.

Diverse Sport Participation as an Adolescent Predicts Adult Sport Participation

The most fundamental finding of this study was respondents with larger adolescent sporting repertoires were more likely to still be active sport participants, and that a larger adolescent sporting repertoire predicts a larger adult repertoire. This supports the notion of substitutability (Iso-Ahola, 1980; Iso-Ahola, 1986; Iso-Ahola et al., 1994) within the Leisure Repertoire Theory because it demonstrates the relative difficulties of substituting or replacing a sport from a narrow adolescent sporting repertoire in adulthood. Iso-Ahola's (1980) warned against the relative struggle to substitute and activity from a narrow leisure repertoire compared to replacing an activity from a wider repertoire.

If the Leisure Repertoire Theory is viewed as a three dimensional figure, and envision the wider, flatter model, of an individual engaged in several different sports as an adolescent, it is easier for that individual to replace the smaller vertical cross-section of that repertoire representing one sport. This sport constitutes a comparatively small percentage of the overall repertoire, thereby easing its replacement either by the addition of a new sport or, more likely, the focusing on a sport already engaged in by the individual to replace it. However, if the individual's repertoire model is narrow, because the individual played one or two sports as an adolescent, that replacement is significantly more difficult because the removal of that sport entails a much larger section of the overall repertoire that must be replaced.

These difficulties echo the conclusions of Barnett et al. (2008) who found that children who developed good motor control abilities were more likely to be fit adolescents than those who struggled in object manipulation. They postulated that fine motor-skill development, therefore, should be an important element of any plan or program targeting

enduring fitness over the lifecourse. Participation in a variety of different sports as a child and/or adolescent is likely to provide opportunities for a variety of settings and requirements for various types of motor control abilities, thereby increasing overall motor skill development. Because of the potential difficulties of engaging in new activities later in life and the inclination for adults to gravitate toward new activities within which they have self-perceived competence (Iso-Ahola, 1980; Iso-Ahola, 1986; Iso-Ahola et al., 1994), better developed motor skill abilities during adolescence is more likely to encourage adult sport participation. This connection exists even within new, unfamiliar sports, because of the relative ease of assimilating the actions and motions required in that sport. When an individual grew up playing one or two sports their ability to adapt to a new sport in adulthood, especially those that may require an entirely different skill set or social setting, will be more arduous than it would be for an individual who already has the background and familiarity with several different sports that might ease adaptation. These difficulties may be further compounded by the type of sport played during adolescence, and this hypothesis should be examined in future research.

It would be inaccurate to view the leisure repertoire model as simply containing one shift, from adolescence to adulthood, at the widest points of the diamond model. Instead, humans experience an ever-adjusting series of progressions over the lifecourse. There may likely be a later shift, post adulthood, where a sporting repertoire is further reduced. This underscores the importance, not only of a diverse adolescent repertoire predicting the presence of adult sport involvement, but how a larger adolescent repertoire predicts a larger adult repertoire. If an adult repertoire contained two sports, running and golf, for instance, as

opposed to just one, running, then a later-life event that forces another shift, a knee replacement for example, may simply reduce the repertoire to one sport instead of none. This would allow the individual to remain an active sport participant for a longer span of their lifetime, continuing their access to the social (e.g., Fraser-Thomas et al., 2005; Hedstrom & Gould, 2004; Weiss, 2004; Wiersma, 2000;) and physical (e.g., Barnett et al., 2008; Fraser-Thomas et al., 2005; Hedstrom & Gould, 2004) benefits of sport. Consequently, it seems important to encourage an early diversification of sporting experiences.

“Lifetime” Sports

Prior to this study, some debate surrounded whether or not different sports are more suitable to lifelong participation. At its core, a lifetime sport must be one where the inherent physical demands of the sport do not disenable the majority of elderly potential participants from engagement. Furthermore, the infrastructure for continued participation in a sport must be present for it to be labelled a lifetime sport. This is apparent perhaps nowhere better than with the sport of padded, tackle football which, despite the presence of small semi-professional leagues, is essentially not an option for any adult after a competitive high school or collegiate career ends. While adult flag football exists it could be argued that this game is so fundamentally altered from its original format that it is, essentially, an entirely different sport. Combine this with the fact that most children who engage in any form of football do so through intramural or community flag football leagues, or, most likely, through unorganized playground or park play, these children essentially begin and end any football career in a separate sport from whatever padded tackle football they engage in in the middle. As such, it

may be reasonable to classify flag, but not padded tackle football as a lifetime sport.

Similarly, the opportunities for adults to engage in organized lacrosse, wrestling, track and field events, gymnastics, cheerleading, or field hockey prevent these sports from being labeled lifetime sports.

Outside of organized environments to engage in sport, some sports have inherent structural, equipment and player personnel requirements that are barriers to lifetime participation. While the physical demands of, for example, baseball, might enable an older adult to engage in the sport, there equipment, number of players for a reasonable game, and, potentially, specialized field space all seem to prove somewhat insurmountable obstacles for consistent senior participation. Likewise, volleyball is an adaptable sport for a small number of people requiring primarily a ball and a net, but the relative lack of availability of nets and courts/sand pits, as well as enough other players with sport-specific skills may be a frequent barrier to participation in many areas of the country.

Lastly, and most ephemerally, there is simply the reality of sport. Some sports are simply adaptable and commonly adapted, such as soccer which can take the form of three on three pickup in a parking lot with trash cans marking goals. Yet soccer participation declined significantly for participants in our study, indicating that even this adaptability may not be enough for potential participants who grew up playing the game before the boom following the 1994 World Cup that saw an astronomical rise in soccer popularity in the United States. Other sports, such as golf, would appear to have a financial impediment to lifelong participation but, while participation rates are declining countrywide, it remains a common sport for elderly adults to engage in, perhaps based on cultural perception. This is supported

by this study's findings which showed that golf was the only sport that actually experienced significant growth from adolescence to adulthood. Similarly, tennis is a sport that is often cited as a lifetime sport, though, at first glance the specialized court requirements would appear to restrict its viability. However, the general availability of tennis courts may enable it to be a lifetime sport. The results of this study were inconclusive for tennis, and merit a follow up. On the other hand, a sport like water polo may appear to be suited for lifetime participation, due to general pool availability and easily adaptable basic sport skills, but the reality is that participation rates are limited and it remains a niche sport in the United States.

Tennis and golf both present interesting case studies of potential lifetime sports. Golf may be an exception to the true, lifelong status of a lifetime sport because the social culture of golf that promotes adaptation in later life. The nature of golf may enable it to be adopted in adulthood despite a lack of sport-specific technique background; because there is no direct competitive interaction in golf, a low-level player could happily play with other low-level players taking as many shots as is needed to get the ball in the cup. Contrast this with a sport such as tennis where a background in tennis technique, or at least the physical and relatable skill to pick up these techniques are essential because of the direct interactional nature of the sport. Tennis is built on the ability to serve, return, and rally, and low-level players unable to accomplish this seem unlikely to continue to participate in the sport. This is partially supported by our results, as Golf displayed a significant increase in participation and while this supports the notion that it is a sport that may be maintained from adolescence into adulthood, it also questions the true nature of golf as a lifetime sport when it may be a sport that is picked up in adulthood (26 of 48 adult golf participants did not report golf as part of

their adolescent repertoire). However, while participation in tennis declined slightly, it did not do so significantly and almost half, (7 of 16 adult participants) began the sport in adulthood. This may be explained, though, by our sample population, consisting solely of former collegiate varsity athletes, who, presumably, are the elite of amateur athletes in the country, and therefore would have the physical ability and possibly relatable skill to adopt a relatively tricky sport in adulthood.

Running, swimming, and martial arts are three sports that would appear to fit all of the requirements without significant debate. They could be called lifetime sports because their physical, financial, and infrastructural demands are all low enough to encourage regular participation throughout the lifecourse and into advanced age. However, the results from the study do not completely bear out these assumptions. Cross country runners significantly maintained running as part of their adult sporting repertoires, though they were not the athletes that opted to engage in marathons, tri- or biathlons, or engage in cross training (i.e. CrossFit, P90X).

In short, though the results of this study go some way towards filling the gap on sport-specific long-term viability, further research in this area is needed. This study has underscored the importance of the inclusion of running and, perhaps, golf (though it may be a sport that can be adopted later in life) in an adolescent sporting repertoire. If intramural programs are a primary means to access for adolescents then these sports should form the core of the program to encourage the widest possible acceptance and integration. However, this study's results also indicated that two sports commonly termed "lifetime" sports, tennis and swimming, were not retained from adolescence to adulthood. Further research should

pay close attention to these sports as these results may be more of a byproduct of this sample population than anything else. Our sample population was comprised solely of former varsity athletes who were definitely subjected to the rigors of playing a DI varsity sport and may have suffered one of the associated negative effects.

Study Strengths and Limitations

It is important to note several important limitations of this study. Perhaps most importantly, because the sample population was comprised entirely of former DI US varsity athletes who had graduated from college, the results of the study are not generalizable to the common population. Moreover, the racial and SES breakdown of respondents further limits the scope of the research. Additionally, while a longitudinal examination might be ideal for this study, due to time and resource limitations, the questionnaire relied on retrospective, self-reported data (Hirvensalo et al., 2000). The IPAQ-LF relies on self-reported physical activity data which often leads to over-reporting of physical activity levels but has been generally accepted within the recreation research community as an optimum self-report tool (e.g., Craig et al., 2003; Hallal et al., 2010; Vandelanotte et al., 2005; Wollin et al., 2008).

However, the specific sport viability over the lifecourse provides an interesting starting point for a future line of research. Whether these former varsity athletes may be more prone to burnout or negative experiences that affect their long-term sport participation merits further investigation. Furthermore, while the results of this study indicate that a larger adolescent sporting repertoire predicts both a larger adult repertoire and overall adult sport participation, it would be beneficial to determine the effects of specialization on repertoire

breadth and ascertain if there is an age at which long-term risks of specialization are decreased.

Conclusion and Additional Research Questions

Given that sport participation has been connected with numerous developmental benefits, including both short- and long-term physical activity (e.g., Barnett et al., 2008; Fraser-Thomas et al., 2005; Weiss, 2004; Wiersma, 2000), the threat posed by an increasing emphasis on early specialization among youth athletes is a concerning trend for the future. The Leisure Repertoire Theory, as created by Iso-Ahola (1980) and updated by subsequent authors (e.g., Bocarro et al., 2008; Iso-Ahola et al., 1994; Mobily et al. 1991; Zeijl et al., 2001) provides both a guiding theory and theoretical model for the investigation of early-life experiences as the foundation for adult behavior. The original rhombic shape of the model can be improved by expanding it into the third dimension to better capture both the breadth of activity as well as the intensity level of an individual's leisure pursuit. The Leisure Repertoire Theory has been used both directly and indirectly in studies primarily relating to youth physical activity and its correlations to adult exercise levels. However, directly speaking, "there is limited research on the leisure repertoire" itself (Nilsson et al., 2006, p. 392). Consequently, this study sought to fill this gap by examining a subset of the Leisure Repertoire, the relationship between adolescent sporting repertoire breadth to adult sporting repertoire breadth, engagement, and physical activity levels.

The results of this study indicated that the larger an individual's adolescent sporting repertoire, the more likely that individual will be an active adult sport participant. Each sport

in an adolescent repertoire correlates to a cumulative 20% increase in the likelihood that that individual will be engaged in at least one sport as an adult. Furthermore, a larger adolescent sporting repertoire predicts a larger adult sporting repertoire. Since youth sport is one of the most effective means of engaging adolescents in physical activity (e.g., Fraser-Thomas et al., 2005; Green et al., 2005; Tammelin et al., 2003; Walters et al., 2009), it may be crucial, therefore, to ensure that sports are part of an individual's early leisure repertoire. However, the current trend towards early, elite-level sport specialization threatens to restrict adolescent sporting repertoires from ages as early as 5 or 6 years old (e.g., Baker, Cobley, & Fraser-Thomas, 2009; Hecimovich, 2004; Hedstrom & Gould, 2004; Malina, 2009, 2010). The results of this study indicate that a limited adolescent sporting repertoire may endanger long-term sport engagement.

Additionally, though there has been some research in this area (e.g., Powell & Dysinger, 1987; Sallis & McKenzie, 1991; Sallis et al., 1996), a further examination of the effect of individual or lifetime sports versus team sports was also needed (Taylor et al., 1999). Participation in football, basketball, soccer, and swimming/diving all significantly declined from adolescence to adulthood, while participation in baseball also declined, from both baseball-to-baseball and baseball-to-softball. Track and Cross Country runners were likely to continue running as adults. Golf actually displayed significant growth as 26 of the 48 adult golf participants took up the sport in adulthood. Results indicate that further research into the sport-specific effects is merited, preferably with a more generalizable sample.

An analysis of the adaptability of certain types of sport or various sport-specific skills is merited. Are the technical skills used in tennis less generally adaptable or useful in a later-

life switch to a new sport than the skills used in soccer, for instance? Conversely, are there sports, such as football, that are especially conducive to the types of injuries that may adversely affect an individual's ability to engage in sport and/or physical activity later in life? This latter question would further elaborate on Hirvensalo et al.'s (2000) finding that adolescent physical activity was predictive of high-level physical activity in old age, regardless of chronic health issues.

This study's results support the importance of a large and diverse adolescent sporting repertoire, containing a sport such as running or golf, to encourage lifelong sport participation. There is an increasing body of evidence (Bocarro et al., 2012; Koplan et al., 2005; McKenzie & Kahan, 2008; Pate et al., 2006) to support the importance of intramural sporting programs as an effective method of accomplishing this. Intramural programs could also be efficient means for positively socializing youth into sport, a critical component to engaging and retaining adolescents in physical activity, especially females (e.g., Fraser-Thomas et al., 2008; Hedstrom & Gould, 2004; Kjonniksen, et al., 2009). Additionally, intramural programs may be able to combat burnout in athletes by providing a less stressful environment that focuses on fun, learning, and participation. This could be critical since Vanreusel et al. (1997) discovered that competitive sport athletes were more likely to drop out of sport earlier and completely than recreational athletes. Yet most middle and high schools do not have intramural programs, and the current focus in this country on school sports is for highly competitive interscholastic competition, with only the most elite athletes receiving playing time, often negating the immense potential for positive impact of our

public school system. As a result, a refocusing on intramural programs may be the most effective method for engaging children in sport and ensuring their lifelong participation.

The physical activity related results also merit further investigation and exploration. There was no significant relationship between adolescent sporting repertoire size and adult physical activity levels. The physical activity data could be cross-compared to a similarly aged national population cross-section to see if this was because the participants in this study are largely meeting CDC recommended levels. Results of this prospective study could shed further light about the long term impacts of playing a collegiate varsity sport when compared non non-varsity peers.

Similarly, while this study conducted an analysis of the carryover effect of specific sports from adolescence to adulthood, clustering results by sport to examine the long term physical activity levels of each sport could prove a useful segmenting of the data. While specific sports appear to be carried over from adolescence to adulthood (Golf, Running), and others decline in participation (e.g. Football, Baseball, Soccer), do adolescent football players achieve more adult physical activity than adolescent track runners?

Along the same lines, a similar analysis could be conducted to assess whether the presence of a specific sport or type of sport in an adolescent sporting repertoire is more likely to predict adult sport involvement in any sport or even diverse adult sport involvement. Do the skills associated with specific sports enable an easier transition or substitution within the sporting repertoire later in life? Do aquatic sporting participants never feel comfortable or engage in land-based sporting or physical activities? Does some form of bat or racquet sport need to be present in an adolescent repertoire to enable adult engagement?

Lastly, an inversion of this study, studying current adult recreational athletes' sporting pasts, might illuminate common factors in adolescence that help enable long-term sport involvement. Assessing the adolescent sporting repertoires for adults still engaged in sport might illustrate the presence of specific sports, commonalities in sport style (competitive vs recreational), or age of specialization. Qualitative interviews with current adult participants might also be useful in the development of research themes on how previous sport participation aided or hindered their continued participation.

The Leisure Repertoire Theory also has the potential for applications outside of the direct recreation fields. As it is applicable to physical activity, it stands to reason that it would also be useful in exploring other public and personal health components such as diet. The Leisure Repertoire Theory and this study's findings need to be explored further, but they have established a foundation for future research.

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APPENDICES

Appendix A: Initial Contact Email

Hello [First Name]!

You are being contacted as a former Wolfpack varsity athlete to help with an interesting study about how children's sport participation connects to adult sport participation and physical activity levels. The survey is brief and will take between 5-10 minutes of your time. **If you choose to participate you may still, at any given time, opt to withdraw from this study or not complete particular questions.**

All your responses are **confidential** and results will only be reported as summaries.

Follow this [link] to the short survey:

Or copy and paste the URL below into your internet browser: [URL]

At the end of the survey there is a link to a separate page where you have the option of including your email address to be **entered into a lottery drawing for one of three \$50 gift-cards as a thank you for your participation.** The Qualtrics software we are using makes it impossible for us to link your answers to you or your email address. Your email address will not be shared with anyone and it will be deleted upon completion of the study. Participation in this study is **voluntary** and all participants will remain **anonymous**.

If you have any questions or concerns about this study, please contact the lead researcher at North Carolina State University:

Rob Sayre-McCord
NC State University
rnsayrem@ncsu.edu

NC STATE UNIVERSITY



Appendix B: First Follow Up Email

Dear [First Name],

We hope you're having a terrific day! We wanted to take a moment and remind you of the study regarding how childhood sport participation connects to adult sport participation and physical activity levels. As a former Wolfpack varsity athlete your contribution to this study would be extremely valuable so if you have 5-10 minutes to complete a brief survey, it would be greatly appreciated! We would also like to remind you that **if you choose to participate you may still, at any given time, opt to withdraw from this study or not complete particular questions.**

All your responses are **confidential** and results will only be reported as summaries.

We'd also like to remind you that all participants are **entered into a lottery drawing for one of three \$50 gift-cards as a thank you for your participation!**

Follow this [link] to the short survey:

Or copy and paste the URL below into your internet browser: [URL]

The Qualtrics software we are using makes it impossible for us to link your answers to you or your email address. Your email address will not be shared with anyone and it will be deleted upon completion of the study. Participation in this study is **voluntary** and all participants will remain **anonymous**.

If you have any questions or concerns about this study, please contact the lead researcher at North Carolina State University:

Rob Sayre-McCord
NC State University
rnsayrem@ncsu.edu

NC STATE UNIVERSITY



Appendix C: Second Follow Up Email

Hi [First Name],

I hope you had a wonderful and relaxing Thanksgiving break! I just wanted to touch base with you briefly about my research on the sporting backgrounds of former Wolfpack athletes.

We're having a competition between all of the varsity teams to see which team will produce the most responses and the Swimming team is currently leading the way. However, Football and Cheerleading are just behind, so please help out your [Varsity Sport] teammates by taking the brief 5-10 minutes it takes to fill out the survey!

We have really appreciated the responses we have received so far. We are nearing the end of the data collection period and would be really grateful if you had some time to complete the survey. Also, in the spirit of holiday giving, we're raffling off three \$50 visa gift cards to respondents!

Follow this [link] to the short survey:

Or copy and paste the URL below into your internet browser: [URL]

As always, if you have any questions or concerns about this study, please don't hesitate to contact me. Have a fantastic rest of your week!

Rob Sayre-McCord
NC State University
rnsayrem@ncsu.edu

NC STATE UNIVERSITY



Appendix D: Third Follow Up Email

Hello [First Name],

I hope the kickoff to the holiday season has been a merry one for you! I wanted to check in one last time because my Wolfpack Athletics survey is closing next Wednesday (12/18), and we'd really love to have your response counted! If you've already begun the survey but had to abandon it, or were disrupted, you can pick up right where you left off with the link below.

The competition between all of the varsity teams, to see which team will produce the most responses, is really heating up. Right now your [Varsity Sport] team is [Contest Ranking], so please help your [Varsity Sport] teammates by taking a short 5-10 minutes to fill out the survey!

And of course, responding enters you into the raffle for one of our three \$50 visa gift cards!

Follow this [link] to the short survey:

Or copy and paste the URL below into your internet browser: [URL]

Again, if you have any questions or concerns about this study, please don't hesitate to contact me. Have a wonderful holiday season!

Rob Sayre-McCord
NC State University
rmsayrem@ncsu.edu

NC STATE UNIVERSITY



Appendix E: Questionnaire

2013 Childhood and Adult Sport Participation Study

Hello! You are being asked to participate in a research study about your childhood and adolescent sports participation. The purpose of this study is to gain a better understanding of how childhood sporting participation connects to adult sports participation and physical activity levels. At any given time, you may choose to withdraw from this study or not complete particular questions.

All your responses are confidential and results will only be reported as summaries.

At the end of the survey there is a link to a separate page where you have the option of entering your email address to be entered into a lottery drawing for one of several gift-cards as a thank you for your participation. The Qualtrics software we are using makes it impossible for us to link your answers to you or your email address. Your email address will not be shared with anyone and it will be deleted upon completion of the study. Participation in this study is voluntary and all participants will remain anonymous.

If you have any questions or concerns about this study, please contact the lead researcher at North Carolina

State University:

Rob Sayre-McCord

NC State University

rnsayrem@ncsu.edu

Which varsity sport(s) did you participate in while attending NC State?

Please think about the sport(s) you played during your childhood and adolescence.

What sport(s) did you play consistently in a structured setting UNTIL YOU REACHED NC STATE (e.g. community rec league, little league, AAU, Pop Warner, church league, Middle School/High School team, etc)? "Backyard," "Street," or casual, informal games do not apply.

Next to each sport is the number of times you must have played that sport in any given year of your childhood or adolescence for it to qualify as "consistent" participation. Please select all that apply:

Baseball - 13+

Rugby - 8+
 Basketball - 13+
 Skiing (Cross Country) - 1+
 Bowling - 13+
 Skiing (Downhill) - 1+
 Boxing - 13+
 Soccer - 26+
 Cheerleading - 26+
 Softball (Fast-Pitch) - 26+
 Cross Country Running - 50+
 Softball (Slow-Pitch) - 13+
 Diving - 8+
 Swimming - 50+
 Field Hockey - 8+
 Tennis - 1+
 Figure/Ice Skating - 13+
 Track & Field (Track Events) - 26+
 Football (Tackle) - 26+
 Track & Field (Field Events) - 26+
 Golf - 1+
 Triathlon/Biathlon - 2+
 Gymnastics - 50+
 Volleyball (Court) - 13+
 Ice/Roller Hockey - 13+
 Volleyball (Sand) - 13+
 Lacrosse - 13+
 Water Polo - 8+
 Marathon - 2+
 Weightlifting - 50+
 Martial Arts - 13+
 Wrestling - 26+
 Rowing/Crew - 8+
 Other (Please Specify):

Now please think about the sport(s) you are currently participating in (in the last year).

What sport(s) do you CURRENTLY play consistently in a regular, structured setting (e.g. community rec league, church league, local club team/group, semi-pro league, etc)? Regular, organized "pick-up" games, such as at a community center, DO count, but you still must meet the standards for "consistent" participation.

Next to each sport is the number of times you must have played that sport in the last year for it to qualify as consistent participation. Please select all that apply:

Baseball - 13+
Rowing/Crew - 8+
Basketball - 13+
Rugby - 8+
Bowling - 13+
Running (Cross Country, Road, or Trail) - 50+
Boxing - 13+
Skiing (Cross Country) - 1+
Cheerleading - 26+
Skiing/Snowboarding (Downhill) - 1+
Climbing (Indoor, Outdoor, Bouldering) - 1+
Soccer (Indoor) - 13+
Cross Training (e.g. CrossFit, P90X) - 50+
Soccer (Outdoor) - 26+
Cycling (Mountain/Off-Road) - 13+
Softball (Fast-Pitch) - 26+
Cycling (Road) - 26+
Softball (Slow-Pitch) - 13+
Diving - 8+
Swimming - 50+
Field Hockey - 8+
Tennis - 1+
Figure/Ice Skating - 13+
Track & Field (Track Events) - 26+
Football (Flag) - 13+
Track & Field (Field Events) - 26+
Football (Tackle) - 26+
Triathlon/Biathlon - 2+
Golf - 1+
Ultimate Frisbee - 13+
Gymnastics - 50+
Volleyball (Court) - 13+
Ice/Roller Hockey - 13+
Volleyball (Sand) - 13+
Lacrosse - 13+
Water Polo - 8+
Marathon - 2+
Weightlifting - 50+
Martial Arts - 13+

Wrestling - 26+
 Racquet Sports (Squash, Racquetball, Badminton) - 13+
 Other (Please Specify):

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** and **moderate** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

PART 1: JOB-RELATED PHYSICAL ACTIVITY

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

Do you currently have a job or do any unpaid work outside your home?

Yes
 No

*The next questions are about all the physical activity you did in the **last 7 days** as part of your paid or unpaid work. This does not include traveling to and from work.*

During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, heavy construction, or climbing up stairs **as part of your work**? Think about only those physical activities that you did for at least 10 minutes at a time.

0
 1
 2
 3
 4
 5

6
7

How much time did you usually spend on **ONE** of those days doing **vigorous** physical activities as part of your work?

Hours per day
Minutes per day

Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.

0
1
2
3
4
5
6
7

How much time did you usually spend on **ONE** of those days doing **moderate** physical activities as part of your work?

Hours per day
Minutes per day

During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.

0
1
2
3
4
5
6
7

How much time did you usually spend on **ONE** of those days **walking** as part of your work?

Hours per day

Minutes per day

PART 2: TRANSPORTATION PHYSICAL ACTIVITY

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

During the **last 7 days**, on how many days did you **travel in a motor vehicle** like a train, bus, car, or tram?

0

1

2

3

4

5

6

7

How much time did you usually spend on **ONE** of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle?

Hours per day

Minutes per day

*Now think only about the **bicycling** and **walking** you might have done to travel to and from work, to do errands, or to go from place to place.*

During the **last 7 days**, on how many days did you **bicycle** for at least 10 minutes at a time to go **from place to place**?

0

1

2

3

4

5

6

7

How much time did you usually spend on **ONE** of those days to **bicycle** from place to place?

Hours per day

Minutes per day

During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time to go **from place to place**?

0

1

2

3

4

5

6

7

How much time did you usually spend on **ONE** of those days **walking** from place to place?

Hours per day

Minutes per day

PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY

*This section is about some of the physical activities you might have done in the **last 7 days** in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.*

Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.

0

1

2

3

4

5

6

7

How much time did you usually spend on **ONE** of those days doing **vigorous** physical activities in the garden or yard?

Hours per day

Minutes per day

Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or yard**?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

How much time did you usually spend on **ONE** of those days doing **moderate** physical activities in the garden or yard?

Hours per day

Minutes per day

Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home**?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

How much time did you usually spend on **ONE** of those days doing **moderate** physical activities inside your home?

Hours per day
Minutes per day

PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY

*This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure.*

Please do not include any activities you have already mentioned.

Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

How much time did you usually spend on **ONE** of those days **walking** in your leisure time?

Hours per day
Minutes per day

Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

How much time did you usually spend on **ONE** of those days doing **vigorous** physical activities in your leisure time?

Hours per day
Minutes per day

Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis **in your leisure time**?

0
1
2
3
4
5
6
7

How much time did you usually spend on **ONE** of those days doing **moderate** physical activities in your leisure time?

Hours per day
Minutes per day

What NCAA gender division did you participate in?

Men's
Women's

What is your age?

What is your race?

White/Caucasian
African American
Hispanic
Asian
Native American
Pacific Islander
Other
Prefer not to answer

Please indicate your current family structure.

Single without children
Single with children
Married without children
Married with children
Life partner without children
Life partner with children

How many children (under the age of 18) are currently living in your house?

0
1
2
3
4
5 +

If you feel comfortable providing this information, please estimate your household's annual income level:

\$0-\$15,000
\$15,001-\$30,000
\$30,001-\$45,000
\$45,001-\$60,000
\$60,001-\$75,000
\$75,001-\$90,000
\$90,001-\$105,000
\$105,001-\$120,000
\$120,000+

I do not wish to provide this information

Thank you for your participation in this study! the next page, you will be provided with a unique link to a separate survey in which you will be able to provide your email address to enter the lottery drawing for one of our gift card prizes.

THIS SECOND SURVEY IS COMPLETELY SEPARATE AND ENTERING YOUR EMAIL ADDRESS CAN IN NO WAY CONNECT YOU TO THE ANSWERS YOU PROVIDED IN THIS SURVEY. ALL OF YOUR ANSWERS WILL REMAIN ANONYMOUS AND CONFIDENTIAL.

Please click on the survey link below if you wish to be entered into a drawing for one of our gift card prizes. Again, entering this drawing will not connect you with the answers you have provided in this survey.

Gift Card Drawing:

http://ncsu.qualtrics.com//SE/?SID=SV_6sNFqKMB0310yON

Appendix F: IRB Informed Consent Form

North Carolina State University

INFORMED CONSENT FORM for RESEARCH

The Relationship between the Breadth of an Adolescent Sporting Repertoire and Adult Physical Activity Levels
Rob Sayre-McCord Dr. Jason Bocarro

What are some general things you should know about research studies?

You are being asked to take part in a research study. Your participation in this study is voluntary and at any given time you may choose to withdraw from this study or not complete particular questions. The purpose of this study is to gain a better understanding of the relationship between sport participation during adolescence and sport participation during adulthood, as well as the relationship between the number of sports played during adolescence and adult physical activity levels. All of your responses are anonymous and confidential and the results will only be reported as aggregated summaries with no individual identifying characteristics. The Qualtrics software we are using to conduct this survey makes it impossible for us to link your answers to you or your email address. Your email address will not be shared with anyone and it will be deleted upon completion of the study and gift card lottery. Participation in this study is voluntary and all participants will remain anonymous. If you do not understand something in this form it is your right to ask the researcher for clarification or more information. A copy of this consent form will be provided to you at your request. If at any time you have questions about participation in this study, contact the researcher listed above.

What is the purpose of this study?

The purpose of this study is to gain a better understanding of the relationship between sport participation during adolescence and sport participation during adulthood, as well as the relationship between the number of sports played during adolescence and adult physical activity levels.

What will happen if you take part in the study?

If you agree to participate in this study, you will be asked to complete a simple online questionnaire in the comfort of your own home or place of work. The questionnaire should take 5-15 minutes to complete. Respondents will be entered into a lottery for one of several gift cards as our way of saying thank you for participating. This will be done by, at the end of the primary survey, having a link to a separate page where you have the option of entering your email address to be entered into a lottery drawing for one of several gift-cards as a thank you for your participation. The Qualtrics software we are using makes it impossible for us to link the initial survey answers to respondents or their email address. Respondents' email addresses will not be shared with anyone and will be deleted upon completion of the study.

The questionnaire will ask which sports you played before the age of 18, as well as which sports you are currently still playing. The questionnaire will also ask you to provide some brief information regarding your current physical activity levels. Additionally, the questionnaire will ask you to height, and weight provide several pieces of demographic information including, age, race, sex, height, weight, and current family income levels. RESPONDING TO ANY AND ALL OF THESE QUESTIONS IS VOLUNTARY AND ANONYMOUS.

Upon completion of the study (approximately four weeks from the initial contact email), the gift card drawing will be held and all winners will be contacted.

Risks

There are no known or expected risks to participate in this study.

Benefits

There are no known direct benefits to you, the participant, unless you are one of our gift card winners. However, participation in this study will help parents, school administrators, and recreation programmers by providing crucial information about youth sport participation and how it prepares individuals for lifelong participation in sport and physical activity.

Confidentiality

The information in the study records will be kept confidential to the full extent allowed by law. Data will be stored securely in a password protected computer that can only be accessed by the primary researcher. No reference will be made in oral or written reports which could link you to the study. You will NOT be asked to write your name on any study materials so that no one can match your identity to the answers that you provide.

Compensation

For participating in this study you will be entered into a drawing for one of five gift cards. If you withdraw from the study prior to the completion of the survey, you will be ineligible to be entered into the drawing.

What if you are a NCSU employee? Participation in this study is not a requirement of your employment at NCSU, and your participation or lack thereof, will not affect your job.

What if you have questions about this study?

If you have questions at any time about the study or the procedures, you may contact the researcher, Rob Sayre-McCord, at Box 8004, Biltmore Hall, NC State University, Raleigh, NC 27695, or at 919-619-0016.

What if you have questions about your rights as a research participant?

If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Deb Paxton, Regulatory Compliance Administrator, Box 7514, NCSU Campus (919/515-4514).

Consent to Participate

“I have read and understand the above information. I have received a copy of this form. I agree to participate in this study with the understanding that I may choose not to participate or to stop participating at any time without penalty or loss of benefits to which I am otherwise entitled.”

Subject's signature _____ **Date** _____

Investigator's signature _____ **Date** _____