WOMEN'S SPORTS FOUNDATION

HER LIFE DEPENDS ON IT III:

Sport, Physical Activity, and the Health and Well-Being of American Girls and Women

May 2015

A Women's Sports Foundation Report

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Women's Sports Foundation Acknowledgments

This report is an update of the original report released in 2004 and again in 2009. The overall framework of the original report remains intact here, and all credit must be extended to the co- authors of the original report. Those individuals were Don Sabo, Ph.D., Director, Center for Research on Physical Activity, Sport and Health, D'Youville College, Buffalo, NY.; Kathleen E. Miller, Ph.D., Research Scientist, Research Institute on Addictions, State University of New York at Buffalo; Merrill J. Melnick, State University of New York at Brockport, Department of Physical Education and Sport; and Leslie Heywood, Ph.D., Professor of English and Cultural Studies, State University of New York at Binghamton. The 2009 update was co-authored by Ellen J. Staurowsky, Ed.D., Professor and Graduate Chair, Department of Sport Management and Media, Ithaca College, Ithaca, NY; Kathleen E. Miller Ph.D., Research Scientist, Research Institute on Addictions, University of State University of New York at Buffalo; Sohaila Shakib, Ph.D., Associate Professor and Faculty Athletics Representative, Department of Sociology, California State University-Dominiquez Hills; Mary Jane De Souza, Ph.D., Professor and Co-Director, Women's Health and Exercise Laboratories, The Pennsylvania State University; Gaele Ducher, Ph.D., Research Fellow, Center for Physical Activity and Nutrition Research, Deakin University; Noah Gentner, Ph.D., Assistant Professor, Georgia Southern University; Nancy Theberge, Ph.D., Professor, Departments of Kinesiology and Sociology, University of Waterloo; and Nancy I. Williams, Ph.D., Associate Professor and Co-Director, Women's Health and Exercise Laboratories, The Pennsylvania State University.

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About the Women's Sports Foundation

The Women's Sports Foundation—the leading authority on the participation of women and girls in sports— is dedicated to creating leaders by ensuring girls access to sports. Founded by Billie Jean King in 1974, our work shapes public attitude about women's sports and athletes, builds capacities for organizations that get girls active, ensures equal opportunities for girls and women, and supports physically and emotionally healthy lifestyles. The Women's Sports Foundation has relationships with more than 1,000 of the world's elite female athletes and is recognized globally for its research, leadership, vision, expertise and influence. For more information, please call the Women's Sports Foundation at 800.227.3988 or visit www.WomensSportsFoundation.org.

Her Life Depends On It III National Policy Advisory Board

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EXECUTIVE SUMMARY

Her Life Depends On It III (HLDOI) is the Women's Sports Foundation's comprehensive report that reviews existing and emerging research on the links between participation in sport and physical activity and the health and well-being of American girls and women. As with the previous editions in 2004 and 2009, this study also confirms that physical activity and sport provides the critical foundation, in no small part, that allows girls and women to lead healthy, strong, and fulfilled lives. Ten years since its first publication, the updated *Her Life Depends On It* provides an even more comprehensive review of the ever-expanding body of research that demonstrates how important it is for girls and women to participate in sport and physical activity. The report's contents reflect the review of 1,500 studies, nearly 400 covered since the previous edition. While the report's focus continues to be on U.S. girls and women, selected research findings that offer perspective regarding girls and women worldwide is also referenced in order to provide some perspective and context. In keeping with previous editions of the report (Sabo et al, 2004; Staurowsky et al., 2009), this updated review of existing research and health information is co-authored by a team of experts from several related disciplines, including epidemiology, exercise physiology, kinesiology, psychology, sociology, and sport management.

Her Life Depends On It III documents the important role physical activity can play in helping to prevent the daunting array of health risks for girls and women, such as cancer, coronary heart disease, osteoporosis, Alzheimer's Disease and related dementias, eating disorders, illicit drug use, obesity, risky sexual behavior and teen pregnancy, and tobacco-related diseases. In addition to documenting the contributions of sport and physical activity to girls' and women's health and well-being, this version of *Her Life Depends On It* provides an overview of:

- emerging research on several health risks that are associated with overtraining and athletic participation;
- targeted research focusing on sport and physical activity in the lives of girls and women of color;
- new studies that point to effective strategies designed to prevent injuries from happening;
- new knowledge regarding the effects of concussions and recovery from concussions for female athletes;
- new findings that reveal positive connections between physical activity and academic achievement in girls and women;
- issues faced by females with disabilities seeking to participate in sport and physical activity; and

- what is known about the expanse of sexual violence in the sport environment that affects girls and women.

With the clarity of a ringing bell, research affirms, even more definitively than five years ago, that engagement in moderate and consistent levels of physical activity and sport for girls and women is essential to good health and well-being. Some key contributions of this new report include the following:

- **Girls and Women Shortchanged:** As a general trend, females across the board, regardless of age, race, or social class, are shortchanged in realizing the benefits of participation in physically challenging activities. However, females from lower economic backgrounds, females of color and females with disabilities suffer even greater negative health consequences as a result of less engagement in physical activity and less access to sport and physical fitness programs.
- **Girls and Women Not Always Safe and Secure in Sport and Physical Activity Settings:** Safety and security are primary areas of concern for girls and women in sport and physical activity environments. Research speaks to this in three ways:
    - **Vulnerability to Concussion:** Female athletes report higher rates of concussions than male athletes in some sports, experience concussions differently than males, and tend to take longer to recover.
    - **Unsafe Venues Pose Barriers to Participation:** Venues such as parks, walking trails, and community gyms that are unsafe and lack security pose barriers to participation for females.
    - **Sexual Violence:** Too many girls and women involved in sport and physical activity are subjected to sexual violence perpetrated by athletes, teammates, coaches, officials and administrators, and others.

Within the United States, the Institute of Medicine defined public health as the collective actions undertaken by a society "to assure the conditions for people to be healthy" (Committee for Assuring the Health of the Public in the 21st Century, 2002). The research compiled in this updated report strongly suggests that sport and physical activity provide conditions that help to ensure girls' health and well-being (physical, social, psychological, and academic). The full report offers expansive documentation on the impact sport and physical activity has in the lives of girls and women. Some important selected findings identified in this report relate to:

- **Breast Cancer Risk:** A review of large physical activity clinical trials demonstrated physical activity improves breast cancer survival rates (Fontein et al. 2014). Based on the findings from 23 studies examining the effect of moderate and vigorous physical activity during adolescence on cancer risk, those who had the highest physical activity during adolescence and young

adulthood were 20% less likely to get breast cancer later in life (Lagerros, Hsieh, & Hsieh, 2004).

- **Osteoporosis:** A study of first- and fifth-grade boys and girls who participated in a school-based daily physical education program with at least 10 minutes of jumping or strength-training exercises of vigorous intensities found improvements in bone health for both genders, which were particularly notable for youth before puberty (Meyer et al., 2011).

- **Smokeless Tobacco:** Among NCAA athletes surveyed in 2009, 27% of men and 2% of women had used smokeless tobacco in the past year. Female softball players reported higher rates (6%) than women in most other sports (e.g., 3% in field hockey and lacrosse, 2% in soccer, and less than 1% in track). However, male athletes reported considerably higher rates in nearly every sport (e.g., 52% in baseball, 54% in ice hockey, 16% in soccer, 9% in track) (NCAA, 2012).

- **Illicit Drug Use:** High school girls who participate in exercise or sports are significantly less likely to use marijuana, cocaine, or most other illicit drugs. The protective effect of sports appears to be strongest for white girls (Miller at al., 2001; Pate et al., 2000; Terry-McElrath & O'Malley, 2011).

- **Risk of Sexual Victimization:** The link between sports participation and sexual victimization is unclear. In one study testing a "sport protection" hypothesis, female athletes were significantly less likely than non-athletes to be victimized during their late high school and early college years (Fasting et al., 2008). A second study, finding that female college athletes actually reported higher incidences of rape and attempted rape, offered two possible explanations. Female athletes tend to drink more heavily and to socialize with male athletes, who have higher-than-average rates of sexual aggression, placing them at greater situational risk for sexual coercion (Brown et al., 2013).

- **Depression:** Moderate levels of exercise and/or sports activity helped protect girls and women against depression (McKercher et al., 2009; Sanders et al., 2000).

- **Suicide:** Women with major depression who participated in some physical activity were less likely to experience excessive guilt and to make a suicide plan (McKercher et al., 2013). Female high school/college athletes were less likely to consider, plan, or attempt suicide (Brown & Blanton, 2002; Brown, Burton, & Rowan, 2007; Sabo et al, 2005; Taliaferro et al., 2008a.).

- **Educational Gains:** According to Veliz & Shakib (2014), in schools with increased female representation in sports (e.g., a 1-to-1 gender ratio of girls participating in varsity sports to boys participating in varsity sports), there was a higher female representation of girls in Advanced Placement science courses.

- **Girls and Women of Color:** The health benefits realized from the participation of girls and women in sport and physical activity vary by socioeconomic level and racial/ethnic group. Throughout the report, available findings document health risks and vulnerabilities for females of color as well as for girls and women living in urban and rural settings. A special addendum to the report is also available that integrates all of the findings related to these populations.

- **Participation:** Despite an ever-expanding body of research evidence that supports the necessity for children, both boys and girls, to participate in physical activity regimens at moderate to vigorous levels for at least an hour a day to ensure their current health and create a foundation for long-term health, children in the U.S. are not engaging en masse in physical activity as they should. According to the 2014 U. S Report Card on Physical Activity for Children and Youth (Katzmarzyk, 2014), just under 25% of youth ages 12-15 were found to participate in physical activity at moderate to vigorous levels. As has been the case for decades, while there are shortfalls for both boys and girls, there remains a significant gender gap in participation that places girls at a disadvantage. Data from the Health Behavior in School-Aged Children study reported by the World Health Organization in 2012 (Currie et al., 2012) shows that 30% to 33% of U.S. boys between the ages of 11 and 15 are engaging in appropriate levels of physical activity, while girls participation declined steadily from a high of 24% at age 11, dropping seven points to 17% by age 15.

- **Cultural Barriers:** In general girls are still not afforded the degree of encouragement or opportunity extended to boys to participate in sports and fitness activities. Impediments to access remain an ongoing concern, complicated by recent trends that run counter to promoting physical activity, fitness, and sport programs in schools and communities. With schools cutting back on recess, a de-emphasis on physical education nationally, and persistent inequalities in school-sport programs and community-recreation programs, girls and women continue to encounter structural barriers to participation (Cheslock, 2007, 2008; Cooky, 2009; Jarrett, 2013; NASPE/AMA, 2006; National Federation of State High School Associations, 2014; Sabo & Veliz, 2008; Sabo & Veliz, 2012; Slater et al., 2012; Taber et al., 2013).

- **Athletic Performance:** While the research base illustrates the importance of physical activity in the lives of girls and women, it is also critical to examine a collection of issues related to performance—overtraining, lack of proper conditioning, poor equipment, and unsafe facilities—that impact female athlete experience. In this report, we also highlight the emerging areas of research that focus on protecting the health of female athletes and offer insights into the steps that need to be taken to ensure their health

and safety. For example, a small proportion of female athletes may develop three interrelated conditions—eating disorders, amenorrhea, and osteoporosis—otherwise known as The Female Athlete Triad. Other emerging areas of research focus on female athletes' injuries to the head and body, among them tears to the anterior cruciate ligament (ACL) and concussions, lack of opportunities for females with disabilities, sexual violence as it occurs in sport settings and affects girls and women, and problems associated with media representations of girls and women in sport.

- **Women in the Sport Workplace:** Despite more female athletes than ever before participating in the sport system, obstacles persist for women who wish to be leaders and decision-makers in the sport industry. The career aspirations of young women often collide with the gender barriers that exist in most male-dominated sport organizations. Since the passage of Title IX in 1972, women remain in the substantial minority in the sport workplace, with women comprising approximately 10% of all high school athletic directors, two in 10 head coaches at the college level, and less than 20% of college athletic directors.

Her Life Depends On It III Principles for Decision Making That Affect Girls and Women in Sport

When viewed in its totality, the findings in this report argue for a set of principles that should guide recommendations and decision making in the creation, development, promotion, and sustainment of opportunities for girls and women to participate in sport and physical activity. These include:

1. **Continued Efforts to Provide for the Needs of Girls in Sport and Physical Activity:** Equity in sport and physical activity settings does not organically happen but is moved forward with conscious efforts to consider the needs of girls and women. With only 25% of the nation's girls getting the appropriate levels of physical activity to slow or discourage the development of chronic disease and enhance quality of life, more work needs to be done in ensuring that programs meet the needs of girls and are developed in environments that foster participation in safe, secure, accessible, and affordable environments. The ability of girls and women to access sport, whether recreational or high-performance, community-based or offered through a national sport governing body, is a fundamental right that has implications for an individual's dignity, happiness, health, personal freedom, and success. This right should be accorded unequivocally and without reservation to every American girl and woman

regardless of ability/disability status, age, ethnicity, marital status, political persuasion, race, religious affiliation, sexual identity and orientation, and socio-economic status. As a general trend over the span of decades, fewer financial resources have been made available for girls and women. Funding needs to match the need for more programs for girls and women.

2. **Development of Management and Executive Infrastructures That Include Women Leaders:** Since the 1800s there have been calls for attention to be paid to the inclusion of women in key leadership and decision-making positions within sport and physical activity organizations and programs for two reasons: 1) to allow the best and most talented leaders to contribute their skills, and 2) to ensure that female perspectives were being included in decision making about physical activity and sport programs. All these years later, women continue more often than not to be on the periphery of decision making and leadership when it comes to sport and physical activity programs. This reflects a systemic pattern of discrimination. As Staurowsky and Weight (2011, 2012) have documented, women are at times undervalued for their work in sport organizations through pay inequities, a hostile environment that hampers women from speaking up and holding institutions accountable, and a climate of retribution. The nation will not achieve its myriad health objectives with this dysfunctional infrastructure. The absence of female leaders also results in fewer role models for young girls, and thus their not envisioning themselves in such leadership positions.

3. **Facilitating Pursuit of Athletic Excellence Among Our Most Gifted Female Athletes:** While Title IX has served as an important tool in promoting varsity athletics in school-based programs for female athletes, the nation's schools, at every level, have not yet come into full compliance with Title IX. Greater effort to ensure Title IX compliance is critical to achieving the end goal of increasing both participation levels and the quality of that participation for girls and women. Further, additional research attention should be directed toward the access challenges girls encounter when seeking participation in non-school club programs and the impact those have on early age skill development and the recruitment process.

4. **Representation of Women in Sport Media:** The digital age offers unprecedented opportunities for girls and women to be celebrated for their participation and accomplishments. Yet, long-standing social stigmas born from attachments to gender boundaries and anachronistic conceptions of masculinity and femininity continue to create media-promulgated tensions that females must contend with in pursuing exercise, fitness, and sport activities for their health, well-being, and enjoyment, as well as the entertainment of others. Further, the propensity of media to focus on beauty and sex appeal rather than athleticism has undermined the

ability of female athletes to be taken seriously (Daniels, 2009; Daniels & LaVoi, 2013). A revision of how athleticism is conceived and represented in mediated forms needs to be undertaken with consideration given to capturing the beauty, power, and accomplishments of female athletes fairly and accurately.

5. **Promote Sport and Physical Activity Participation Among U.S. Girls and Women:** The research record offers abundant evidence that there are numerous economic, educational, health, psychological, social, and vocational benefits that girls and women experience as a result of participating in sport and physical activity. While the benefits are clear, more research needs to be undertaken to better understand how to foster those opportunities, as well as to identify barriers to participation with the goal of developing strategies and public policy to overcome them.

6. **Ensure the Health of Girls and Women Participating in Sport & Physical Activity:** Research on the incidence of concussions generally shows higher rates among female athletes at both the collegiate and high school levels. Particular attention has been given to analyses in soccer and basketball, in which men and women play by similar rules, and ice hockey, a sport that is largely similar in the men's and women's game with the important difference that intentional body checking is prohibited in the women's game. Data for all three sports show higher rates of concussions among females at both the high school and collegiate levels (Dick, 2009; Hootman, Dick & Agel, 2007; Rosenthal, Foraker, Collins & Comstock, 2014). This research must continue with a focus on the differences in presenting symptoms and recovery as well as prevention.

7. **Ensure the Safety and Security of Girls and Women Participating in Sport and Physical Activity:** Research on sexual victimization of athletes and sexual victimization that occurs within athletic communities has lacked clarity due to the use of different definitions to describe various behaviors. As a consequence, there is no clear picture of the frequency with which coaches become sexually involved with athletes (Brake, 2012). Further, unlike the ongoing work that has been done to chronicle sexual victimization in U.S. schools, the most comprehensive work on issues associated with sexual victimization in sport has been done outside of the United States. Brake (2012) speculates that this reflects "...an ideology that idealizes coaches and overlooks or minimizes the harmful aspects of sports" (p. 399). Sport authorities need to be mindful of the vulnerability that exists for female athletes within sport settings. A commitment to safe and secure play environments for girls and women requires an investment of resources, personnel, and programming that will educate athletes, parents, coaches, and administrators on the prevention of abuse of female athletes and the extension of athlete protection policies to all members of national sport governing bodies.

Research Recommendations

As an outgrowth of the current state of what is known about girls' and women's participation in sport and physical activity, these future research directions are recommended. These recommendations are designed to create the knowledge base to implement the principles outlined above.

1. **Continued Efforts to Provide for the Needs of Girls in Sport and Physical Activity:** More research is needed to identify and quantify the immediate and long-term social, psychological, educational, and health benefits of participation in sports with a special emphasis on intersections between and among gender, age, ability/disability, race/ethnicity, religious affiliation, immigration, socio-economic status, and sexual identity and orientation. The complexity of these intersections poses areas of research warranting further investigation. In addition, selected research agendas to be pursued include:

    - measurement and assessment of what is lost if girls and women do not get an opportunity to participate (in other words, what are the economic and educational consequences? health and social consequences?);
    - measurement and longitudinal tracking of participation opportunities available to women and girls of color (broken down by subgroups);
    - identification of the forces motivating (or preventing) girls of color from participating in physical activity; and
    - longitudinal research and cross-sectional studies examining whether female athlete academic success in high school and college is linked to success in education, the work place, and in the community.

2. **Development of Management and Executive Infrastructures in Sport Organizations That Include Women Leaders:** Because women remain underrepresented throughout the sport industry in leadership positions (coaching, administration, executive positions), continued monitoring of the sport workplace and the barriers to recruitment, retention, and promotion is called for. The array of workplace issues (pay equity and equal treatment) that affect the lives of women working in sport speak to the culture in which girls and women play and participate. Women in key leadership roles within sport and physical activity settings is important because these upstream issues prevent women and girls from fully participating in sports and physical activity.

3. **Facilitating Pursuit of Athletic Excellence Among Our Most Gifted Female Athletes:** Compliance with Title IX requires that schools receiving federal funds regularly monitor how resources in sport and physical activity programs are allocated and how

those resources are employed to provide equitable opportunities for female and male students. An important aspect of public accountability in the enforcement of Title IX relies on an informed citizenry. Despite the importance of public awareness in Title IX enforcement, research has shown that the citizenry in general does not know what Title IX does and does not require. Lines of research regarding local school allocation patterns, Title IX compliance, and what Americans (e.g., parents, students, educators, administrators, and reporters) know about Title IX all hold the prospect of yielding information to support decisions to fund more sport and physical activity programs for girls and women.

4. **Representation of Women in Sport Media:** With the explosion in digital media, more coverage of female athletes now exists throughout the culture. Remarkably, the percent of coverage compared to men's sport remains at levels similar to what they were in the 1950s. Further, depictions of female athletes and the narratives told about them continue to reinforce traditional stereotypes. Support of research that offers new models for media coverage of female athletes and interventions to interrupt long-standing journalistic practices that undermine women in sport is encouraged.

5. **Expansion of Research Agendas Beyond Risky Behaviors, Disease, Mental Health and Injury:** While much work has been done around the general concept of getting girls and women moving and in the game, there remains a great deal yet to know about the benefits of participating in sport. From a larger macro health perspective, research agendas should be expanded beyond the disease syndromes and mental health areas identified in this report. Further, there is a whole vista of research opportunities yet to be explored relative to the effects of participation in specific sports (i.e., crew, weight lifting, etc.) and little is known about health, education, and social benefits of participation in specific sports (i.e., basketball vs. snowboarding).

6. **Ensure the Safety and Security of Girls and Women Participating in Sport and Physical Activity:** At present, research has not caught up with the increase in sport participation among girls and women. There is much to be learned about what it takes to diagnose injury in active girls and women, what are the causes of sport-related injuries among active girls and women, and what it takes to support them after injury has occurred to facilitate their reengagement. Further, comparisons between males and females and understanding potential differences between females and males in sport and physical activity is warranted. Research attention needs to be directed toward better screening protocols for The Female Athlete Triad and prevention strategies. And analyses of the quality of service provided by athletic trainers and sports medicine personnel available to girls and women in the sport system is a largely unexplored area.

7. **Sexual Assault/Violence/Hazing of Girls and Women Participating in Sport and Physical Activity:** There needs to be more research on sexual assault and violence against girls and women as it manifests in sport and physical activity settings. This includes the assessment of the need for and educational impacts of sexual harassment prevention programs for coaches and athletic administrators, as well as broad educational programming around Title IX requirements and obligations relative to incidents to sexual violence and hazing in school-based and open amateur sport settings.

Because the need for more research is so great, we have included a review of existing data sets that lend themselves to quantitative studies of girls and women in sport and physical activity settings (see Appendix A).

Conclusion

This report's user-friendly format provides a toolbox of information, analysis, and sources for parents interested in the health of their daughters; coaches interested in the well-being of female athletes; media interested in informing readers about strategies to achieve optimal health for females, both young and old, from every sector of society; health consumers; sport leaders and program heads; public health advocates; and public policy makers interested in reducing health-care costs while emphasizing prevention and health promotion for female citizens. With increasing specificity and urgency, calls are being sounded across the United States for greater and better opportunities for all Americans to become more physically active. As those calls roll across the land it is imperative that the needs of girls and women be taken into account and met.

INTRODUCTION

For centuries, noted healers and philosophers have expressed the belief that moderate and sustained physical activity over a life span is simply good for the mind, body, and soul. As early as 1859, the first female physician in the United States, Elizabeth Blackwell, wrote in a series of lectures, collected in the book *The Laws of Life, With Special Reference To The Physical Education of Girls*, that the first law of life was the law of exercise. Blackwell argued in compelling language that to neglect the physical education of girls is to rob them of both happiness and a life well lived.

Worldwide, the right of girls and women to participate freely in sport and physical activity remains unsettled all of these years later. It was only recently, in 2012, that all countries participating in the Olympic Games had, at least once, included female athletes in their delegations, with Saudi Arabia sending two female athletes to compete in track and field (Human Rights Watch, 2013). An actual ban on girls' participation in physical education in Saudi Arabia was reversed in 2014, with the decision lauded by many in that country and elsewhere as a positive step while others warned that the move threatened societal values (Al Arabyia News, 2014).

In the United States, 19th and 20th century preoccupations with female frailty have since given way to the accomplishments of girls and women on the move, aided in no small degree by the passage of Title IX in 1972. Title IX has been credited with catalyzing the largest expansion of sport opportunities for girls and women in this country (Sharp Center, 2013). Title IX's influence on the likelihood of girls and women participating in sport and physical education has been documented by researcher Robert Kraestner (2012). He notes that women who did not have the benefit of opportunities to participate in physical activity and sport prior to 1972 were more likely to have a difficult time becoming active later in life. In contrast, generations of women who grew up in the shadow of Title IX started participating in sport and physical activity at younger ages and were more likely to continue that participation later in life. Economist Betsey Stevenson (2010) documented that a 10 percent increase in female sports participation caused by the passage of Title IX resulted in a one percent increase in female college attendance and a one to two percent increase in female labor force participation. She further found that the more girls are able to participate in sport, the greater the likelihood that they will be working in what have been thought of historically as male-dominated occupations, particularly high-skill occupations.

While the U.S. has been a worldwide leader in promoting the educational, health, and social benefits of sport and physical activity for girls and women, participation trends

offer substantive evidence that even with the social revolution that has occurred around female athleticism, significant majorities of girls and women continue to encounter barriers to participation and the attendant benefits to be derived from such participation. As clear as the research is that involvement in sport and physical activity positively impacts overall health and happiness, general trends reveal that girls and women have fewer opportunities to participate than boys and men have, with the greatest shortfalls occurring among girls and women of color, from urban and rural communities, and from lower socio-economic backgrounds (Sabo & Veliz, 2008; Sharp Center, 2013). And while boys and men suffer from an array of heath concerns, some of which mirror those of girls and women, the focus of this report is on the degree to which girls and women continue to realize the protective health benefits to be found in moderate to high levels of physical activity.

When considered through the lens of the nation's health agenda, the potential human and economic costs associated with girls and women being underserved in the area of fitness, physical activity, and sport programs are considerable. In 2013, the U.S. Surgeon General's office launched its "Every Body Walk!" Initiative, an effort that recognized that in order to "...create a healthier nation, we must promote the health and wellness of individuals, families, and communities." Dr. James Levine, director of the Mayo Clinic-Arizona State University Obesity Solutions Initiative, has noted that "Sitting is more dangerous than smoking, kills more people than HIV and is more treacherous than parachuting" (MacVean, 2014).

Kohl et al. (2012) have labeled physical inactivity as a global pandemic "...with far-reaching health, economic, environmental, and social consequences." As a matter of scale, it is estimated that $5.6 billion in healthcare costs could be saved if 10% of Americans became active in walking programs (Whitsel et al., 2012). Analyses of companies' medical costs reveal that one-fifth to nearly a quarter of those costs are attributable to 10 modifiable risk factors, one of them being physical inactivity (Goetzel et al., 2012; Whitsel et al., 2012). Two thirds of Medicare dollars are expended on people with five or more chronic conditions (Whitsel et al., 2012). According to the World Health Organization (WHO, 2010), rising levels of physical inactivity have led to adverse health consequences; they are the fourth leading risk factor for global mortality and are now the principal cause for 21-25% of breast and colon cancer burden, 27% of diabetes burden, and 30% of ischemic heart disease burden.

The consensus around the need to create "cultures of health" is embedded in the Affordable Care Act, which emphasizes proactive approaches to citizen health and well-being through an emphasis on prevention (Anderko et al., 2012). An agenda to get more girls up and moving through exercise and sport is wholly consistent with the nation's health agenda. As in previous iterations of this report, the focus here is on highlighting the estimated costs of failing to invest in exercise and sport and the attendant benefits

to accrue in supporting American girls and women in being the best that they can be. Those costs, as evidenced below, are considerable:

- **Cardiovascular Disease:** The total costs for all cardiovascular disease in the United States are projected to be $656 billion by 2015 and more than a $1 trillion by 2030 (Go et al., 2014).
- **Cancer:** In 2014, it is estimated that nearly 600,000 Americans will die of cancer, translating into 1,600 deaths from cancer per day. While early detection is known to be a critical factor in treatment and survivability, the uninsured and members of ethnic minorities often diagnosed later, which necessitates more expensive treatments and reduced rates of survival (American Cancer Society, 2014).
- **Obesity-Related Diseases:** Childhood and adult obesity trends have remained stable between 2003-2004 and 2011-2012 (Ogden et al., 2014). Annual healthcare costs associated with obesity-related diseases have been estimated to be $200 billion. Nearly 21% of medical costs in the United States have been attributed to obesity (Campaign to End Obesity, 2014). Nationally, the medical costs of treatment could increase by between $48 billion and $66 billion per year by 2030, while the loss in economic productivity could be between $390 and $580 billion annually (Fiester, 2014).
- **Diabetes:** The estimated cost of diabetes in the United States in 2012 was $245 billion (Centers for Disease Control and Prevention [CDC], 2014).
- **Osteoporosis:** Regular exercise beginning in childhood, and carried on through adolescence and young adulthood, helps to prevent osteoporosis. Expenses associated with the care and treatment of patients with osteoporosis and related fractures are estimated at $14 billion per year in the United States. The estimated expenses nationally for osteoporosis and related fractures are $17 billion per year (based on figures from hospitals and nursing homes). Over the next two decades, costs are estimated to be $474 billion (American Association of Orthopaedic Surgeons, 2014).
- **Alzheimer's Disease:** The current annual cost of caring for persons with Alzheimer's disease is estimated at $214 billion. By 2050, it is anticipated that costs will rise to $1.2 trillion (Alzheimer's Association, 2014).
- **Tobacco Use:** Cigarette smoking caused approximately $289 billion in health-related economic losses ($133 billion direct costs and $156 billion in lost productivity) each year from 2009 through 2012, according to the U.S. Department of Health and Human Services (2014).

- **Alcohol Use:** A study of the costs associated with excessive drinking was estimated to be $223.5 billion in 2006 (Sacks, 2013).
- **Illicit Drug Use:** The estimated annual costs of drug abuse to the U.S. economy in 2007 were $193 billion, most of which were associated with drug-related crime (Office of National Drug Control Policy, 2014).
- **Sexually Transmitted Diseases:** In 2013, the Centers for Disease Control and Prevention estimated that nearly 20 million new cases of STDs occur each year and almost half of them infect young people aged 15 to 24. Healthcare costs associated with STDs are estimated to be $16 billion each year (CDC, 2013).
- **Teen Pregnancy:** Despite signs that both the rate of teen pregnancy and birth rates in general have declined in the United States since the early 1990s, the associated financial liabilities for items such as healthcare, foster care, criminal justice costs, public assistance, and lost tax revenues, are estimated at more than $9.4 billion annually. Teen birth rates fell 51% between 1991 and 2010, representing an estimated $12 billion in taxpayer savings (The National Campaign to Prevent Teen and Unplanned Pregnancy, 2013).

This report is divided into eight sections:

- Section I focuses on several major diseases of later life for which physical activity in youth is a key preventive factor.
- Section II examines how sports and exercise influence patterns of substance use among female adolescents.
- Section III explores ways that athletic participation lowers young women's rates of risky sexual behaviors and teen pregnancy.
- Section IV focuses on research of how sports and exercise interface with girls' mental health and psychological well-being.
- Section V discusses research linking sports, exercise, and educational outcomes.
- Section VI examines patterns and trends in female participation in sports and fitness activities.
- Section VII provides an overview of emerging research in three areas: the Female Athlete Triad, female athletes and injuries, and the use of energy drinks by female athletes.
- Section VIII focuses on research that gives voice to the experiences of girls and women as they engage in physical activity and navigate the sport system in the United States.

- Section IX offers principles for decision making that affect girls and women in sport and research recommendations followed by a concluding section.

This is followed by a concluding section with principles derived from the array of findings in the report and recommendations for future research. In Appendix A, readers are directed to existing research databases that might be tapped to conduct future research.

SECTION I. PREVENTION OF CHRONIC DISEASES IN LATER LIFE

Heart Disease (including Diabetes)

An ever-evolving and growing body of research supports the important public health conclusion that a physically active lifestyle lowers risk for heart disease, certain cancers, obesity, osteoporosis, and Alzheimer's disease. These diseases, which typically become chronic in middle age and among the elderly, are among the leading causes of death for women in the United States. The annual direct and indirect costs of sedentary lifestyles to chronic health conditions are reported to be $150 billion (Pratt, Macera & Wang, 2000). The findings gathered below testify to the fact that a public health strategy that encourages sports and exercise for girls when they are young, and offers real opportunities to stay physically fit, promotes the lifelong health of women.

Background

Cardiovascular heart disease (CVD) is an umbrella term for a number of diseases impacting the heart, including high blood pressure, coronary heart disease (CHD), and stroke (American Heart Association, 2014). Coronary heart disease (where plaque hardens the arteries supplying blood to the heart muscle) causes chest pain and can lead to heart attack (National Heart, Lung and Blood Institute [NHLBI], 2014). Often thought of as a "male disease," CHD is actually more problematic for women. In point of fact, it is the number-one killer of women in the United States. Among adult females, more than 1 in 3 will have some form of cardiovascular disease, and the number of women experiencing cardiovascular disease has continuously exceeded that of men since 1984. Females comprise 51% of CVD death rates, which translates to about 400,332 women dying annually. African-American women have the highest prevalence of CVD among women. The majority of women who experience CHD are postmenopausal, and risk for heart attack among women increases with age (Bassuk &Manson, 2010; Crimmins et al., 2008; Dalleck et al., 2009). Risk factors that can be modified to reduce CVD in women include: tobacco use, hypertension, diabetes mellitus, and high cholesterol, obesity, physical inactivity, and sedentary behavior (Barnes 2013; NHLBI, 2014).

Despite the fact that CVD is the number-one cause of death among women, there has historically been a general lack of awareness among the public of its magnitude. CVD kills more women alone than all of the various cancers combined. Post-World War II, following reports of research

that focused on white males (Li & Siegrist, 2011), CVD became known as a "man's illness" (Christian et al., 2007; NHLBI, 2014; Godfrey & Manson, 2008; Herrmann, 2008). Scientists, healthcare providers, affected publics, and public policy makers have sought to rectify misperceptions related to sex/gender that are associated with CVD. As a result, the rate of awareness of heart disease as the leading cause of death among women doubled during the past two decades (Mosca, Barrett-Conor, &Wenger 2011). Research demonstrates, however, that racial and ethnic disparities in heart disease awareness exist (Mathieu et al., 2012).

Compared to men, women are less likely to survive CVD and also are more likely to die from a heart attack within the first year of its occurrence (American Heart Association, 2014; Miller & Best, 2011; Quinn, 2008). This gender difference in survival has been attributed to a number of factors, including women being diagnosed with CVD at an older age, women delaying seeking treatment, the presence of more pre-existing conditions among women (e.g., diabetes and hypertension), and women not receiving treatment as aggressive as that given men due to this lack of understanding that women are serious candidates for heart disease (American Heart Association 2014; Colhoun, 2006; Dracup, 2007; Quinn, 2008; Quinn & King, 2005; Travis, 2005). Women and men present their symptoms differently; women are less likely to identify their discomfort as "chest pain," describing it in other ways. Clinicians may not recognize that women are having a heart attack, and women may not realize it themselves (Mosca et al., 2014; Quinn, 2008).

A key to unlocking the gender disparities that exist relative to women's vulnerability to CVD is found in emerging research, which is raising questions regarding the shortfalls in clinical and experimental trials that fail to examine data by gender, resulting in lack of understanding regarding the ways sex hormones influence vascular function. For example, treatment modalities identified in clinical studies may not apply equally to females as they do to males. There is a call for future research in CVD to focus more directly on the mechanisms by which sex impacts its development (Miller & Best, 2011).

There is also some evidence that women are less likely to participate in cardio-rehabilitation programs (Sarrafzadegan et al., 2008). When women do suffer from CHD, they are more likely to report a significant decline in their quality of life, both physically and mentally (Norris et al., 2004; Torres et al., 2004; Espnes & Byrne, 2008; Ford et al., 2008). Women who suffer from CHD are more likely to report more intense feelings of burnout and difficulty coping with stress (Hallman et al., 2003).

Risk Factors Associated with Cardiovascular Disease (CVD)

- Classic risk factors for CVD are similar in women as in men, but there are sex differences in the prevalence of these risk factors. Women and men report equal rates of hypertension (1 in 3 adults), but more women 65 and older have high blood pressure than men. The highest rates of hypertension are among

African-American women (Mosca, Barrett-Conor, & Wenger, 2011).

- Having a large waistline (obesity and overweight), high triglyceride levels (a type of fat found in the blood), low HDL (or good cholesterol), high blood pressure, and high fasting blood sugar (diabetes) are considered metabolic risk factors for CVD (NHBLI, 2014).
- Seven out of 10 women reported being unaware of their higher likelihood of having a stroke than a man. Further, they lacked knowledge of stroke risk factors (American Heart Association, 2014).
- Within one year of their first incident, 42% of women, compared with 24% of men, die of heart attack (Godfrey & Manson, 2008).
- According to the Behavioral Risk Factor Surveillance System study of 120,035 women, 38% had two or more risk factors for CVD (Sundaram et al., 2005).

One of the most identifiable risk factors linked to CVD is diabetes.

- The total cost of diabetes in the United States is $245 billion, with average medical expenses being two to three times higher than for those without diabetes (American Diabetes Association, 2014).
- Diabetes is the fifth deadliest disease in the United States. There are 9.7 million women who have diabetes and one-third of them are unaware (American Diabetes Association, 2014).
- Diabetes rates are two to four times higher among African-American, Hispanic/Latino, American Indian and Asian/Pacific Islander women than among Caucasian women (American Diabetes Association, 2014).
- Pregnancy may cause gestational diabetes in women who have never had diabetes before but who experience high blood sugar levels during pregnancy (American Diabetes Association, 2014).
- Women with diabetes are at much greater risk for heart disease than the non-diabetic population or men with diabetes (Colhoun, 2006).
- According to the Nurses' Health study, 82% of CHD events, 74% of CVD events, and more than 90% of diabetes cases in women could be prevented by improving lifestyle factors: not smoking, eating healthily, maintaining a healthy weight, and engaging in regular physical activity (Stampfer et al., 2000).

Symptoms That May Lead to Diagnosis of Cardiovascular Disease

- Women with CHD are more likely than men with CHD to report feeling they have health-related issues that lower quality of life. Women reported significantly more physically and mentally unhealthy days than men with CHD (Ford et al., 2008).
- A study of 51 women and 41 men found that women and men experienced and expressed chest pain differently. Women were more likely than men to report

chest pain as pressure, throat discomfort, vomiting, and pain in the lower back. Men were also more likely to recognize they were experiencing symptoms of a heart attack than were women (Quinn & King, 2005).

- Spanish-speaking Hispanics are significantly less likely to identify symptoms of cardiovascular risk factors than Caucasians, African-Americans, and English-speaking Hispanics are (DuBard, Garrett, & Gizlice, 2006).

Frequency of Cardiovacular Disease (CVD) Occurrence Among Women

- The prevalence of CVD in women 20 years of age or more varies by race/ethnicity. It is 47% among African-Americans, 34% among Caucasians, and 31% among Mexican-Americans; the prevalence of CHD is 7.6%, 5.8% and 5.6%, respectively. Asian women have the lowest prevalence of CHD at 3.9% (Mosca et al., 2014).
- Death from CHD is highest among African-American women in comparison to women from other ethnic groups (Mosca et al., 2014).
- Death related to stroke in women is twice as high as breast cancer (American Heart Association, 2014). Each year, 55,000 more women than men have a stroke (American Heart Association, 2014).
- There is a higher prevalence of stroke among African-American women in comparison to white women. Yet, when asked to correctly identify causes of a stroke, African-American were less able than white women to do so correctly (American Heart Association, 2014).
- Stroke is the leading cause of death for Hispanic women, who were also less likely than white women to correctly identify stroke symptoms (American Heart Association, 2014).
- Stroke tends to be more severe when occurring in women than in men with a one-month post-stroke fatality rate of 24.7% for females compared with 19.7% for males (Appelros, Stegmayr, and Terent, 2009).
- Estimates are 1 in 4 women die from heart disease, while 1 in 30 die of breast cancer (NHLBI, 2007).
- In a study of children ages 2-6 and 6-9, 15% of the sample were classified as having unhealthy CVD risk scores (McMurray, 2013).

Facts and Research Findings

Research shows that physically active women are less likely to suffer from cardiovascular disease (CVD). Physical activity is a lifestyle factor that can reduce many of the risk factors for CVD as well as mortality (Bassuk et al., 2010; Kodama et al., 2013). There also is ample evidence that physical activity performed by CVD survivors reduces the risk of mortality (Shibata et al., 2011).

While heart attack risk for women increases with age, physical activity throughout the life span helps reduce a woman's risk for CVD (Barnes 2013; Crimmins et al., 2008; Mosca, Barrett-Conor, &Wenger 2011). A physically active lifestyle during youth and early adulthood can help prevent the emergence of chronic disease later in life by

establishing behavior patterns that continue into adulthood and keep the individual in better physical shape.

With growing trends towards overweight and obesity among children and adolescents, researchers are investigating whether physical activity can lower metabolic risk factors for CVD that already exist in these youth. There is now evidence among children and adolescents that physical activity will reduce metabolic risk factors for CVD (Christofaro et al., 2013; McMurray 2013; Tanha et al., 2011). There also is ample evidence of the importance of maintaining a physically active lifestyle among elderly populations as old as 93 years of age (Cheng et al., 2012).

Physical activity after menopause is particularly important, as menopause is linked to an increase in a number of risk factors for CVD, such as weight gain and increases in blood pressure, lipids, and insulin sensitivity (Bassuk & Manson, 2010; Dalleck et al., 2009). Physical activity can mitigate these factors as it has been shown to reduce overweight, hypertension, cholesterol, and control diabetes (Cheng et al., 2012; Danielsen et al., 2013; Dalleck et al., 2009; Vepsalainen et al., 2011). Overweight, in turn, is associated with three other risk factors: hypertension, cholesterol, and diabetes, therefore physical activity also reduces CVD risk indirectly by reducing overweight (Dickie et al., 2014; Yates et al., 2010; Zhang, Qin, & Wang, 2010; Daubenmier et al., 2005; Daubenmier et al., 2007; Loomba & Arora, 2009).

Physical activity might directly impact CVD risk, as overweight women experience a decreased CVD risk after exercise, even if they do not lose weight (Christofaro et al, 2013; Dhaliwal, Welborn, & Howat, 2013). There also is evidence that the more a woman engages in physical activity, the greater the reduction in her cardiovascular risk factors (Dalleck et al., 2009; Williams, 2013). There is a connection between experiencing stress and CVD, therefore physical activity might also impact CVD risk by releasing stress (Stults-Kolehmainen, 2013). While research demonstrates that physical activity is an important factor in reducing a woman's risk of developing CVD, the majority of women are not meeting the Surgeon General's guidelines and are less physically active than men (American Heart Association, 2014).

Rates of physical activity also differ by ethnicity, with ethnic minority women participating at lower rates than white women, even after accounting for differences in education and income. Interestingly, even though ethnic minorities had similar knowledge as whites about the importance of physical activity, fewer ethnic minorities reported participating in physical activity when compared to Caucasians. These findings might suggest that differences could be due to the communities and surrounding environments in which these groups live. It also is possible that these groups were raised with differing social perceptions about exercise (Mathieu et al., 2012).

The timing of physical activity continues to be an important issue. While it is important in preventing CVD throughout the life span, it is also important after a CVD diagnosis. However, many individuals advised to engage in physical

activity after a CVD diagnosis fail to do so (American Heart Association, 2014; Centers for Disease Control and Prevention [CDC], 2009; Middleton et al., 2012). There is evidence that engaging in physical activity two weeks after a stroke is critical for an improved recovery, and that time spent in bed during the early phase of a stroke is associated with poorer functioning after three months (Askim et al., 2014).

Physical activity is more important than ever for girls and women now that hormone replacement therapy (HRT) is no longer the standard treatment for lowering women's risk for heart disease, given the evidence from large-scale clinical trials demonstrating that HRT might actually increase risk of coronary events (Barrett-Connor, 2006; NHLBI, 2007). With HRT no longer considered the gold standard for treating post-menopausal women for CHD, it is now critical to focus on modifiable lifestyle factors such as physical activity.

While the majority of studies that examine physical activity look at at leisure physical activity, they still recommend the importance of moderate to vigorous physical activity (Barnes, 2013; Shibata et al., 2011; Ishii et al., 2014; Vanhees et al., 2012). There is some evidence that activities of daily living, particularly among the elderly, including walking, occupational physical activity as well as housework, are also important for reducing cardiovascular risk factors (Park et al., 2012; Tielemans et al., 2013).

Research examining the unique and negative effects of sedentary behavior on CVD is emerging as highly important in the current literature. Evidence is now growing that independent of the amounts of exercise one obtains, sitting for long periods of time performing desk work or sitting in front of the television or computer, presents as an independent risk factor. In other words, even if individuals meet the current physical activity guidelines, if they engage in excessive sedentary behavior, they are at an increased risk for CHD (Barnes, 2013), Ertek & Cicero, 2012; Stults-Kolehmainen, 2013). Women who reported more than 10 hours/day of sitting were more likely to be white, to have attended college, and to have higher incomes when compared with women who reported sitting less than five hours a day. Increases in sitting time are shown to have a high association with CHD and stroke, independent of one's level of physical activity (Chomistek et al., 2013).

- The World Health Organization (WHO) recommends that adults must engage in at least 150 minutes of moderate intensity physical activity per week or 75 minutes of vigorous intensity per week or some equivalent combination (WHO, 2010).
- Men are more likely than women to meet the physical activity guidelines (CDC, 2009).
- A study assessing the relationship between blood pressure levels and physical activity found that, among adolescents aged 10-17, those who were either overweight or obese had higher blood pressure levels. However, even if they were overweight, if they were physically active, these adolescents had lower blood pressure levels (Christofaro et al., 2013).

- Physical activity studies of children as young as 6 with metabolic risk factors for CVD found moderate-to-vigorous physical levels of more than 65 minutes per day for girls to be effective in reducing risk for CVD (Jimenez-Pavon et al., 2013; McMurray, 2013).
- A 10- to 14-week inpatient lifestyle modification intervention program found that a minimum 90 minute of physical activity per day for five days a week had positive effects on reducing body composition and metabolic risk factors among obese subjects (Danielsen et al., 2013).
- Prospective research studies examining associations between physical activity and risk for all-cause mortality (death from any cause within 30 days after hospital admission date) and cardiovascular disease in patients with diabetes found that those with the highest levels of physical activity had a 9.5% and 7.9% reduction in all-cause mortality and CVD, respectively, when compared with those with the lowest level of physical activity (Kodama et al., 2013).
- For Type I diabetes patients who were at risk for CVD, those who walked more were less vulnerable to CVD than those who were not physically active (Tielemans et al., 2013).
- In a meta-analysis of studies examining the relationship between physical activity and risk for cardiovascular disease, researchers found a strong protective effect of both leisure time physical activity and occupational physical activity. These two forms of physical activity reduced the risk of coronary heart disease and stroke by 20-30% and 10-20%, respectively (Li & Siegrist, 2011).
- Active women had significantly lower body weight, lower body fat percentages, smaller waist circumferences, and better cholesterol and insulin levels than inactive women (Dickie et al., 2014).
- Participants without a known history of CVD were classified into a healthy group or a non-healthy group based on blood pressure, waist circumference, inflammation levels, cholesterol, and diabetes. It was found that engaging in at least one to two physical activity sessions of low to vigorous intensity per week protected against mortality. Those who had high metabolic risk factors and were physically active were still at a substantially lower risk for associated cardiovascular disease. Those with the highest risk for CVD and all-cause mortality were physically inactive with metabolic risk factors (Hamer & Stamatakis, 2012).
- Seventy percent of Hispanic women did not meet the recommended physical activity guidelines for reducing CVD. Following the current physical activity guidelines was found, in this population, to be associated with better cholesterol measures, more fat-free mass, and greater cardiovascular fitness measures (Vella, Ontiveros, & Dalleck, 2011).
- In a study of more than 15,000 female and male African-Americans and Caucasians aged 45-64,

physical activity was inversely associated with CVD, heart failure, and CHD incidence (Bell, Lutsey, Windham, & Folsom, 2013).

- An estimated 12.2% of heart attacks across the globe would be prevented with proper levels of physical activity (American Heart Association, 2014).
- Only 42.6% of women, compared with 52.1% of men meet the physical activity guidelines (CDC, 2009).
- High school females engaged in lower levels of physical activity than their male counterparts. Only 17.7% of females, compared with 36.6% of males, reported being physical active at least 60 minutes per day. Only 24.0% of females and 34.9 % of males reported attending physical education class (CDC, 2009).
- It is projected that more than 90% of initial heart attacks could be eliminated if the following nine risk factors were controlled through changes in lifestyle: cigarette smoking, abnormal cholesterol levels, hypertension, diabetes, overweight and obesity, sedentary behavior, low fruit and vegetable consumption, excessive alcohol consumption, and psychosocial stressors (Yusuf et al., 2004).

Physical activity can lower cholesterol, reduce hypertension, and control or eliminate diabetes, as well as reduce stress. To illustrate, these findings demonstrate:

- After considering other cardiovascular disease (CVD) risk factors, such as smoking, diabetes, hypertension, obesity, cholesterol, alcohol consumption, and psychosocial factors, physical inactivity accounts for approximately 12% of the global burden of myocardial infarctions (Yusuf et al., 2004).
- Based on findings from multiple studies, just one hour of walking per week reduces a woman's overall risk of coronary heart disease (CHD), stroke, and cardiovascular disease (CVD) (Oguma & Shinoda-Tagawa, 2004).
- A study evaluating the reductions in all-cause and CVD mortality found that greater exercise was associated with lower all-cause mortality, and meeting or exceeding the physical activity guidelines is associated with a reduction in CVD (Williams, 2013).
- Walking is associated with a reduced risk of all-cause and cardio vascular disease mortality (Williams, 2013).
- There is strong evidence that physical activity shows CVD benefits. In a 15-year prospective study using a large sample with no previous history of heart disease, diabetes, or stroke, researchers linked participants' physical activity and obesity levels with the national death index. Subjects who engaged in the highest levels of recreational physical activity were significantly less likely to die from CVD (Dhaliwal et al., 2013).
- Among women 65 years or older, engaging in daily physical activity, such as cleaning the house, doing the laundry by hand, and working in the kitchen, was associated with lower CVD mortality (Park et al., 2012).

Cancer

Background

Cancer is among the leading causes of death among women in the United States. Women in Western countries are diagnosed with breast cancer more often than any other female cancer. It is the second-leading cause of cancer-related deaths for women after lung cancer, and is followed by colorectal cancers (American Cancer Society, 2014b). There is evidence that women with breast cancer are more likely to develop colorectal cancer (Ochsenkuhn et al., 2005). In 2014, estimates predict there will be approximately 810,320 new cases of female cancer with approximately 275,710 cancer-related deaths among women (American Cancer Society, 2014a).

Cancer is the second-most-preventable disease next to heart disease. More than half of all cancer deaths could be prevented through modifiable lifestyle factors, such as overweight and obesity, physical inactivity, and unhealthy eating (American Cancer Society, 2014a; Demark-Wahnefried et al., 2008).

Early detection is another factor considered to reduce cancer-related deaths. There is some evidence that men may be screened for colorectal cancer more often than women, increasing the likelihood of early detection (Woods et al., 2005). Among 2,891 colon cancer patients, women were significantly more likely to be diagnosed with Stage II colon cancer, while men were more likely to be diagnosed at Stage 1 (Woods et al., 2005). The risk of cancer diagnosis increases with age, so more individuals are at risk for developing cancer as the American population ages. Furthermore, as treatment for cancers like lung and breast cancers improve, the number of cancer survivors is also increasing (Nes et al., 2012; Ho et al., 2013).

In addition to increasing healthcare costs, the indirect effects of cancer-related morbidity and mortality are crippling. Therefore, modifying lifestyle factors like physical activity and overweight/obesity, which place women at risk of developing both cancer and its possible reoccurrences, are important initiatives for the future.

Costs associated with cancer are considerable. In 2009, the overall costs of cancer, including healthcare costs and costs associated with morbidity and mortality, were about $216.6 billion (American Cancer Society, 2014a). Those who lack health insurance are less likely to have cancer detected in early stages, when treatment is more effective and survival rates are greater. Approximately 48.6 million (15.7% of all Americans) were uninsured in 2011. One in three uninsured were Hispanic, and one in 10 were children (18 years of age or younger).

Various forms of cancer occur at the following rates among the general population and among female populations in the United States:

- In 2014, it was estimated that approximately 1,665,540 new cases of cancer cases would occur,

with 585,720 Americans (or 1,600 per day) dying from the disease (American Cancer Society, 2014a).

- As of January 2012, an estimated 13.7 million Americans were living with a history of cancer (American Cancer Society, 2014a).
- Cancer survival rates are improving. In 1975-1977, cancer survival rates were only 49%. Between 2003 and 2009, cancer survival rates were up to 68% (American Cancer Society, 2014a).
- Projections indicated there would be 232,670 new cases of breast cancer, 48,380 of colon cancer, 108,210 of lung cancer, and 47,790 cancers of the thyroid diagnosed in women in 2014 (American Cancer Society, 2014a).
- Estimates predicted 62,980 cases of thyroid cancer diagnosed in 2014, with three out of four of these cases expected to occur in women (American Cancer Society 2014a).
- Women's rates of thyroid cancer increase significantly during adolescence and young adulthood and then plateau during menopause (Cash et al., 2013).
- Comparisons of women with and without cancer reveals that women over the age of 65 with breast cancer were more likely to test positive for colorectal adenomas, precursors to colon cancer, than women over the age of 65 without breast cancer (Ochsenkuhn et al., 2005).
- There are more than 500,000 cancer deaths in the United States annually, with one-third attributable to poor diet, overweight and obesity, and a lack of physical activity (Demark-Wahnefried et al., 2008).

Recent findings regarding cancer reduction include the following:

- Maintaining a healthy weight, increasing physical activity, and consuming smaller portions and more plant foods are recommended for reducing cancer risk (Chlebowski, 2013; Demark-Wahnefried et al., 2008; Patterson et al., 2010; Vries et al., 2010).
- In a projection study, it was found that if the entire population obtained the optimum levels of BMI and physical activity, between 2.3% and 18.2% (optimum BMI) and3.2% and 21.2% (optimum physical activity) of colon cancer cases would be eliminated. The benefits of increased physical activity appear to be stronger for women than for men in the reduction of colon cancer (Vries et al., 2010).

Facts and Research Findings

Physically active women are less likely to develop cancer. Mounting evidence exists that physical activity is associated with a number of cancers common among women (Friedenreich, Neilson, & Lynch, 2010; McTiernan, 2008). There is strong evidence demonstrating that physical activity reduces risk for breast and colon cancer (Chelbowski et al., 2013; Fontein et al., 2014; Ho et al., 2013; Irwin, 2009;

Ishii et al., 2013; Lof et al., 2012; Patterson et al., 2010; Vries et al., 2010). Being physically active also affects the likelihood of various cancers reoccurring among women and survival rates after diagnosis (Basen-Enquist et al., 2011; Buffart et al., 2014a; Carmichael et al., 2010; Loprinzi et al., 2012; Magne et al., 2011; Moorman et al., 2011). This evidence is stronger for postmenopausal women than premenopausal women (Fontein et al. 2014; Gemert et al., 2013; Huy et al., 2012; Neilson et al., 2009; Shin et al., 2009). Physical activity during cancer treatment as well as post-cancer treatment is important to preventing cancer reoccurrence (Johnsson, Johnsson, & Johansson, 2013). However, there also is evidence that physical activity throughout the life span, beginning in childhood, is important in lowering cancer risk (Awatef et al., 2011; Magne et al., 2011). There also is support, although less consistent, that physical activity can decrease cancers impacting the female reproductive system, such as ovarian and endometrial cancers (Basen-Engquist et al., 2011; Lee et al., 2013; Magne et al., 2011). Strong evidence exists that physical activity is associated with lower lung cancer rates (Buffart et al., 2014b; Friedenreich et al., 2010; Granger et al., 2013; Nes et al., 2012), and newer emerging evidence that physical activity may be associated with decreases in esophageal and thyroid cancers (Cash et al., 2013; Singh et al., 2014).

Physical Activity and Reduction in Risk Factors

The American Cancer Society (2014a) recommends that adults participate in at least 150 minutes of moderate intensity or 75 minutes of vigorous intensity activity each week (or a combination of these) to prevent cancer. Children and teens should obtain at least one hour of moderate or vigorous intensity activity each day with vigorous activity occurring at least three days per week. It is also recommended that people of all ages limit their sedentary behavior such as sitting, lying down, watching TV, and other screen-based entertainment.

Breast Cancer

Findings from 66 controlled intervention studies show that engaging in physical activity during or shortly after cancer treatment is safe and yields benefits for patients (Speck et al., 2010). In a study comparing lifetime histories of physical activity among breast cancer survivors and cancer-free controls aged 25-75, breast cancer survivors had lower physical activity levels across the life span. The researchers identified significant risk reductions in breast cancer for women who participated in the highest levels of physical activity compared with the lowest levels. Physical activity reduced the risk of breast cancer by 56% in postmenopausal women (Awatef et al., 2011).

- It is estimated that the most physical active women are 25% less likely to get breast cancer than the least physically active women (Friedenreich et al., 2010).
- In a prospective study of 2,076 early-stage breast cancer patients, physical activity was collected

before and after diagnosis. Breast cancer deaths were found to be lower only for those women who either maintained a physically active lifestyle or who increased their physical activity levels post-diagnosis. (Irwin et al., 2011).

- Post-diagnosis physical activity has been associated with 34% fewer breast cancer deaths (Ibrahim & Al-Homaidh, 2011).
- Findings from 31 studies revealed a 12% increase in risk of postmenopausal breast cancer for every 5kg increase in body mass (Renehan et al., 2008).
- An analysis of 62 breast cancer studies identified a 25–30% reduction in breast cancer risk for women who were physically active (Friedenreich & Cust, 2008; Friedenreich et al., 2008).
- A review of 48 studies of pre- and postmenopausal breast cancer risk found risk reductions of 15–20% for premenopausal and 20-80% for postmenopausal women who were physically active. There was also a 6% risk reduction for each additional hour of physical activity per week that post-menopausal women engage in (Monninkhof et al., 2007).
- According to the results found in 23 studies, those who had the highest levels of physical activity during adolescence and young adulthood were 20% less likely to get breast cancer later in life (Lagerros, Hsieh, & Hsieh, 2004).
- The Japan Collaborative Cohort Study, which included 30,157 women, ages 40–69, found that the most physically active group (those walking more than an hour per day and exercising more than one hour per week) were less likely to get breast cancer than those who were the least active. These results were found regardless of menopausal status and body mass index (Suzuki et al., 2008).
- In the Breast Cancer Detection Demonstration Project Follow-up Study, 32,269 women were followed for more than 10 years. During this time, those postmenopausal women least likely to develop increased cancer risk were those engaged in vigorous activity (Leitzmann et al., 2008).
- Physical activity is thought to reduce estrogen directly or indirectly by reducing obesity (Patterson, Cadmus, Emond, & Pierce, 2010). There is some support for the direct effect of physical activity on breast cancer risk reduction, as studies have reported that physical activity reduces breast cancer risk, independent of weight (Schmidt et al., 2008; Shin et al., 2009). However, there also is some evidence that physical activity does not help reduce cancer risk in overweight women (Leitzmann et al., 2008).
- In the NIH-AARP Diet and Health study, the most active women (engaged in at least 20 minutes of moderate-intensity exercise per week) had a13% lower breast cancer risk than the most inactive (Peters et al., 2009).

Colon Cancer

- In additon to hormonal and weight-control factors, physical activity is also thought to reduce colon cancer rates by reducing gastrointestinal transit time (American Cancer Society, 2014a).
- According to the American Cancer Society (2014b), sedentary people who become active later in life can also reduce their risk of developing colon cancer.
- Worldwide there have been more than 60 studies conducted on the effects of physical activity on colon cancer. Based on this work, it is estimated that physical activity reduces colon cancer risk by 20-25% amongst men and women who engage in the highest levels of physical activity when compared to those who engage in the lowest levels (Friedenreich et al., 2010).
- In the NIH-AARP Diet and Health Study, 488,720 participants (ages 50–71) were followed for almost 10 years. Women who engaged in exercise and/or sport five or more times per week had a reduced risk of colon cancer compared with those who were sedentary (Howard et al., 2008).

Lung Cancer

- Physical activity is associated with a 20% to 40% risk reduction for lung cancer (Friedenreich et al., 2010).
- While it still stands to reason that sports and exercise are indirectly related to lung cancer through reduction in smoking behavior since sports and fitness practices encourage girls not to start smoking or to quit smoking (American Cancer Society, 2014a), there is evidence that exercise itself might actually contribute directly to the relationship (Tardon et al., 2005).
- Smokers who had moderate or high levels of physical activity were less likely to develop lung cancer than those who had the lowest levels of physical activity. This risk reduction in lung cancer rates showed no difference based on whether the individual was a heavy or light smoker (Tardon et al., 2005).
- A review of studies examining the relationship between physical activity and lung cancer found that a reduced risk of cancer is strongly associated with more vigorous levels of physical exercise, particularly for women (Tardon et al., 2005).

Ovarian Cancer

- "As compared to women reporting less than one hour of aerobic activity per week, women reporting 1 to <2 hours per week of activity in the year before or in the 10 years before diagnosis/interview had a statistically significant reduced risk for ovarian cancer" (Moorman et al., 2011, p. 182).
- Among women with a body mass index (BMI) of less than 30, those with less than one hour per week of reported physical activity had poorer survival rates than those who reported two hours per week of activity. For women with a BMI of more than 30, physical activity

had no effects on reducing ovarian cancer survival (Moorman et al., 2011).

- In a case-control study comparing women diagnosed with ovarian cancer and those who were cancer free, the cancer-free women reported longer durations of strenuous sports and moderate daily physical activity in their lives (Lee et al., 2013).
- The pooled results of 12 studies of the relationship between ovarian cancer and physical activity found a modest inverse relationship between level of physical activity and risk for ovarian cancer (Olsen et al., 2007).

Other Cancers

- The risk for endometrial cancer is about 20-30% lower for those who are physically active (Friedenreich et al., 2010).
- Esophageal cancer risk was 29% lower among the most physically active than among the least physically active in a review of series of studies (Singh et al., 2014).

While not enough studies have examined the relationship between thyroid cancer and physical activity to draw any solid conclusions about the relationship, there is some evidence a relationship might exist. In a study that followed 116,939 women aged 22-79 with no history of thyroid cancer found that women who had engaged in long-term physical activity had a 23% lower risk of thyroid cancer when compared to inactive women. These findings were stronger among normal weight and underweight women (Cash et al., 2013).

Physical Activity and the Impact on Women Post-Cancer Diagnosis: Treatment, Reoccurrence, and Survival

As the number of women who survive cancer grows, there is an increased focus in the research community on life after cancer. Numerous studies examine the relationship between physical exercise, cancer reoccurrence and long-term survival (Hamer, 2009). These studies found that women who engage in exercise are less likely to have cancer reoccurrence, as well as having higher survival rates than those who do not (Hamer et al., 2009; Hoick et al., 2008; Holmes et al., 2005; Lynch et al., 2007; Patterson, Cadmus, Emond, & Pierce, 2010; Schmidt et al., 2008; Shin et al., 2009). Physical activity at a moderate-to-vigorous intensity shows the most consistent promise of reducing cancer risk (Magne et al., 2011). Although women should exercise more after a cancer diagnosis, unfortunately there is evidence that they actually engage in less exercise post-cancer diagnosis (Granger et al., 2013; Huy et al., 2012). This relationship is particularly strong for women who reported feeling more fatigued (Biceogo et al., 2008).

General Findings: Women Post-Cancer Diagnosis

- A review of large clinical trials demonstrated physical activity improves breast cancer survival (Fontein et al., 2014).
- The effect of physical activity in reducing cancer has shown a more critical impact on postmenopausal

women. Those with sedentary lifestyles are at increased risk for breast cancer (Magne et al., 2011).

- The Scottish Health Survey studied the impact on mortality of physical activity after a cancer diagnosis. Participation in three vigorous sessions of exercise per week, for at least 20 minutes, was associated with lower risk for mortality (Hamer et al., 2009).

Breast Cancer

- Women treated for breast cancer with adjuvant chemotherapy who were more physical activity before their cancer treatment were also more likely to be physically active during and after chemotherapy (Johnsson, Johnsson, & Johansson, 2013).
- The effect of physical activity on breast cancer is intensified for women after 50 years and in postmenopause, supporting the idea that lower rates of breast cancer could be due to the impact of physical activity on the ratio between the hormones androgen and estrogen (Magne et al., 2011).
- In the Shanghai Breast Cancer Study, 3,458 women with breast cancer were compared with 3,474 matched controls without breast cancer. Physically active women, both post- and premenopausal, were at a lower risk for developing breast cancer. This relationship was stronger for postmenopausal than premenopausal women (Shin et al., 2009).
- In the MARIE study, a population-based case control study of 3,414 pre- and postmenopausal women (ages 30–49 and 50-plus) with breast cancer, levels of physical activity were compared with 6,456 controls. Results showed a stronger protective effect of physical activity for post-menopausal women. These effects were independent of body mass index (Schmidt et al., 2008).
- In a prospective cohort study, 1,231 women, ages 20–79 and diagnosed with breast cancer, were followed. Those who engaged in greater levels of physical activity had a significantly lower risk of dying from breast cancer, regardless of their age, stage of disease, and body mass (Holick et al., 2008).
- In the Nurses' Health study, a prospective study based on 2,987 female registered nurses, women who walked between three and five hours per week, at a moderate pace, had a reduced risk of breast cancer reoccurrence (Holmes et al., 2005).

Ovarian Cancer

- Exercise in young and teenage girls is thought to impact menstrual patterns, which in turn influence the production of ovarian hormones and are, therefore, likely to protect against cancer (Magne et al., 2011).

Lung Cancer

- In a study of the physical activity patterns of recently diagnosed lung cancer patients, those diagnosed

with lung cancer were significantly less physically active than similar-aged healthy individuals, with 60% not meeting the physical activity guidelines. Over six months post-diagnoses, lung cancer patients' physical activity declined (Granger et al., 2013).

Colorectal Cancer

- In a study with 1,996 colorectal cancer survivors, pre- and post-diagnosis physical activity levels were measured. After their diagnosis, 21% fewer cancer patients met recommended physical activity guidelines than pre-diagnosis. Compared to men, women were less likely to follow the physical activity guidelines (Lynch et al., 2007).

Researchers have examined how exercise helps cancer patients and survivors deal with negative repercussions of the disease by improving aspects of the person's quality of life (Albrecht & Taylor, 2012; Basen-Engquist et al., 2011; Fontein et al., 2014). There is some evidence that female cancer survivors fare worse than males on quality-of-life measures and physical functioning (Buffart et al. 2014a; Giesinger et al., 2009). Cancer can create physical and psychological problems that continue for years after diagnosis and treatment (Giesinger et al., 2009; Granger et al., 2013; Nes et al., 2012), some of which, like obesity, are thought to contribute to disease reoccurrence (Kim et al., 2009). Many survivors have lowered physical functioning, increased muscle weakness and atrophy, pain, difficulty sleeping, and increased weight gain, conditions often associated with some of the cancer treatments. However, cancer fatigue (a sense of persistent tiredness that interferes with usual functioning), the most common symptom, experienced by 70–100% of all cancer patients, can be ameliorated through exercise (Buffart et al. 2014a; Courneya et al., 2011; Lof et al., 2012).

Physical exercise can reduce losses in cardiopulmonary function (fitness) as a result of colorectal cancer treatment, increase muscle and bone strength, reduce weight gain, and help to combat fatigue (Buffart et al. 2014a; Kim et al., 2009; Pinto et al., 2008; Winter-Stone et al., 2008). Cancer patients also experience a number of psychological and social stressors associated with fear of disease reoccurrence and death (Basen-Engquist et al., 2008; Everdingen et al., 2008), increased depression, and decreased social and interpersonal functioning (Granger et al., 2013). In general, there is strong evidence demonstrating that exercise has a positive impact on physical and psycho-social functioning in cancer patients and survivors, regardless of age (Buffart et al., 2014a). However, there also is evidence that the majority of cancer survivors are not meeting recommended guidelines for physical activity (Basen-Engquist et al., 2008; Coups et al., 2009; Lynch et al., 2007).

Physical Activity and the Impact on Women Post-Cancer Diagnosis: Quality of Life

- There is solid research evidence to support a conclusion that cancer-related fatigue can be reduced by exercise (Lof et al., 2012).
- Physical activity is recommended to take place during and after cancer treatment to ameliorate a multitude of factors, including muscle weakness, anxiety, and fatigue (Buffart et al., 2014a).
- The quality of life of patients with advanced-stage cancer can be enhanced and improved as a result of participating in exercise. Activities such as yoga, walking, biking, and swimming decrease anxiety and have contributed to a reduction in stress and depression while improving pain levels, fatigue, shortness of breath, constipation, and insomnia among advanced-stage lung cancer patients (Albrecht & Taylor, 2012).

Breast Cancer

- Exercise interventions have been found to be effective for breast cancer survivors who are currently undergoing treatment as well as those who are post-treatment by reducing physical fatigue and improving muscle strength and endurance. Starting an exercise program during treatment yields even greater results than starting an exercise program post-treatment. Exercising while undergoing treatment results in better global health, and physical, role, and emotional functioning than those who start after treatment (Buffart et al., 2014a).
- Postmenopausal women with breast cancer who performed moderate-to-vigorous aerobic exercise 45 minutes per day, five days per week for a year possessed significantly better physical functioning, general health, vitality, and reported less bodily pain than those who were less active (Courneya et al., 2011).
- In a prospective study of 136 breast cancer survivors, more than one-half of the sample experienced moderate-to-high levels of disease-recurrence fear and increased anxiety levels (Everdingen et al., 2008). Previous studies that examined the impact of exercise on the quality of life in older cancer patients (age 65 and older) during and after treatment showed that aerobic exercises, such as moderate walking and strength training, were associated with a reduction in fatigue, improved sleep, improved physical functioning, and greater sense of well-being (Luctkar-Flude et al., 2007).
- For 374 breast cancer survivors, diagnosed at age 40 or younger (approximately 10 years post-diagnosis), those who exercised more after diagnosis scored higher in physical-health functioning and general health, and reported experiencing less bodily pain than those who did not exercise (Kendall et al., 2005).
- In a sample of breast cancer survivors, those who expended more energy at higher intensities (without

excessive strain) demonstrated improved physical functioning, better general health, and lower levels of pain and depression (Basen-Engquist et al., 2008). A review of 33 experimental studies of the impact of exercise programs on participants diagnosed with cancer demonstrated strong evidence that physical function improves with exercise (Stevinson et al., 2004).

- Breast cancer patients engaging in aerobic exercises, such as walking at moderate intensities, reported improvements in their quality of life, their sleep, and their feelings of self-esteem, as well as reporting less weight gain (Kirshbaum, 2006).
- In a study of 47 breast cancer survivors, higher fatigue was associated with lower physical activity, increased body fat, and poorer lower-extremity strength (Winters-Stone et al., 2008).

Colorectal Cancer

- The majority of long-term colon cancer survivors reported lack of energy, pain, and emotional problems associated with colon cancer. Distress about future diagnostic tests and the spread of cancer was highly ranked (Phipps et al., 2006).
- In a comparison of men and women with colorectal cancer, the majority of men reported a better quality of life, including better emotional and cognitive functioning with less financial impact (Giesingerr et al., 2009).
- In a review study of the effectiveness of 10 aerobic exercise interventions for women receiving cancer therapy, weekly exercise sessions of two to five times per week and 30–40 minutes over six to 26 weeks were shown to have a moderate-to-large effect on fitness and lean body mass (Kim et al., 2009).
- A study examining the relationship between physical activity and quality of life for people with colorectal cancer six, 12, and 24 months after diagnosis found that participants who achieved at least 150 minutes of physical activity per week had 18% higher quality-of-life scores (comprised of measures of physical, social and emotional well- being) than those who reported engaging in no physical activity (Lynch et al., 2008).

Lung Cancer

Among long-term lung cancer survivors, decreased physical activity was associated with lower mental, physical, emotion, social, and spiritual functioning as well as decreased symptom control. Those who were less physically active had more pain, dry coughing, coughing with phlegm, shortness of breath, and fatigue than those who engaged in physical activity. Those reporting engaging in regular physical activity (30 minutes or more per day, at least five days per week) reported higher quality of life scores than those who were more sedentary (Nes et al., 2012).

Obesity and Overweight

Background

Obesity and overweight (weight ranges associated with increased health problems) are leading preventable causes of mortality and morbidity among women (Centers for Disease Control and Prevention, 2014; NaPier et al., 2005; Redinger, 2008). Abdominal obesity (defined by measures of waist circumference) is also an independent predictor of mortality, even in normal weight individuals (Ladabaum et al., 2014). Overweight leads to metabolic syndrome, a group of conditions known to increase risk of cardiovascular disease (CVD), high blood pressure, Type II diabetes, and/or cholesterol problems (Duan et al., 2010; Lin et al., 2010; Ostchega et al., 2012; Power et al., 2014). In addition, overweight leads to a number of other serious conditions including a number of cancers and an overall poorer quality of life with markedly lower levels of physical functioning (Hu, Walace, & Tesh, 2010; Lim, Voss, & Flaxman, 2012; Lin et al., 2010; Smuck et al., 2014).

Obesity and overweight has reached epidemic proportions worldwide. Over the past 33 years, there have been alarming increases in the rates of obesity and overweight in both adults (up 28%) and children (up 47%) globally (Ng & Gakidou, 2014). The numbers of normal weight individuals with abdominal obesity is also on the increase (Ladabaum et al., 2014). Overweight and obesity contribute to an estimated 300,000–400,000 premature deaths in the United States annually and create tremendous medical and healthcare costs (Li et al., 2009; Wyatt et al. 2006). In the developing world, women have higher rates of obesity than men (Ng & Gakidou, 2014). Although a global problem, the highest levels of obesity and overweight are identified in the Western developed nations, which are characterized by more sedentary lifestyles (Buchowski et al., 2010; CDC, 2014; Chau et al., 2012; Redinger, 2008; Thibault et al., 2010). The United States has higher numbers of overweight and obese children, adolescents, and adults than most of the world; these individuals, as a result of being overweight, also suffer from co-morbidities (CDC, 2012; Ogden et al., 2014).

Since the late '70s, the average weight of the U.S. population has increased so that all people, including children, are now heavier than their counterparts were in prior decades, and the heaviest have become even heavier (Ogden et al., 2014). While overweight and obesity have increased among all sectors of the U.S. population, lower socioeconomic groups (CDC, 2014; Li et al., 2009; Ogden et al., 2010; Scharoun-Lee et al., 2009), and African-American and Mexican-American girls and women are at increased risk in comparison to white females (CDC, 2014; Franzini et al., 2009; Ogden et al., 2014; Robinson et al., 2009; Sinha & King, 2009). Particularly disturbing is that the rise in overweight and obesity among young children and adolescents occurs with a parallel rise in extremely large, unprecedented increases in Type II diabetes among these groups (Ogden et al., 2014). Weight gain occurring before middle age is associated with higher chances of

obesity and obesity-related illnesses later in life (Rosenberg et al., 2013). Because the length of time an individual is overweight or obese increases that person's mortality risk, researchers project that youth today will face shorter life spans than their parents if steps are not taken to reverse this growing problem (Ladabaum et al., 2014).

- In 1980, worldwide, there were 857 million overweight and obese people. As of 2013, there were 2.1 billion overweight and obese people (Ng et al., 2014).
- Over half of the 671 million obese people in the world live in one of the following 10 countries: the United States (more than 13%), China and India (15% combined), Russia, Brazil, Mexico, Egypt, German, Pakistan and Indonesia (Ng et al., 2014).
- In developing countries, the rates of obesity are growing, with 64% of the world's obese population reported to be located in developing countries (Ng et al., 2014).
- One-third (or 78.6 million) of U.S. adults are obese (Ogden et al., 2014).
- Non-Hispanic blacks have the highest rates of obesity (47.8%) followed by Hispanics (42.5%), non-Hispanic whites (32.6%) and non-Hispanic Asians (10.8%) (CDC, 2014).
- Among infants and toddlers, 16.9% were identified as having high weights in 2014 (Ogden et al., 2014).
- When U.S. trends in obesity are examined, from 1988 to 2010, researchers found that average BMI was increasing .37% per year in women and men. Average waist circumference increased more in women (.37%) than in men (.27%) (Ladabaum et al., 2014).
- The prevalence of abdominal obesity in normal-weight women has increased from 9.6% in 1988 to 13.8% in 2010, and from from 66.1% in 1988 to 80.8% in 2010 in in overweight women (Ladabaum et al., 2014).
- Studies demonstrate that women who are inactive and have higher abdominal obesity have higher rates of cardiovascular disease when compared to men with the same characteristics (Arsenault et al., 2010).
- Non-Hispanic black women have the highest average waist circumference, with non-Hispanic white women having the smallest (Ladabaum et al., 2014).
- Women with higher incomes and college degrees are less likely to be obese than those with lower incomes and lower education levels. However, since 1988, the prevalence of obesity has increased at all income and education levels (Ogden et al., 2010).
- Since 1988, younger women have experienced the greatest increases in obesity and abdominal obesity (Ladabaum et al., 2014).
- Living in the United States longer than 10 years is associated with a higher chance of being overweight and obese (Goel et al., 2004).

- Based on respondents to the Behavioral Risk Factor Surveillance Survey in 2012, the highest prevalence of adult obesity in the United States existed in the Midwest (29.5%), followed by the South (29.4%). The lowest prevalence of adult obesity were found in the West (25.1%) and the Northeast (25.3%) (CDC, 2014).
- There were approximately $147 billion spent annually on U.S. medical costs associated with obesity. Individuals who were obese had approximately $1,429 higher annual medical costs than those who were not obese (CDC, 2014).
- Among children and adolescents (aged 2-15), approximately 17% (12 million) were obese (Ogden et al., 2014).
- Obesity was highest among Hispanic youth (22.4%) followed by Non-Hispanic black youth (20.2%), non-Hispanic white youth and non-Hispanic Asian youth (8.6%) (CDC, 2014).
- The likelihood of developing metabolic syndrome is 2.81 times higher for overweight individuals and 5.24 times higher for obese individuals than for normal-weight individuals (Cheriyath et al., 2010).
- Overweight or obese individuals are more likely to suffer from osteoarthritis, lower back pain, sleep apnea, asthma, polycystic ovary disease, eclampsia pregnancy, nonalcoholic fatty liver disease, and certain cancers (Redinger, 2008).
- The greater the level of physical activity among high school girls, the greater the impact on healthy body mass indices. Of high school girls who played on three or more athletic teams, 80% had a healthy BMI, compared to 75% of moderately involved athletes and 60% of non-athletes (Sabo & Veliz, 2008).
- Almost two-thirds of youth aged 8-18 reported the television being on during meals, and almost half of them reported the TV was on the majority of the day. Per day, this group was found to spend more than seven hours per day, or 53 hours a week, using entertainment media such as TV, video games, and computers (Surgeon General Report, 2010).

Facts and Research Findings

Physical activity and dietary factors can cure most overweight and obesity, leading to improved health for girls and women (Cheriyath et al., 2010; Hodges et al., 2013; Lindsay et al., 2014; Lazarou et al., 2010; Power et al., 2014). Overweight and obesity are caused by an imbalance between the food an individual consumes and the energy they expend in physical activity. While the causes of obesity can involve complex biological and social factors, the widespread increase in the number of overweight and obese individuals is due primarily to environmental and lifestyle changes (increased access to technology, computers, machinery, and other labor-saving devices) leading to more sedentary behaviors (lower occupational activity levels and less activity during leisure time) (Brock et al., 2009; Chau et

al., 2012; Hodges et al., 2013; Michimi & Wimberly, 2012; Stephens, Cobiac & Vermeer, 2014).

There is evidence to support a finding that certain environmental factors that lead to more sedentary behaviors are associated with increased obesity. Obesity is linked to living in pedestrian-unfriendly neighborhoods, watching TV, playing video games, using the computer, the number of fast food outlets in the area, and perceiving one's neighborhood as unsafe (Brown et al. 2014; Franzini et al., 2009; King et al., 2011; Proper et al., 2011; Rawlins et al., 2012; Rodriquez-Oliverso et al., 2011; Surgeon General Report, 2010; Thibault et al., 2010; Thorp et al., 2011; Trowbridge et al., 2013; van Uffelen et al., 2010). Studies show that the more physically active an individual, the less likely it is she will become overweight and that physical activity is crucial in preventing weight gain throughout the life span (He et al., 2011). Those who are more sedentary tend to be more overweight, less physically active, and less fit (Ball et al., 2005; Stovitz et al., 2008). Girls who are more sedentary are more likely to be overweight than boys who are sedentary (Velde et al., 2007).

There is also growing evidence that sedentary behaviors, such as TV viewing and computer work, may be associated with overweight and obesity independent of one's level of physical activity (Chau et al., 2012). In other words, even if you are physically active but also sedentary for long periods of time, you are still at an increased risk for both overweight and obesity, as well as related illnesses, even if you are not overweight or obese (Buchowski et.al., 2010).

In general, women and girls are less physically active than men and boys (Ladabaum et al., 2014). A study examining trends in physical activity starting in 1988, demonstrates that the number of adults reporting no leisure-time physical activity increased greatly and this number was higher for women than for men (Landabaum, 2014). Developmentally, young people heading into puberty are more likely to experience a reduction in physical activity and an increase in overweight and obesity (Ness et al., 2007).

There is a growing interest among obesity researchers in physical activity patterns developed during the preschool years (Hodges et al., 2013). While there has been a recent modest decline in the prevalence of overweight and obese 2- to 5-year-olds over the past 30 years, the level of obsesity in this group continues to be higher than in previous generations, and it is clear that even preschool children are not immune from an "obesogenic lifestyle" (Ogden et al., 2014). Childcare settings are being examined by researchers because these are places where young children have the opportunity to gain substantial opportunities for physical activity. Studies demonstrate that many preschool-aged children in childcare settings do not meet the minimum physical activity requirement (Hodges et al., 2013). The amount of portable playground equipment available in childcare centers has been associated with levels of vigorous physical activity among children (Tucker & Irwin, 2010). Considering childcare settings is crucial because there is evidence that later obesity is associated with increases in weight between the ages of 3 and 6.

Researchers believe that the timing of weight gain in preschool children could program the body towards later obesity; therefore, increasing physical activity levels among preschoolers is of particular concern (Hills et al., 2007).

Many studies are taking a look at how the environments in which we live impact levels of physical activity and in turn levels of obesity. Communities with more recreational opportunities for walking, biking, swimming, and hiking, as well as those with natural amenities (such as more sunlight hours, better temperatures and humidity levels, more forest cover, etc.), have populations who engage in more physical activity and are also less obese (King et al., 2011; Michimi et al., 2012).

Likewise, environmental factors associated with negative opportunities to participate in outdoor physical activity, such as in communities where inhabitants perceive less safety, or higher levels of criminal activity (often found in ethnic/minority communities), people tend to be more obese and less likely to engage in physical activity (Brown et al., 2014. As a result, these studies are leading city planners and members of communities to consider how developments or changes in the built environments can promote physical activity as a way to more effectively combat obesity problems. Strategies included in preventing obesity at the community level include creating more alternative transportation systems, such as bike share programs; increasing public transportation usage, which forced people to walk more; and the creation of safer and/or more pedestrian-friendly environments (Trowbridge et al., 2013).

There is overwhelming evidence that physical activity reduces overweight and obesity and, therefore, the risk for diseases associated with overweight and obesity (Fletcher et al., 2009; Lambers et al., 2008; Lee et al., 2009; Lin et al., 2010). Even if overweight and obese individuals do not lose weight, moderate-to-high levels of fitness significantly reduce CVD and cancer risks in these individuals, but do not completely eliminate them (Chau et al., 2012; Lee et al., 2009). Therefore, researchers argue that, although weight loss and exercise combined are the best tools for combating mortality and morbidity associated with overweight and obesity, exercise—independent of weight loss—is still important (Janiszewsk & Ross, 2007). In addition to improving cardiovascular risk factors and risk factors for other chronic disease, physical activity among overweight or obese individuals has been shown to enhance quality of life by improving physical functioning, lower back pain, general health, and vitality (Balboa-Castilla et al., 2011; Buys et al., 2013; Hu et al., 2010; Smuck et al., 2014).

Making sure to obtain adequate physical activity at the recommended levels is vital for weight reduction and the prevention of weight gain. Diet plus exercise, however, demonstrates the best results for maintaining weight loss and for preventing long-term overweight and obesity (Stephens et al., 2014). Both the World Health Organization (2014) and the Surgeon General (2010) recommend that adults aged 18-64 should do at least 150 minutes per week of moderate-intensity physical activity, or 75 minutes of vigorous-intensity physical activity per week, or some kind of combination. Physical activity includes leisure-time physical

activity (e.g., walking, cycling, yoga), occupational activity, housework, play, games, sports, or any other planned exercise. In order to obtain greater health benefits from physical activity, it is recommended that aerobic activity is performed in 10-minute bouts, and that adults either obtain moderate-intensity physical activity for up to 300 minutes per week or they engage in 150 minutes of vigorous-intensity physical activity (or an equivalent combination).

Children and youth aged 5-17 are advised to engage in at least 60 minutes of moderate-to-vigorous physical activity daily, with the majority of physical activity, occurring at least three times a week, being aerobic. Physical activity beyond 60 minutes per day is recommended to ensure even greater health benefits.

While many might think of older adults aged 65 years and above as perhaps too frail for many forms of physical activity or to even begin physical activity, the World Health Organization (2014) and other research demonstrates, physical activity is critical for older adults (Balboa-Castillo et al., 2011). The World Health Organization (2014) recommends that older adults engage in the same levels outlined for younger adults. However, they also recommend that for those older adults who are unable to meet the recommended physical activity amounts, it is vital for them to be as physically active as they can.

While physical activity throughout the life span, starting as early as the preschool years, is important in preventing later obesity, few people are meeting the physical activity recommendations. According the CDC (2010), only 64.5% of adults are physically active, and only 43.5% are highly active. Meanwhile, 25.4% report no leisure-time physical activity. Among students in the ninth through 12th grades, only 17.1% report being physically active, and only 30.3% are getting daily physical education in schools. There is evidence that fewer schools are offering physical activity programs today than in the past (Brown & Summerbell, 2010).

In one of the only studies of its kind linking the impact that Title IX has had on health of women educated during the 1970s at a time when the law was just being implemented, results showed a 20-point increase in girls' participation in sport during that era resulted in a 24% increase in physical activity levels (Kaestner & Xu, 2006). Given the importance of being physically active in controlling weight and reducing obesity levels, continued efforts to comply with the mandates of Title IX will likely yield added health benefits in these areas.

- Students in the grades 6, 8, and 11 with low levels of physical activity were three times more likely to be positive for metabolic syndrome than their physically active counterparts. Students who were the least physically active were 2.4 times more likely to be overweight than those who reported greater levels of physical activity (Moore et al., 2008).
- States with the highest levels of inactivity are also those with the highest levels of obesity (Brock et al., 2009).

- In a large-scale study that looked at associations between occupational and leisure-time sitting, physical activity and obesity in adults, it was found that those with sedentary jobs were much more likely to be overweight and obese than those with standing or heavy-labor jobs (Chau et al., 2012).
- Sedentary behaviors were strongly associated with obesity, and the association is stronger for white than black women (Buchowski et al., 2010).
- Obese women were found to spend less time walking and were less engaged in other forms of physical activity than non-obese women. Time spent in sedentary behaviors was directly related to body mass index (BMI), and time spent in moderate and vigorous physical activity was inversely related to BMI (Buchowski et al., 2010).
- Parent behavior impacts the behavior of their children. In a study of adolescents aged 11-18, parental overweight was strongly associated with sedentary behavior of their children (Thibault et al., 2010).
- Abdominal obesity is associated with increased risk for cardiovascular disease regardless of one's level of physical activity. In a large study of 30- to 74-year-olds, women who had large waist circumferences and also were active were still at an increased risk of cardiovascular disease in comparison to those with normal waist circumferences. The study further found that, even if you are not obese, physical activity is still vital. Among those women with normal waist circumferences, those who were inactive were at an increased risk of cardiovascular heart disease when compared with those who were active (Kim & Han, 2012).
- Physical activity can reduce obesity-related lower-back pain. A study of the relationships between obesity, lower-back pain and physical activity found that one's chances of experiencing lower-back pain increase progressively with overweight and obesity. Among overweight and obese subjects, more time spent in moderate physical activity is associated with a reduction in lower-back pain. Further, even among the morbidly obese, a small increase in physical activity is associated with a reduction of back pain (Smuck et al., 2014).
- Increasing physical activity or maintaining physical activity was associated with lower mortality in elderly people with or without abdominal obesity (Balboa-Castillo et al., 2011).
- The adverse impact of sedentary behaviors, such as longer TV viewing, are worse for those who are obese. If TV viewing was reduced and physical activity increased, the effect of obesity on glucose metabolism was minimized (Power et al., 2014).
- In a comparison of "normal weight," "overweight," and "obese" children aged 8-13, "normal weight" children had significantly better cardiovascular fitness levels, and cardiovascular fitness also was significantly associated with not becoming overweight or obese (He et al., 2011).

- Adolescents who regularly exercise had lower body mass indexes (BMIs) as well as higher knowledge levels of the causes of obesity than those who did not exercise. Further, adolescents who had higher knowledge of food ads on TV also had higher body mass indices (BMIs) (Ziyagil et al., 2011).
- Of 650 fifth-grade children and their primary caregivers, those children who were overweight or obese reported living in less safe neighborhoods and were less likely to be physically active (Franzini et al., 2009).
- Adults aged 66 years or older who live in more "walkable" neighborhoods walked more, engaged in more moderate-to-vigorous physical activity and also had lower BMIs. Even among the most mobility-impaired older adults, those living in more pedestrian-friendly environments reported walking and activity levels similar to those who are less mobility- impaired but were living in less walkable neighborhoods (King et al., 2011).
- Adult workers with less than four hours per day of leisure-time sitting had significantly lower obesity risk than those workers who had four or more hours per day of leisure-time sitting (Chau et al., 2012).
- According to Sabo and Veliz (2008), fewer female athletes in grades three to eight watched 21 or more hours of TV during the week than did non-athletes.
- Hispanic girls at risk for being overweight reported significantly fewer sessions of moderate physical activity, less involvement with team sports, and more time spent watching TV (Stovitz et al., 2008).
- Among low-income youth aged 9–12, girls engaged in less moderate-to-vigorous physical activity than boys did. By age 13, the majority of girls failed to meet the recommended 60 minutes of moderate-to-vigorous physical activity per day (Nader et al., 2008).
- Girls aged 6 to 10 who were more physically active were less likely to be overweight and more likely to be fit (Ball et al., 2005).
- A 10-month nutrition and physical-activity intervention with obese African-American children aged 2–19, consisting of 60 minutes of cardiovascular activities and 30 minutes of toning exercises twice a week, was successful in decreasing overweight among these youth (Fletcher et al., 2009).
- For 11-year-old girls living in nine European countries, those who were sedentary (spent more time watching TV and using the computer) were more likely to be overweight (Velde et al., 2007).
- Among 12-year-old children, girls were found to be less physically active than boys. Going through puberty was associated with increases in obesity among girls. Those children who were engaged in more moderate-to-vigorous physical activity were less likely to be obese (Ness et al., 2007).

- Based upon the pooled results of 14 studies examining the effects of exercise on treating overweight children and adolescents, 155–180 minutes of aerobic exercise per week at moderate- to-high intensities effectively reduces body fat in overweight or obese children and adolescents (Atlantis et al., 2006).

- A study of 619 Asian-American and 1,385 Hispanic adolescents in Southern California examined the association between cultural preferences and influences (acculturation) and certain obesity-related behaviors (i.e., physical activity levels and fast-food consumption). Respondents completed surveys in both the sixth and the seventh grade, revealing that in sixth grade, acculturation impacted physical activity participation, while in seventh grade, there was a higher frequency of fast-food consumption. The findings suggest that health promotion programs are needed to encourage physical activity and healthy diets among students whose families are going through the acculturation process (Unger et al., 2004).

Osteoporosis

Background

Osteoporosis (the excessive loss and deterioration of bone mass) and osteopenia (low bone mass predicting osteoporosis in the next 10 years) are serious public health concerns, particularly for women (Hernlund et al., 2013; Kanis et al., 2013; National Osteoporosis Foundation 2014). Osteoporosis is chronic degenerative disease shaped by physical activity and nutrition habits during childhood and adolescence (Gunter et al., 2012). It begins in young adulthood and accelerates after menopause and typically develops fully in older age (Kanis et al., 2013). Osteoporosis and low bone mass affect more than 54 million Americans (National Osteoporosis Foundation, 2014), and 80% of those individuals are women (Gamage et al., 2012; National Osteoporosis Foundation, 2014). In industrialized countries, osteoporosis can have a severe impact on the quality of one's life (Madureira et al., 2012). Excessive bone loss from osteoporosis and resulting fractures are leading causes of morbidity and mortality among women and often result in increases in institutionalization among those affected (Kim et al., 2014; Madureira et al., 2012; Rizzoli et al., 2010).

The majority of women currently affected in the United States are white (Endicott, 2013; Tella & Gallagher, 2014). While African-American women have the lowest fracture rates (Kim et al., 2014). However, cases among Hispanic women are increasing over past decades. Although fewer African-American women have osteoporosis, when they do have it, they are the least likely of these three groups to obtain adequate treatment (Pothiwala et al., 2006). As the population in the United States grows to 80 million by 2050 and continues to age, and children and adolescents become more and more sedentary, cases of osteoporosis will continue to increase, creating an even greater economic burden than we bear now (Chastin et al., 2014; Eastell, 2013).

- Osteoporosis results in two million broken bones a year (National Osteoporosis Foundation, 2014).
- More than 10 million people have osteoporosis, and another 34 million suffer from low bone mass, the majority of whom are women (National Osteoporosis Foundation, 2014; Endicott, 2013; Becker, Kilgore, & Morrisey, 2010).
- Two hundred million people around the world are estimated to have osteoporosis, and the majority are women (National Osteoporosis Foundation, 2014).
- In suburban U.S. areas 25% of women studied had low bone mass (Gueldner et al., 2008).
- Half of all premenopausal women aged 40 have osteopenia (Tella & Gallagher, 2014).
- Twenty-five percent of postmenopausal women are affected by osteoporosis (Muir et al., 2013).
- Women over 50 years old are three times more likely to have osteoporosis than men (Kanis et al., 2008; Muir et al, 2013).
- Estimates are that 6% of men and 21% of women aged 50–84 have osteoporosis (Kanis et al., 2008; Kim et al., 2014). The prevalence of osteoporosis increases to 45% in women 85–89 living in Western countries (Nshimyumukiza et al., 2013).
- In the United States and Europe, 6% of men and 21% of women aged 50-84 have osteoporosis (Schmitt, Schmitt, & Doren, 2009). Approximately 30% of postmenopausal women in the United States and Europe have osteoporosis. Over 40% of these women will have at least one fracture over their lifetime (Gunendi et al., 2008).
- Worldwide, osteoporosis is responsible for almost nine million fractures annually, or about 1,000 fractures per hour, with the majority of sufferers being women (Hernlund et al., 2013).
- One in three women with osteoporosis will suffer from a fracture in their lifetime (Muir, Ye, Bhandari, Adachi, & Thabane, 2013).
- The mortality rates for women over 50 years old with osteoporotic fractures is about 50% greater than for women without those fractures (Hasserius et al., 2005).
- More than 40% of postmenopausal women will suffer at least one osteoporotic fracture, with a high chance of resulting permanent and severe disability that will impair life quality or even death (Gonnelli et al., 2014).
- By the age of 50, the lifetime probability of suffering any osteoporotic fracture is 50% for women yet only 20% for men (Rizzoli et al., 2010).
- Approximately 20% of hip-fracture patients older than 50 die within one year of their fracture (National Institutes of Health Consensus Development Panel, 2001).

- Risk of death is elevated for those who suffer from most fracture types. Individuals are five to eight times more likely to die wihin the first three months after a hip fracture (Kim et al., 2014).
- Due to improvements in life expectancy, the numbers of worldwide hip fractures is increasing among the aging population. By 2050, the hip fracture incidence is predicted to reach 6.3 million up from 1.7 million in 1990 (Kim et al., 2014).
- One half of all women and one-third of all of men will experience a fracture in their lifetime (Karlsson et al., 2008), and one in three women and one in five men will suffer a serious fracture (Muir et al., 2013).
- Osteoporosis-related costs add up to $19 billion in a year (National Osteoporosis Foundation, 2014).
- As the aging population increases, it is predicted that by 2025, osteoporosis will create approximately three million fractures and $25.3 billion in costs annually (National Osteoporosis Foundation, 2014).Half-a-million hospital admissions are related to osteoporosis. The direct care of fractures is estimated to cost $18 billion annually (Tosteson & Hammond, 2002).

Facts and Research Findings

The importance of lifestyle factors in preventing osteoporosis cannot be underestimated. Osteoporosis is caused by inadequate accumulation of bone mass before skeletal maturity or the excessive loss of bone during aging (Bieleman et al., 2014; Borer, 2005; Gunter, Almstedt, & Janz, 2012; Nedergaard et al., 2013). Osteoporosis is further compounded by the natural atrophy of muscle tissue (Nedergaard et al., 2013). Physical activity and healthy nutrition improve bone and muscle mass throughout the lifecycle. They prevent osteoporosis by stimulating bone formation, strengthening muscles, and improving balance, all factors associated with reduced fracture rates (Body et al., 2011; Gunendi et al., 2008; Tella & Gallagher, 2014). The most critical time for developing bone mass occurs during growth, when hormone levels allow for the accrual of peak bone mass (maximum skeletal strength) (Feskanich et al., 2014; Karlsson et al., 2008). Children and adolescents who are physically active and nutritionally healthy demonstrate higher levels of peak bone mass and a lower risk for developing osteoporosis later in life (Rizzoli et al., 2010).

Biologically, women have weaker bones than men beginning in childhood due to sex differences that result in greater bone strength and thicker bone structure for men. The higher fracture rate in women is partly due also to postmenopausal estrogen withdrawal. Bone mass for women sharply declines further after menopause.

When women reach their 30s, slowly declining hormones mirror slower declining bone mass. Once women reach menopause, which is characterized by a rapid decline in hormone levels, bone mass begins to decline sharply (Benton & White, 2006; Chahal, Lee & Luo, 2014; Kim et al., 2014). Physical activity and proper nutrition has been

shown to decelerate bone loss during these times (Bellew & Gehrig, 2006; Kemmler et al., 2007; Kim et al. 2014).

Physical activity is more important than ever as hormone replacement therapy, once considered the optimum treatment for hormone loss, is now deemed more risky than beneficial (Azoulay, 2004; Benton & White, 2006; Nedergaard et al., 2013; Tella & Gallagher, 2014). However, researchers also caution that excessive exercise or athletic training can induce amenorrhea (the loss of menstrual periods or having fewer than two over the course of 12-months) (Borer, 2005; Nguyen, Wang, & Okamura, 2014). Amenorrhea is of major concern because the reduction in hormones leads to bone loss similar to that found in post-menopausal women (Milos et al., 2014). The female athlete triad is a syndrome that includes three interrelated health conditions that female athletes may experience: energy deficit and eating disorders; menstrual disturbances and amenorrhea; and bone loss and osteoporosis (Nguyen et al., 2014). (More information on the important connections between osteoporosis and the female athlete triad can be found in the report section entitled "The Female Athlete Triad," which starts on page 121 in the Emerging Research section.)

Birth to Adolescence

- Adolescence is a critical period of the life cycle for bone formation for young girls. Forty percent of their bone mass is acquired during this time (Szadek & Scharer, 2013).
- Twenty-five percent of a girl's peak bone mass is acquired during the adolescent growth spurt (Bachrach & Sills, 2011).
- Girls have about 83% of their bone mass by the age of 12 (Borer, 2005).
- Sex differences exist with regard to when girls and boys reach their peak bone mass. Girls acquire peak bone mass at 12.5 years, while boys do so at (Rizzoli et al., 2010).
- Physical inactivity during childhood is a risk factor for osteoporosis later in life (Szadek & Scharer, 2013).
- While muscle mass is important for the stimulation of bone mass, as well as for preventing falls and resulting fractures, fat mass has been shown to negatively affect bone mass in adolescents. In a study of 377 adolescents aged 10-19, higher body fat was associated with lower levels of bone mass (Mosca et al., 2014).
- In a study following pre-pubertal 10-year-old girls for 20 months, those who participated in an exercise program lasting for 12 minutes, three times per week, had an increase in bone mass, while those girls who did not participate in the exercise program did not experience such an increase (MacKelvie et al., 2001; MacKelvie et al., 2002; MacKelvie et al., 2003; MacKelvie et al., 2004).

Adulthood

- By age 20, the average woman has attained 98% of her skeletal mass (Beaudoin & Blum, 2005). This can be accelerated with physical activity during childhood and adolescence (Bellew & Gehrig, 2006).
- Peak bone mass is achieved by the age of 30 years (Eastell, 2013).
- After skeletal maturity is reached, both sexes lose bone at 1% per year, while at 50, women begin to experience accelerated bone loss for five years after menopause (Eastell et al., 2013).
- Women who experience early menopausal are at even greater risk for developing osteoporosis and fracture risk due to declining estrogen levels at an earlier age (Kim et al., 2014).
- Originally, obesity was considered a protective factor against osteoporosis. However, several recent studies have challenged this belief (Gonnelli, Caffarelli, & Nuti, 2014). For example, a research study of more than 46,000 women worldwide illustrates that rates in osteoporosis do not differ between obese and normal-weight women (Hernlund et al., 2013).
- Obesity can increase fracture rate by increasing the chances of falling due to reduced physical function (Gonnelli, Caffarelli, & Nuti, 2014).
- Engaging in systematic resistance training can increase muscular strength and prevent bone loss enough to eliminate the risk of developing osteoporosis (Nedergaard et al., 2013).
- The Canadian Multicenter Osteoporosis Longitudinal Study of 6,445 women 25 years and older found that an increase in physical activity demonstrated positive effects on bone mass (Langsetmo et al., 2012).
- Fitness programs that strengthen the core, like yoga and Pilates, have been found to stabilize the spine and pelvis and, therefore, can prevent falling and fracture rates among women (Hsu et al., 2014; Hyun, Hwangbo, & Lee, 2014).
- Higher levels of physical activity in premenopausal women were associated with higher bone mass (Saravi & Sayegh, 2013).

Post-Menopausal

- Increases in fall and fracture rates among postmenopausal women are thought to be due to impaired balance associated with estrogen withdrawal and the speed at which the brain processes information (Gueldner et al., 2008). Physical activity increases balance and strength, therefore decreasing risk for falls (Hsu et al., 2014).
- A three-month course of circuit exercises performed twice weekly improved mobility, balance, and the quality of life for women with osteoporosis and a history of vertebral fracture (Bergland et al., 2011).

- Less physically active patients with osteoporosis, who have poor balance, are also more likely to have a fracture (Lee et al., 2002; Hsu et al., 2014).
- Consistent engagement in weight-bearing and muscle-strengthening exercises has been shown to improve agility, strength, posture, and balance, which are all associated with a decreased likelihood of falls and fractures in women (Tella & Gallagher, 2014).
- Studies consistently show that exercises that improve muscle quality and postural alignment are critical for maintaining balance control in elderly individuals in order to prevent falling and osteoporotic fractures (Hsu et al., 2014).
- Among women and men over age 65, those with higher muscle mass also had higher bone mass. The authors conclude that muscle mass acts as a stressor, which promotes bone formation through stimulating bone density (Kim et al., 2014).
- A prospective cohort study of 9,423 adult women aged 75 and older revealed that increasing women's levels of moderate physical daily activity from two to three hours per day to four to six hours per day resulted in increases in bone density (Muir et al., 2013).
- Postmenopausal women enrolled in a multipurpose exercise training program (endurance, strength training, and jumping) stabilized their bone density, while those not enrolled in the program lost bone mass (Kemmler et al., 2004a; Kemmler et al., 2004b; Kemmler et al., 2007).
- Based on the research for postmenopausal women, there is an inverse relationship between physical activity and fracture risk. Studies consistently show exercise slows bone loss in women in a dose-dependent manner (the more exercise, the less bone loss). However, the most effective exercise programs should contain high-impact components (Schmitt et al., 2009).
- Postmenopausal women with osteopenia and osteoporosis who walked at their target heart rate for one hour a day for at least four days a week, over a 12-month period, sustained bone mass, while study participants assigned to a non-walking group lost bone mass (Yamazki et al., 2004).
- Postmenopausal women who walked at least four hours per week had a 41% lower risk of hip fracture when compared to those walking less than one hour per week (Feskanich et al., 2002).
- A longitudinal study which included 14,903 participants found that moderate physical activities at home and during leisure as well as walking were associated with fewer hip fractures for women (Moayyeri et al., 2010).
- A study of 25,000 women, aged 50–80, found a significantly increased risk for breast cancer and myocardial infarction for women taking hormone-replacement therapy (Kuller, 2003; Nedergaard et al.,

2013). Given that hormone replacement therapy has greater risks than previously realized, physical activity is more important than ever as a way to improve bone health.

The kind of exercise that one engages in makes a difference. Aerobic activity, because of its intensity, and weight-bearing activities that load multiple sites of the body, are ideal for preventing osteoporosis. Sports that involve high ground reaction force (GRF), such as gymnastics, tennis, squash, and running, are shown to create higher bone density than sports that do not present unusual loading patterns, like swimming and cycling (Hind, 2007; Bieleman et al., 2014; Saravi & Sayegh, 2013). It is important to load a variety of bones when engaging in physical activity. Studies indicate that the areas of the bone that are directly loaded show the greatest increases in bone mass (Chahal et al., 2014; Karlsson et al., 2008).

Whole-body vibration, which involves standing on a platform that vibrates, has recently been shown to be effective in loading muscles and increasing bone density (Cardinale & Wakeling, 2005). Whole-body vibration is touted as ideal for those with muscle weakness, who may not be able to perform weight-bearing exercises, by providing benefit to bone health at low risk for injury (Lai et al., 2013).

In addition to loading patterns, exercise intensity is important for bone mass. Exercises with higher intensities tended to produce better bone mass results (Kemmler et al., 2007; Saravi & Sayegh, 2013). There is now evidence emerging that repeated exposure to long bouts of sedentary behavior, such as sitting, is a risk factor for female bone health independent of whether they engage in physical activity or not. However, this same relationship has not been shown for men (Chastin et al., 2014).

Birth through Adolescence

- First- and fifth-grade boys and girls who participated in a school-based physical activity intervention of daily physical education with at least 10 minutes of jumping or strength training exercises of vigorous intensities evidenced improvements in bone health (Meyer et al., 2011).
- Among female athletes aged 10–17, elite swimmers had significantly lower bone density than those who played soccer (Bellew & Gehrig, 2006).
- A study that compared the bone density of elite, college-aged gymnasts, who had practiced since youth, with the bone density of young women who just engaged in leisure activities, confirmed that the bone density of the gymnasts was significantly higher (Bareither et al., 2008).
- When the bone mass of female gymnasts was compared to that of children in the regular student population, it was found that the female gymnasts had 21% higher bone mass than the non-gymnasts (Ward et al., 2005).

- A study comparing female former gymnasts with non-gymnasts found that the former gymnasts had higher bone density than the non-gymnasts. This demonstrates that bone mass acquired earlier in life is sustained later in life (Kudlac et al., 2004).
- Bone density is likely to improve in the bones that are loaded or used the most during an activity. In a study comparing bone accrual in girls who were gymnasts with those who were not, differences in bone density between the two groups were found only in those bones directly loaded during gymnastic activity (Gero et al., 2005).
- For girls who play tennis, higher bone density was found in the dominant arm than in the non-dominant arm (Bass et al., 2002).

Adult Women

- A study of healthy, middle-aged women revealed that high intensity and high frequency physical activity that loaded muscles had the most beneficial impact on muscle and bone strength (Chahal et al., 2014).

Postmenopausal Women

- In a randomized study comparing postmenopausal women who participated in whole-body vibration exercises for six months with those who did not, those women who participated in whole-body vibration exercises demonstrated significant benefits in bone density (Lai et al., 2013).
- Improvements in the bone mass of postmenopausal women were found after six months of whole-body vibration, experienced over three, 30-minute sessions per week (Verschueren et al., 2004).
- When scientists had two groups of postmenopausal women perform the same resistive exercises at different intensity levels, it was found that those who performed those exercises at the higher intensities maintained their bone mass, while women in the other group lost bone mass (Stemgel et al., 2005).

Osteoporosis Education and Prevention

Since osteoporosis is preventable, osteoporosis education should begin during childhood and continue through the life cycle. Studies show that while many girls and women have some idea what osteoporosis is, many do not know how to prevent it (Anferson et al., 2005; Endicott, 2013; Gamage et al., 2012; Nguyen et al., 2014; Reventlow, 2007). Ironically many women with osteoporosis are afraid of physical activity for fear of suffering a fracture. (Mayoux-Benhamou et al., 2005). Therefore, osteoporosis education is as critical as osteoporosis screening.

Birth to Adolescence

- In a study of adolescent females 12–16 years old, girls knew that physical activity could strengthen bones; however, they were unable to correctly identify what kind of physical activities were beneficial. Also, a large number did not know that severe dieting, excessive

exercise, and irregular menstrual cycles harmed bones (Anferson et al., 2005).

Adult Women

- In a study of premenopausal women aged 42-52, researchers examined whether family history of osteoporosis impacted knowledge, health beliefs and self-efficacy. While there was no baseline difference between groups in their knowledge of osteoporosis (both groups lacked much knowledge) women with a family history perceived a greater susceptibility for developing osteoporosis. Also, these women with a family history of osteoporosis were more likely to perceive the benefits of exercise after attending an osteoporosis education program than those without a family history of osteoporosis (Endicott, 2013).
- In a study of gender differences in osteoporosis-related knowledge and beliefs among male and female university students, it was found that although osteoporosis knowledge was low among both genders, it was higher among women. In addition, women also accurately reported higher perceived susceptibility and higher perceived severity than men (Gamage et al., 2012).
- Women collegiate cross-country runners were found to have low levels of perceived susceptibility and low levels of concern about osteoporosis. In fact, those in more competitive divisions showed less concern (Nguyen et al., 2014).

Postmenopausal Women

- When postmenopausal women with low bone mass attended a one-day education session about the importance of exercise in preventing further bone loss, they were more likely to exercise (Mayoux- Benhamou et al., 2005).
- Based on interviews with women in their 60s, those who had bone scans indicating a higher risk for osteoporosis were more likely to decrease physical activity out of fear of falling (Reventlow, 2007). This illustrates why women need to learn that exercise actually improves balance and decreases their risk of falling.

Alzheimer's Disease and Related Dementias

Background

As the U.S. population continues to age, cognitive decline is becoming an increasing problem for women (Blondell et al., 2014; Vincent & Velkoff, 2010). Because, statistically, women outlive men, they are twice as likely to develop dementia (Lindsay et al., 2004). Women are also more likely than men to be caregivers to those suffering cognitive decline (Yee & Schulz, 2000). As such, more women than men experience stress and other adverse effects associated with the burden of caring for elders with cognitive decline (Cedervall & Aberg, 2010; Lindsay et al., 2004; Steinberg

et al., 2008). There is growing acknowledgement of the importance of non-pharmacological approaches for addressing cognitive health issues. To date, there is compelling evidence from animal and human studies that physical activity at all stages of the lifecycle can have a positive impact on cognitive health throughout the life span (Gomez-Pinilla & Hillman, 2013). As a result, scientists now consider physical activity a first line of defense for preventing and ameliorating the increasing social and economic burdens associated with cognitive decline in our growing elderly population (Bruijn et al., 2013).

There are many forms and stages of cognitive decline associated with aging. These include: cognitive impairment no dementia (CIND), mild cognitive impairment (MCI), and dementia. All are degenerative (Gregory, Parker, & Thompson, 2012). CIND refers to cognitive decline in memory and executive function that is not severe enough to warrant a diagnosis of dementia. MCI is used to categorize those older adults who do not currently have problems with daily living but do demonstrate problems with subjective and objective memory. MCI is likely to precede a dementia diagnosis, and between 10 to 15 % of individuals with MCI progress to dementia (Blondell et al., 2014). Dementia is characterized by a decline in memory and cognitive function severe enough to interfere with activities of daily living (Barnes et al., 2007; Podewils et al., 2005; Smith et al., 2013; Woodhead et al., 2005). In addition to the growing cases of dementia in the United States, there is evidence that it is increasing among developing countries as well (Christofoletti et al., 2011). Currently 35.6 million people have dementia. Within the larger category of dementia, there are several subtypes of the disease that represent different underlying factors, including Alzheimer's disease (AD) and vascular dementia (VaD), which is caused by a stroke or blockage of the blood supply (Alzheimer's Foundation of America, 2014). Of those diagnosed with dementia, 80% have either AD or VaD (World Health Organization, 2012).

Alzheimer's disease (AD) is the most common form, accounting for 60% of all dementia (Alzheimer's Foundation of America, 2014; Regan et al., 2005). Approximately 5.4 million Americans suffer from AD, with the majority being over the age of 65 (Alzheimer's Association, 2012). AD is a chronic disease characterized by progressive cognitive and physical decline, functional impairment, and neuropsychiatric symptoms (Cedervall et al., 2010; Luengo-Fernandez et al., 2010; Pajonk et al., 2010; Pitkala et al., 2012; Rolland et al., 2007; Roman, Nash, & Fillit (2012); Steinberg et al., 2007; Steinberg et al., 2008; Vital et al., 2012). It is a 1eading cause of death in the United States elderly population (Alzheimer's Foundation of America, 2014; Perez & Carral, 2008). Older populations may also suffer from other forms of dementia or a condition known as " Cognitive Impairment No Dementia," which affects about 16.8% of those age 65 years or older (Lindsay et al., 2004).

The prevalence of dementia rises dramatically with age. Among individuals who are 71 years and older, 13.9% have

dementia. The prevalence of dementia increases to 37.4% among those who are 90 and older (Plassman et al., 2007) with nearly 35% of those aged 85 or older being diagnosed with some form of dementia (Lindsay et al., 2004). It was estimated that in 2013, approximately $203 billion was spent on Alzheimer's disease. As the baby boom generation continues to age and their life expectancy increases, these numbers are only expected to increase. It is estimated that by 2050, $1 trillion will be spent on this disease (Alzheimer's Foundation of America, 2014).

Finding non-invasive and inexpensive ways to ameliorate or prevent dementia and other forms of cognitive decline is an important public health priority (Podewils, et al., 2005). Physical activity is one promising approach for reducing the negative effects of cognitive decline (Blondell et al., 2014; Carvalho et al., 2014; Gomez-Pinilla & Hillman, 2013; Gregory et al., 2012; Lautenschlager, Cox, & Jurz, 2010; Pitkala et al., 2012) . Interestingly, many risk factors associated with inactivity have also been identified as risk factors for dementia later in life. These include cardiovascular disease (CVD), diabetes (Cheng et al., 2012; Peila et al., 2002), hypertension, and obesity (Barnes, et al., 2007; Lautenschlager et al., 2010; Smith et al., 2013; Szekely et al., 2007) .

- Physical activity lowers CVD risk and obesity and also increases "good" cholesterol and glucose tolerance, all of which are related to cognitive function. Studies show that countries with higher fat consumption levels have higher rates of dementia (Heyn et al., 2004).
- A study of individuals who were obese or overweight at 40–45 years old showed that they were more likely to develop dementia later in life than those who were normal weight. In fact, the risk for dementia increased 60–70% among men who weighed the most (Whitmer et al., 2005a; Whitmer et al., 2005b).
- Adults who had better subjective and objective measures of cardiovascular fitness at age 55 or older experienced less cognitive decline on tests of attention and executive function (Barnes et al., 2003).

Facts and Research Findings

Simply being physically active earlier in life has been associated with higher cognitive function among children, preadolescents, and adolescents, as well as with a reduced risk for developing cognitive decline, including dementia (Gomez-Pinilla & Hillman, 2013; Peila et al., 2002). Evidence has even emerged that demonstrates that exercising during pregnancy can enhance the children's spatial learning abilities (Parnpiansil et al, 2003).

Studies show that people who maintain good overall physical health have less cognitive decline relative to their age (Erickson, Weinstein, & Lopez, 2012; Gregory et al., 2012; Kramer & Erickson, 2007; Kramer & Willis, 2003). Being physically active is associated with reduced risk for dementia, AD, and cognitive decline later in life. While the physical activity measures varied across studies, a dose response relationship between the amount of physical activity performed and level of cognitive decline experienced

has been identified. In general, the more physically active, the more likely a person would not experience cognitive decline later on in their life (Carvalho et al., 2014). There is evidence that physical activity is even more important for those who carry the AD gene. Studies are demonstrating that the effect of physical activity on cognitive health is stronger for carriers of the AD gene (Smith et al., 2013).

- In a population-based, case-control, Mayo Clinic study, investigators examined the effects of physical activity taken on later and found physical activity delayed the onset of MCI (Geda, Roberts, & Knopman, 2010).
- Of 3,903 dementia-free participants 55 years and older who were followed for up to two years, those who engaged in moderate to high levels of physical activity were less likely to develop cognitive impairment compared with those who were not active (Etgen, Sander, & Huntgeburth, 2010).
- In a study that examined self-reported physical activity during the teenage years, at ages 30, 50 and over 65 years, researchers found that physically active women at all of these ages were less likely to report cognitive impairment late in life. Additionally, being a physically active teenager strongly correlated with a lower odds of cognitive impairment later in life (Middleton et al., 2010).
- In an experimental study of sedentary adults aged 55-85 who were diagnosed with MCI, improvements in executive function (ability to multitask, cognitive flexibility, information processing efficiency, and selective attention) were seen in those who participated in of aerobic exercise four days per week for a duration of six months, in comparison to those who performed stretching exercises only (Baker et al., 2010).
- Among a large population ranging in age from 61-97 years, those who were more physical active were less likely to have dementia and AD four years later (Bruijn et al., 2013).
- The Canadian Study of Health and Aging found that individuals 65 or older were 31% less likely to have AD five years later if they engaged in regular physical activity (Lindsay et al., 2002; Lindsay et al., 2004).
- When Swedish twin pairs, 65 years or older and discordant for dementia, participated in a population study, researchers found that those who engaged in light and regular exercise at midlife had a reduced risk for AD 31 years later when compared with those who did not exercise (Andel et al., 2008).
- A prospective longitudinal study found that if people 65 years or older engaged in physical activity three or more times per week, they were 32% less likely to develop dementia six years later (Larson, 2006).
- Individuals 65 years or older who had the most physically active lifestyles also had the lowest risk of developing dementia, AD, and vascular dementia (Podewils et al., 2005).

- In the Canadian Study of Health and Aging, physical activity at baseline among elderly individuals without dementia was associated with a 42% reduction in the odds of cognitive impairment, a 50% reduction in AD, and a 37% reduction in dementia of any type (Laurin et al., 2001).
- A longitudinal population study in Stockholm found that risk of developing dementia was lower in the physically active group when compared with a group that was not physically active (Karp et al., 2006).
- Physical activity was associated with a 62% reduction in risk for AD later in life (Rovio et al., 2005).
- Older women who reported getting more exercise in terms of number of blocks walked, sports, and calories exerted in routine activities at baseline were less likely to experience cognitive decline six to eight years later (Yaffee et al., 2001).
- Older Japanese men who walked over two miles a day at baseline were less likely to develop dementia than those who walked only a quarter of a mile (Abbott et al., 2004).
- Walking distance and speed were associated with a reduced risk for dementia 4.7 years after baseline among individuals aged 71–93 (Abbott et al., 2004).
- A prospective longitudinal population-based study found that people who were more physically active (walking, hiking, bicycling, swimming) at baseline had a reduced risk for developing AD when measured again 6.2 years later. More specifically, those who exercised more than three times per week were 34% less likely to be diagnosed with dementia than those who exercised less (Larson, 2006).
- Individuals age 55 years and older who provided objective and subjective or self-reported measures of cardiovascular fitness performed better on cognitive tests measuring executive control, attention, verbal memory, and fluency at six-year follow-up. This association was stronger for objective measures of fitness than the subjective ones (Barnes et al., 2003).
- Physical activity can help combat physical disability associated with cognitive decline (Teri et al., 2008). People who suffer from AD tend to lose body weight and muscle mass due to metabolic changes occurring in the body, rendering them far less able to perform tasks related to daily living as well as less socially and mentally stimulated (Perez & Carral, 2008). Exercise benefits people with AD by building back strength, which, in turn, increases their functional independence.
- Patients with AD who participated in a comprehensive, care-giver-delivered, home-based exercise program consisting of aerobic fitness, strength training, balance, and flexibility demonstrated improved hand function and lower-extremity strength (Steinberg et al., 2008).

- Nursing home patients with AD who engaged in physical exercise demonstrated less functional decline (Rolland et al., 2007).
- Among home-living AD patients, those who received an exercise program showed improved physical function (Teri et al., 2003).

Physical activity has also been shown to improve the mental functioning of people diagnosed with dementia (Pitkala et al., 2012). Diseases like dementia often initially present as subtle cognitive impairment, most commonly memory problems. As neuro-degeneration takes place, reserve capacities in the brain are taken over and there is marked loss of functioning in numerous domains (Christofoletti et al., 2011; Szekely et al., 2007). There is also evidence that physical activity improves the physical functioning of older people with dementia. Because dementia and forms of cognitive decline are associated with increases in rigidity, decreased walking speed, and problems managing simple daily living activities, such as dressing and undressing, the burden on caregivers is amplified. As a result, it is important to note ways in which physical activities can not only prevent further cognitive decline, but also improve functionality (Pitkala et al. 2012).

- In a longitudinal study of people in their 80s who were dementia-free at baseline, the risk of developing disabilities in instrumental activities of daily living decreased 7% for each additional hour of physical activity (Boyle et al., 2007).
- In a 12-week randomized control study of elderly residents in care facilities, clients received one of the following programs: no intervention (control), social intervention consisting of a 30-minute visit with no exercise program, or an aerobic exercise program (including joint and muscle movement) for 30 minutes, three times per week. At the end of the 12 weeks, those residents in the exercise program showed improvement in self-help skills while the other groups showed a decline in self-help skills (Stevens & Killeen, 2006).
- A six-month, randomized control study of sedentary and active people, 65 years or older, examined the differences in decline in activities of daily living. Individuals categorized as sedentary participated in no physical activity program while individuals categorized as active participated in a comprehensive program consisting of respiratory, balance, and fine-motor coordination exercises. At the end of the six-month intervention, the active individuals scored higher on activities of daily living and cognitive functioning tests than those in the sedentary group (Arcoverde et al., 2008).
- Nursing home residents with AD received either routine medical care or participated in a comprehensive physical activity program for one hour, twice a week. The program was designed to increase balance, flexibility, strength, and aerobic fitness. Those participating in the exercise program demonstrated

a slower decline in activities of daily living over a 12-month period than those in the group receiving only routine medical care (Rolland et al., 2007).

- In a review of many experimentally designed studies comparing the effects of a physical activity program to a non-physical activity control, those in the physical activity group were more likely to improve in cognitive function (Heyn et al., 2004).
- Physical activity has also been shown to ameliorate a number of mood-related problems associated with dementia. These include depression, anxiety, sleep problems, and agitation. AD and depression often coexist. Between 5 and 23% of people with AD are thought to have major depression (Vital et al., 2012).

Alzheimer's Disease, Dementia, and Depression

Dysthymia (a chronic type of depression) is believed to occur in between 8% and 34% of people with AD. Depression and dementia may be linked through an underlying neurobiological mechanism; the same vascular problems leading to dementia might also be shared by depression (Brayne et al., 2005). Depression in those with AD is associated with greater impairment in activities of daily living and is associated with earlier institutionalization (Regan et al., 2005; Vital et al., 2012), both of which can lead to lower mental stimulation, compounding problems associated with the greater cognitive decline of AD. Depressed nursing home residents tend to be more isolated and have greater morbidity, physical pain, and behavioral problems. As a result, depressed nursing home residents are more expensive to serve (Christofoletti et al., 2011; Williams & Tappen, 2008).

- Neuropsychiatric patients with dementia who engaged in physical activity demonstrated fewer psychiatric symptoms than those who did not. In addition, their caregivers reported that those patients who engaged in physical activity were less of a burden. Therefore, physical activity can reduce caregiver stress (Christofoletti et al., 2011).
- Patients with Alzheimer's Disease who engaged in physical activity demonstrated less depression that those who did not (Vital et al., 2012).
- Walking has been shown to decrease depression in community-dwelling older adults with significant levels of depression (Teri et al., 1997).
- In a randomized trial of 153 patients with AD living at home, those who received a combination of exercise and caregiver education showed improved physical function and less depression (Teri et al., 2003).
- Those with dementia who engaged in comprehensive exercise program over 12 weeks were less depressed than those who received only routine medical care (Teri et al., 2003).
- Comprehensive exercise programs consisting of 20-30 minutes of balance, flexibility, aerobics, and strength training conducted over 16 weeks were associated with

higher positive mood and affect in residents of nursing homes with AD (Williams & Tappen, 2007; Williams & Tappen, 2008).

- Engaging in muscular strength training twice a week is associated with an improved mood in early- to moderate-AD patients (Arkin, 2003).
- A study of depression in nursing home residents with AD compared depression levels after enrolling residents for 16 weeks in one of three programs: comprehensive exercise, supervised walking, or social conversation. Depression was lowered in all three groups but more so in the exercise groups (Williams & Tappen, 2008).
- A pilot study of 14 elderly volunteers (4 male, 12 female) found that 30-minute, chair-based sessions of stretch and resistance training, three times per week, were associated with lower anxiety ratings immediately after exercise. Researchers still found lower anxiety ratings 12 weeks after initiation of the exercise program, as well as lower levels of depression (Stanziano et al., 2009).
- Of people with AD living in the community (living in residential homes, in their own homes, getting treatment at day clinics), those who exercised were less likely to be depressed than those who had hobbies (Regan et al., 2005).
- One study found that being mobile, stretching, and exercising lightly (seven times per week for at least 20 minutes) reduced agitated behaviors among patients suffering from dementia (Namazi et al., 1994).
- Patients with dementia who participated in a walking program had better sleep in terms of time and quality than those who were in the control group (Teri et al., 2008).

Early on scientists were unclear whether the relationship between physical activity and cognitive health was a function of a number of social mechanisms. For example, it was speculated that engaging in physical activity might provide a richer and more engaging social environment (Boyle et al., 2007; Podewils et al., 2005; Woodhead et al., 2005), which could decrease dementia risk. While the social aspect of physical activity is most probably important, there has been an explosion in biological research in human and animals that demonstrates convincing evidence that improvements in cognitive function associated with physical activity are definitely tied to neurophysiological changes in the brain. As we age, there is a reduction in brain tissues and the size of the hippocampus (Gregory et al., 2012). Advancements in neuroimaging techniques, such as MRI studies that can illustrate the effects of aerobic fitness on brain structure and function, have grown rapidly within the past five to 10 years. These types of studies have examined a number of biological mechanisms, such as growth in the hippocampus (an area of the brain associated with learning and memory), changes in brain tissue volume (grey and white matter areas of the brain), cerebral blood flow, and

brain activation in response to exercise (Erickson et al., 2012; Gomez-Pinilla & Hillman, 2013; Smith et al., 2013).

Studies also show support for a number of biological mechanisms related to the association between physical activity and improved cognitive function. Numerous metabolic and neuropathological changes occur with AD, such as increased cerebral blood flow and other biological processes in the brain. These are thought to be modified by exercise (Barnes et al., 2007; Boyle et al., 2007; Kramer, Bherer, & Colcombe, 2004).

SECTION II. SUBSTANCE ABUSE

Substance abuse is a continuing problem of staggering proportions in the United States, taking a toll on families, workplaces, and communities. While the economic costs, including those related to health care, crime, and lost productivity, are estimated at more than $600 billion annually (NIDA, 2012), the human costs in misery and lost potential are immeasurable. The good news is that overall adolescent substance use has declined somewhat in recent decades (Johnston et al., 2014; SAMHSA, 2013). Nevertheless, teens who do use tobacco, alcohol, and other drugs face a dizzying constellation of negative consequences, damaging to their immediate and long-term health, safety, and well-being. Conventional wisdom suggests that the athletic experience may confer some protection against these dangers, but empirical research shows that the relationship between sports participation and substance use is complex. The playing field may help to buffer against some kinds of substance use, such as tobacco or illicit "hard" drugs, while exacerbating the risk of others, such as smokeless tobacco, alcohol, and anabolic-androgenic steroids. Gender further complicates the equation. Traditionally girls have tended to have lower rates of substance use than boys, but the long-standing gender gap is narrowing – especially for those substances that have most typically been closely linked to sports.

Smoking

Background

Smoking is the leading cause of preventable death in the United States, killing approximately 480,000 Americans a year and costing nearly $300 billion annually in health care costs and productivity losses (USDHHS, 2014). Since 1964, more than four and a half million women have died prematurely due to lung cancer, cardiovascular disease, and other smoking-related diseases (Holford et al., 2014). Tobacco use is also linked to other negative health outcomes of special concern to women, such as decreased bone density, impaired menstrual function, early menopause, infertility, pregnancy complications, and increased neonatal risk (USDHHS, 2001).

Despite these health risks, young people continue to have higher-than-average rates of tobacco use (Nelson et al., 2008). Almost 90% of smokers begin by age 18, and 99% begin by age 26 (CDC, 2013a; SAMHSA, 2013). In contrast to overall declines in adult smoking in recent decades (Agaku et al., 2014), adolescent smoking rates increased dramatically in the 1990s, declined briefly in the early 2000s, and have since leveled off (USDHHS, 2012). Every day more than 3,200 American adolescents start smoking

and 1,000 become regular smokers. The CDC projects that if current smoking rates persist, approximately 5.6 million Americans now below the age of 18 (about 1 in every 13 U.S. children) will die prematurely as adults due to smoking-related illnesses (USDHHS, 2014, Table 12.2.2).

- Nearly one in five high school girls (18.1%) uses some form of tobacco. Although cigarettes (11.7%) and cigars (8.7%) are most common, nonconventional products, such as hookahs, bidis, and kreteks, are growing in popularity (CDC, 2013a). Use of flavored e-cigarettes more than doubled from 2011 to 2012 (CDC, 2013b).
- Smoking rates by high school girls are highest (22.8%) among whites, lowest (8.4%) among African-Americans, and intermediate (16.7%) among Hispanics, Asians, and Native Americans (USDHHS, 2012).
- According to the CDC, 3.2% of middle school girls smoke cigarettes. When other forms of tobacco use are included, the prevalence rises to 5.6% (CDC, 2013a).
- Teenage girls are more likely to smoke if they have friends or family members who smoke (Faucher, 2003; Leonardi-Bee, Jere, & Britton, 2011), perceive smoking as a weight-control strategy (Maldonado-Molina et al., 2007), or suffer from low self-esteem (Kaufman & Augustson, 2008) or depression (Berg et al., 2009; Fergusson, Goodwin, & Horwood, 2003).
- Despite marketing restrictions imposed by the Justice Department in the 1998 Master Settlement Agreement, $10 billion in advertising dollars spent annually by the tobacco industry continue to shape children's awareness and attitudes about smoking, as well as their intentions to smoke. Regular exposure to cigarette advertising significantly increases the likelihood of smoking initiation (National Cancer Institute, 2008).
- Pro-tobacco advertising that emphasizes weight control, relaxation, and social acceptance has a powerful impact on girls' decisions to smoke (Duke et al., 2009; Seo, Bodde, & Torabi, 2009).
- Since the 1960s, tobacco companies have inundated women consumers with messages that smoking is feminine and fashionable. Today, Virginia Superslims Ultra Lights are sold in a slender "purse pack" resembling a cosmetics case, and the 2007 ad campaign for Camel No. 9 cigarettes targeted adolescent girls with the slogan "light and luscious" (Campaign for Tobacco-Free Kids et al., 2009; Pierce et al., 2010).
- Although it is still unclear if tobacco is a "gateway" drug leading to other forms of substance use, adolescent cigarette smoking is a strong predictor of alcohol, marijuana, and other illicit drug use (Biederman et al., 2012; Chen et al., 2002; Degenhardt et al., 2010).

Facts and Research Findings

Athletic participation may help to protect girls against smoking (Diehl et al., 2012; Lisha & Sussman, 2010).

Both sports involvement and general physical activity are associated with lower rates of cigarette use, particularly for girls (Kaczynski et al., 2008a, 2008b). Possible reasons for this link include enhanced self-esteem (Nelson & Gordon-Larsen, 2006) and physical self-concept (Rodriguez & Audrain-McGovern, 2005); reluctance to allow smoking-related reductions in lung function to compromise athletic performance (Wichstrom & Wichstrom, 2009; Yusko et al., 2008); and greater awareness of the health consequences of smoking (Melnick et al., 2001). Sports participation may also reduce the need for smoking as a source of stress reduction, mood elevation, or enhanced social status (Audrain-McGovern et al., 2013). In addition, high school athletes may be unwilling to risk suspension or removal from the team if they are caught smoking (Rodriguez & Audrain-McGovern, 2004).

- Physical activity is also associated with delayed onset of smoking and reduced odds that an individual will smoke at all. A national study of U.S. public high school students found that organized sports participants were 22% less likely to smoke cigarettes, regardless of gender (Castrucci et al., 2004).Physical activity contributes to a physically active self-concept, which in turn reduces the odds of tobacco use (Rodriguez & Audrain-McGovern, 2005; Verkooijen, Nielsen, & Kremers, 2008).
- The more heavily a girl is involved in sports, the less likely she is to smoke. Compared to non-athletes, female athletes are less likely to report current or lifetime cigarette use, and girls who participate on three or more teams in a given year are least likely of all to report cigarette use (Melnick et al., 2001; Page et al., 1998).
- A shift away from sports participation can signal increased risk for smoking. Virginia high school students whose level of sports participation decreased over a two-year period were nearly twice as likely to smoke as those with low participation overall and three times as likely to smoke as those with high participation overall (Rodriguez & Audrain-McGovern, 2004).
- Type of sport may make a difference in the impact of athletic participation on smoking risk over time. A study of Norwegian high school students found that participation in team sports and endurance sports reduced later tobacco use, whereas participation in power sports did not (Wichstrom & Wichstrom, 2009).
- The protective effect of sports participation applies to young adults as well as adolescents. Female college athletes were two to three times less likely than non-athletes to engage in smoking, either in season or in the off-season for their sport (Yusko et al., 2008).
- Although the evidence for sport as a long-term strategy for smoking cessation is quite mixed, exercise can reduce cigarette cravings and withdrawal symptoms in smokers (Linke et al., 2013).

Smokeless Tobacco

Background

Smokeless tobacco (snuff, chew, dip, snus, or "spit" tobacco) is chewed, placed between the cheek and gums, inhaled, or snorted through the nose rather than smoked. Although sometimes promoted as a less-harmful alternative to cigarette smoking (Arabi, 2007; Tomar, Fox, & Severson, 2009), use of smokeless tobacco significantly increases a range of health risks, including nicotine addiction, oral cancer, gum disease, cardiovascular disease, and pregnancy complications (WHO, 2007, 2012; Tomar, 2007).

- One in three U.S. smokeless tobacco users is under the age of 21; more than half started before the age of 13 (Nemours Foundation, 2008).
- Smokeless tobacco has a significant following among U.S. youth: 12.8% of high school boys and 2.2% of high school girls are current users. White boys (15.6%) report the highest usage rates of smokeless tobacco (CDC, 2012).
- Smokeless tobacco has been marketed to children by introducing them to less potent, starter versions of popular brands (e.g., Skoal Bandit) with candy or fruit flavorings (e.g., cherry, vanilla, or citrus blend) or promoting easily concealed spitless products, including dissolvable pellets, sheets, or strips (Campaign for Tobacco-Free Kids, 2013). Smokeless tobacco products are frequently advertised in youth-oriented venues and magazines (Morrison, Krugman, & Park, 2008). These techniques may help to explain why the prevalence of smokeless tobacco use by kids has not decreased in the past decade (Agaku et al., 2013).
- Although three quarters of 12th-grade girls perceive regular cigarette smoking as very risky, fewer than half perceive regular smokeless tobacco use this way (Tomar & Hatsukami, 2007). In recent years, there have been declines in high school students' perceptions that smokeless tobacco is harmful and in their disapproval of its use (Johnston et al., 2014).
- High school students who use smokeless tobacco are twice as likely to have unprotected sex, two to three times as likely to start smoking (Severson, Forrester, & Biglan, 2007; Tomar, 2003), and three times as likely to use marijuana (Everett et al., 2000).

Facts and Research Findings

Smokeless tobacco is one of the few forms of substance use conventionally associated with athletic participation, partly as a result of corporate sponsorship of sporting events, such as auto racing and major league baseball (Pechacek, 2010). Girls and women who play sports generally report lower rates than their male peers, but female athletes in certain sports may have an elevated risk.

- According to one national study, high school girls who played on a school or community sports team were 83% more likely than their non-athlete peers to use

chewing or dipping tobacco; girls who played on three or more teams were more than three times as likely to use these products (Melnick et al., 2001).

- A second national study found that, compared to non-athletes, participants in organized high school sports were 32% more likely to have used smokeless tobacco in the past and 89% more likely to use it currently (Castrucci et al., 2004).
- Among NCAA athletes surveyed in 2009, 27% of men and 2% of women had used smokeless tobacco in the past year. Female softball players reported higher rates (6%) than women in most other sports (e.g., 3% in field hockey and lacrosse, 2% in soccer, or less than 1% in track). However, male athletes reported considerably higher rates in nearly every sport (e.g., 52% in baseball, 54% in ice hockey, 16% in soccer, 9% in track) (NCAA, 2012).
- Imitation may be one factor in young athletes' use of smokeless tobacco, given that more than a third of professional baseball players engage in this behavior (Severson et al., 2005). Since 2011, Major League Baseball has restricted use of smokeless tobacco use when fans are present – but not during games.

Alcohol Use

Background

Women and men process alcohol differently. Because women's bodies generally have less water, they dilute alcohol less effectively and thus tend to suffer more severe consequences when they do drink heavily (NIAAA, 2008; Sugarman, DeMartini, & Carey, 2009). Although women generally drink less than men, there is evidence to suggest that the gender gap may be closing (Keyes, Grant, & Hasin, 2008). Problem drinking is associated with a constellation of negative health consequences, including liver disease, heart disease, brain damage, stroke, low bone density, breast cancer, and fetal alcohol syndrome (Wilsnack, Wilsnack, & Kantor, 2013). Excessive drinking further undermines academic performance and worker productivity and plays a significant role in sexual risk-taking, intimate violence, motor vehicle accidents, and suicide. Recent studies have estimated the annual cost of alcohol abuse in the range of $223-$235 billion annually in the United States (Bouchery et al., 2011; Rehm et al., 2009).

Underage drinking is also a key predictor of future alcohol dependence, illicit drug use, employment problems, and criminality (Patrick & Schulenberg, 2013; USDHHS, 2007). The National Academy of Sciences estimates that underage alcohol use alone costs the nation $53 billion annually, including the costs of traffic accidents, violent crime, and treatment (NAS, 2004); when medical expenses, work loss, and lost quality of life are also included, the direct and

indirect costs rise to $62 billion each year (Miller et al., 2006). Taxpayers spend about three quarters of a billion dollars a year just on underage drinking hospitalizations (Kim et al., 2012).

- Although rates are gradually declining, alcohol remains the long-standing drug of choice among teenage girls. Nearly three in four high school girls (71%) have tried alcohol in their lifetimes, and more than a third (38%) report drinking in the past month (CDC, 2012, Tables 41 and 43).
- Binge drinking rates more than double over the high school years, from 13% of freshman girls to 27% of senior girls (CDC, 2012, Table 43).
- Girls have traditionally reported significantly lower drinking rates than their male peers, but the gap is narrowing; in fact, one national study found that males and females aged 12 to 20 now have nearly the same overall rates of current alcohol use (24.7% vs. 24.0%; SAMHSA, 2008). Problem drinking is still more common among boys, but whereas senior boys were nearly 90% more likely than senior girls to report binge drinking in 1975, the gender gap is now only about 40% (Johnston et al., 2014).
- In 2011, 7% of high school girls reported driving after drinking, and 25% reported riding in a vehicle with a driver who had been drinking (CDC, 2012, Table 5).
- Adolescent girls who drink frequently are almost six times more likely to attempt suicide (Jersild, 2002).
- Drinking puts girls and women at increased risk for dating violence, unsafe sex, unplanned pregnancy, and sexually transmitted diseases, including HIV (CASA, 2003; Davis et al., 2007; Krebs et al., 2009).
- Alcohol has been identified as a possible "gateway" drug that precedes use of other illicit drugs in a developmental progression (Kandel, 2002; Kirby & Barry, 2012).
- Adolescent girls are more likely than boys to drink as a way to cope with problems, boost confidence, or relieve stress. (Kuntsche et al., 2006).
- One third of adolescent girls have tried alcopops, such as Smirnoff Ice or Mike's Hard Lemonade, and almost two-thirds of underaged female drinkers report having consumed them in the past 30 days. These fruit-flavored alcoholic beverages are aggressively marketed to girls 12-21 years old, who see 95% more magazine ads for alcopops than adult women do (American Medical Association, 2004; Center on Alcohol Marketing and Youth, 2006; Fortunato et al., 2014).

Facts and Research Findings

Research on the relationship between female athletic participation and alcohol consumption is inconsistent. Most studies found that female athletes in high school or college are more likely than non-athletes to engage in problem drinking, including heavy episodic ("binge") drinking (Diehl et al., 2012; Kwan et al., 2014; Lisha & Sussman, 2010;

Turrisi et al., 2006), although a few studies have found the opposite effect, or none at all (Mays & Thompson, 2009; Yusko et al., 2008). The impact of athletic participation on drinking behavior is complicated by mediating factors such as peer influences, sport-related identities, and sport subcultures (Martens et al., 2006; Miller et al., 2003; Peck, Vida, & Eccles, 2008; Wichstrom & Wichstrom, 2009).

- Teen participants in organized sports report more alcohol use in later adolescence or young adulthood than non-participants (Hoffman, 2006; Wichstrom & Wichstrom, 2009).
- Because excessive alcohol use undermines muscle development and recovery, information processing and retention, and proper absorption and metabolism of nutrients, it hampers athletic performance (American College of Sports Medicine, 2000; Vella & Cameron-Smith, 2010).
- Excessive drinking by athletes may result from self-medication to reduce the anxiety and stress of competition and injuries (Miller et al., 2002; Wahesh et al., 2013), drinking-tolerant team subcultures (Zamboanga et al., 2008), or exaggerated perceptions of peer alcohol use (Dams-O'Connor, Martin, & Martens, 2007; Perkins & Craig, 2012). Female athletes may be particularly prone to use drinking as a coping mechanism, compared to male athletes who are more likely to drink for social reasons (Wilson, Pritchard, & Schaffer, 2004).
- According to the National College Athletic Association, approximately four out of five college athletes report drinking in the past 12 months (78% in 2005, 83% in 2009, and 81% in 2013). More than half report that they drink during both their competitive and off seasons (NCAA, 2014; NCAA, 2012).
- One third of female college athletes report that they "typically" drink four or more drinks in one sitting, meeting the criteria for binge drinking; this number is down from 41% in 2005 (NCAA, 2014).
- Some girls' and women's sports may be more conducive to drinking than others. Higher rates tend to be found in team sports like field hockey (NCAA, 2012), soccer (Ford, 2007), swimming/diving (Martens, Watson, & Beck, 2006), and lacrosse (Brenner & Swanik, 2007).
- Sports spectatorship, live or broadcast, also increases the risk of problem drinking (Merlo, Hong, & Cottler, 2010; Neal et al., 2005; Nelson et al., 2010). The alcohol industry spends more than half a billion dollars annually on advertising during televised sports programs, to which more than 80% of girls and women are exposed at some point. A small but growing proportion of that advertising is devoted to women's sports (Center on Alcohol Marketing and Youth, 2004).

Illicit Drug Use

Background

In 2011, the U.S. Department of Justice assessed the economic costs of illicit drug use at approximately $193 billion (NDIC, 2011). No single estimate can adequately encapsulate the complicated nature of assessing the societal impact of illicit substance use, however. In broad terms, drug abuse contributes to escalating healthcare costs, loss of worker productivity, homelessness, school failure, vehicular accidents, crime, unintended pregnancies, and domestic violence. Yet illicit drugs vary both in popularity and in the severity of their effects; for example, marijuana is far more widely used, but also far less damaging to the user's health, than methamphetamine. Overall, adolescent drug use has declined somewhat over the past decade, although researchers cannot yet predict the long-term consequences of the current trend toward legalization of marijuana (Cerda et al., 2012; Johnston et al., 2014). Still, the continued emergence of new drugs and abuse on the teen social landscape, including those available through legal means (e.g., prescription stimulants like Adderall or over-the-counter cough suppressants containing dextromethorphan), remains cause for concern (CASA, 2005; Johnston et al., 2014).

- Nearly one in six eighth-grade girls (17.5%), one in three 10th-grade girls (34%), and almost half of 12th-grade girls (45.1%) have used an illicit drug at least once in their lives (Johnston et al., 2012).
- After alcohol and cigarettes, the most commonly used drugs among eighth-grade girls are inhalants, with 13.9% of girls reporting use in the past year (Johnston et al., 2012). "Huffing" (inhaling fumes from glue, paint, aerosols, and other widely available household or industrial chemicals) can damage the brain, heart, kidneys, lungs, and liver (Johnston et al, 2012).
- Among high school seniors, boys are more likely than girls to use illicit drugs. Perhaps because girls tend to mature earlier and/or date older boys, the difference is less pronounced at younger ages; among eighth- and 10th-graders, girls and boys are about equally likely to use club drugs (e.g., ecstasy), prescription stimulants (e.g., Adderall), prescription narcotics (e.g., OxyContin or Vicodin), amphetamines, cocaine, or heroin. In fact, girls are more likely to use inhalants or tranquilizers (Johnston et al., 2012).
- Among young adults aged 18-25, women are significantly more likely than men to be dependent on psychotherapeutic (prescription) drugs (Cotto et al., 2010).
- Research suggests some gender differences in the risk and protective factors associated with illicit drug use; for example, girls are more susceptible than boys to social influences, including peer, partner, or parental drug use (Amaro et al., 2001).
- At both the high school and college levels, rates of drug use and substance use disorders tend to be lowest

among African-Americans and Asian-Americans, higher among whites and Hispanics, and highest among Native Americans (McCabe et al., 2007; Wu et al., 2011).

Facts and Research Findings

Most studies show lower rates of drug use by female athletes compared to their non-athlete peers, suggesting that sports participation may help protect girls against illicit drug use. Explanations for this relationship vary. Drug abstinence may be a rational decision for girls who seek to maximize their athletic performance and avoid jeopardizing their eligibility to play. Athletic participation may also enhance self-esteem and provide a framework for supervision of free time. Research shows that teen athletes are more likely than non-athletes to disapprove of peer substance use (SAMHSA, 2001). Sports may facilitate involvement in a social network of teammates, coaches, and health professionals, among whom illicit drug use is not tolerated.

- High school girls who participate in exercise or sports are significantly less likely than their less-athletic peers to use marijuana, cocaine, or most other illicit drugs. The protective effect of sports appears to be strongest for white girls (Miller et al., 2001; Pate et al., 2000; Terry-McElrath et al., 2011).
- One study profiling a "druggie lifestyle" found that college students who participated on an intercollegiate sports team were only half as likely as non-athletes to use hard drugs such as cocaine, LSD, opiates, stimulants, or ecstasy (Mustaine & Tewksbury, 2004).
- One study found that female college athletes were significantly less likely than non-athletes to have used marijuana in the previous year, prescription drugs in high school, or designer "club" drugs (e.g., ecstasy, ketamine, or GHB) in their lifetimes (Yusko et al., 2008).
- Another study of non-medical prescription drug use found that female college athletes were significantly less likely than non-athletes ever to have abused prescription tranquilizers or opiates (Ford, 2008).
- Meta-analyses of research studies on sports participation and illicit drug use consistently found that adolescent and young adult athletes are less likely to engage in recreational use of drugs other than marijuana (Diehl et al., 2012; Kwan, 2014; Lisha & Sussman, 2010).
- College student-athletes are at less risk for marijuana use than their non-athlete peers (Buckman et al., 2011), but they are not immune. According to NCAA statistics collected in 2009, 18% of female college student-athletes had used marijuana in the past year. (NCAA, 2012). Usage varied by sport, with high rates in ice hockey (36%), lacrosse (30%), and soccer (23%), but lower rates in tennis (16%), basketball (15%), and track (9%).

Anabolic-Androgenic Steroid Use

Although anabolic-androgenic steroid use is most often associated with organized sports, research suggests that many girls and young women may be motivated to use steroids for other reasons—most importantly, in order to look fit and attractive. A physically active lifestyle, which accomplishes the same purpose, may actually serve as a protective mechanism against the use of steroids. In combination with accurate knowledge about the potential consequences of steroid use, sports and exercise programs may be a potential weapon in the public health arsenal.

Background

Anabolic-androgenic steroid use as a means of enhancing physical appearance or athletic performance has been condemned by the Committee on Sports Medicine and Fitness of the American Academy of Pediatrics (1997), the American College of Sports Medicine (1987), the National Athletic Trainers' Association (Kersey et al., 2012), and the National Institute on Drug Abuse (2006). The public health implications of anabolic-androgenic steroid use are dismaying. Steroid users face a variety of health risks, including heart disease, liver damage, high blood pressure and cholesterol, acne, depression, mood swings, and increased aggression. There is also evidence to suggest that steroid use may lead to physical dependence (Kanayama, Hudson, & Pope, 2010). The onset of steroid use tends to be later than most other drugs, with only one in five users starting before the age of 20 (Pope et al., 2013).

Approximately 2.9% of high school girls in the United States admit to using steroids at least once in their lifetimes without a doctor's prescription, according to the Centers for Disease Control and Prevention (CDC, 2012). Other national studies have found even lower rates, below 1% (Johnston et al., 2012).

- Women who use steroids are susceptible to a variety of masculinizing side effects, including hirsutism (growth of facial and body hair), deepened voice, male pattern baldness, clitoral enlargement, reproductive abnormalities, and changes in libido. Once they occur, these side effects are often irreversible (Gruber & Pope, 2000).
- The risk of steroid use is even greater for adolescent girls, who are vulnerable to premature skeletal maturation. Users risk permanently stunted growth (Committee on Sports Medicine and Fitness, 1997; National Institute on Drug Abuse, 2006).
- As with other illicit drugs, girls' lifetime steroid use increased during the 1990s (a four-fold increase, according to one estimate) but has decreased over the past decade (CDC, 2012).
- Adolescent female steroid users are significantly more likely to engage in other health-risk behaviors as well, including substance use (tobacco, alcohol, or other illicit drugs), sexual risk-taking, and violence. They are also more likely to experience depression and/or be

suicidal (Dodge & Hoagland, 2011; Elliot et al., 2007; Hall, Hall, & Chapman, 2005; Miller et al., 2005).

- Because anabolic steroids are a Schedule III controlled substance often acquired through the underground market, non-medical use carries a variety of other risks, including counterfeit or spiked doses and reliance on inaccurate medical advice from amateurs or disreputable health practitioners (Denham, 2012).

Facts and Research Findings

Steroid use serves the primary purpose of building muscle mass, which may make it a tempting prospect for those seeking to maximize performance in strength-oriented sports. While athletes constitute a significant at-risk population, adolescent steroid use is not restricted to sports enthusiasts. Many girls and young women are motivated to use steroids in order to conform to contemporary "hard body" standards of attractiveness that prize a lean, muscular physique (American College of Obstetricians and Gynecologists, 2011). For some, steroid use may be part of a pattern of disordered eating, poor body image, and preoccupation with weight (Elliot et al., 2006; Gruber & Pope, 2000). For others, steroid use is a component of a broader problem behavior syndrome with health risks that include elevated risk for alcohol, tobacco, or illicit drug use, sexual risk-taking, violence, suicidality, pathogenic weight control, and other unhealthy behaviors (Elliot et al., 2007; Harmer, 2009; Miller et al., 2005; Wichstrom & Wichstrom, 2001).

- Many, but by no means all, female adolescent steroid users participate in organized sports or bodybuilding. However, a substantial number of steroid users report no athletic involvement (Bahrke et al., 2000). High school girls may actually be less likely to use steroids than their non-athlete peers (Elliot et al., 2007), particularly when experimenters (i.e., teens who have only used steroids "once or twice") are excluded from the equation (Harmer, 2009).

- Athletic participation may actually help to protect steroid users against other problem behaviors. While users are at heightened risk for illicit drug use, sexual risk-taking, and suicidal behavior, the risks are lower for athlete steroid users than for non-athlete users (Miller et al., 2005).

- Preoccupation with physique can be what links sports and steroid use (American College of Obstetricians and Gynecologists, 2011; Elliot et al., 2006). Because of their physique-altering ("body-shaping") function, steroids may play a role in the Female Athlete Triad of disordered eating, amenorrhea, and osteoporosis (Denham et al., 2007).

- Balanced, accurate education programs can be effective tools in reducing steroid use. However, when programs deny potential benefits (such as muscle development and enhanced strength), they are not credible and can actually backfire, increasing the risk of steroid use (Kersey et al., 2012; National Institute on Drug Abuse, 2006).

- In one recent study of attitudes toward steroid abuse, health club patrons expressed significantly stronger disapproval of athlete users seeking to enhance performance than of non-athlete users seeking to improve appearance (Dawes et al., 2013).
- The ATHENA (Athletes Targeting Health Exercise & Nutrition Alternatives) program for girls and the ATLAS (Adolescents Training and Learning to Avoid Steroids) program for boys are established programs emphasizing health nutrition and strength-training alternatives to substance use. The programs have been shown to reduce steroid use or intentions to use steroids in high school athletes of both genders (Elliot et al., 2006; Goldberg et al., 2000; Ranby et al., 2009).

SECTION III. SEXUAL AND REPRODUCTIVE HEALTH

Good news: In recent years, high-risk sexual behavior (such as unprotected intercourse or sexual contact with casual or high-risk partners) has declined among young women in the United States. We also see corresponding decreases in common outcomes associated with sexual risk-taking, most notably unintended adolescent pregnancies and sexually transmitted diseases. However, these public health problems remain considerably more common in the United States than in other industrialized nations, largely as a result of inconsistent or ineffective contraceptive and/or prophylactic use. Participation in sports may offer girls and young women both incentives and resources to make healthy and responsible sexual choices. As the Athletes for Sexual Responsibility (a peer education group at the University of Maine) suggest, "Smart sex is like baseball: You have to cover all the bases to make it home safe. Use a condom." (Athletes for Sexual Responsibility, n.d.)

Sexual Behavior

Background

Risky sexual behavior remains a significant danger to the health and safety of American girls and women. Sexual risk-taking may take several forms, including sexual precocity (early initiation of sexual intercourse); promiscuity (multiple partners, either sequentially or concurrently); casual sex or "hooking up" (with an unfamiliar or uncommitted partner); unprotected sex (not using contraceptives or prophylactics); having sex with high-risk partners; or sexual activity in conjunction with substance use. These behaviors are often associated with serious negative outcomes, ranging from social stigma to sexual victimization and assault, unintended or unwanted pregnancy, and infection with STDs. Women are at greater risk than men for all of these consequences—including sexually transmitted infections or diseases (STDs), to which they are more susceptible and from which they are more likely to experience permanent harm (CDC, 2009; Misra, 2001).

- Adolescent girls' sexual activity has declined since the early 1990s. In 1991, 50% of high school girls had ever had sexual intercourse; in 2011, 46% had done so. Declines are especially marked for younger girls; the proportion of ninth-grade girls who report having had sex dropped from 39% in 1991 to 28% in 2011 (CDC, 2012).
- Of sexually active high school girls, 13% have had sex with four or more partners; 18% used alcohol or drugs,

and 46% did not use a condom during their most recent sexual encounter (CDC, 2012). Although only 3% of girls report having intercourse before the age of 13, about two-thirds of sexually experienced teens say they wish they had waited longer before having sex (Albert, 2007; CDC, 2012).

- Substance use increases sexual risk-taking. Substantial numbers of young adults aged 18-24 report that on at least one occasion, alcohol or drugs have influenced their decisions about sexual behavior (37%), led them to engage in more sexual activity than they had planned (30%), or led them to have unprotected sex (24%; Hoff, Green, & Davis, 2003; Rehm et al., 2011).
- About half of adolescent girls aged 15-19 have had oral sex, and two-thirds have done so by the age of 25. Although often perceived as a safe way to avoid pregnancy, performing oral sex can also have negative physical (i.e., STDs) and emotional consequences; girls in particular are vulnerable to feeling bad about themselves or feeling used (Brady & Halpern-Felsher, 2007; Copen, Chandra, &Martinez, 2012; Lindberg, Jones, & Santelli, 2008).
- Inconsistent use of prophylactics has resulted in higher rates of STDs among teens in the United States than in other industrialized countries (Panchaud et al., 2000; Woolf & Aron, 2013). Adolescents are especially vulnerable to STDs compared to adults for several reasons; they have heightened biological susceptibility, are less likely to use condoms consistently and effectively, and experience more barriers to obtaining STD-related health care (Wildsmith et al., 2013).
- Young people aged 15-24 account for about half of the nearly 20 million new sexually transmitted infections diagnosed each year in the United States, although they comprise only a quarter of sexually active Americans. About 38% of sexually active adolescent girls aged 14 to 19 have a sexually transmitted infection.
- Most sexually active women will contract the most common STD (the cancer-causing human papillomavirus) at some point in their lives; fortunately, there is now a vaccine to protect against HPV. Early, comprehensive sex education and regular health screenings are also key tools to protect young women (CDC, 2013; Forhan et al., 2009).
- Nearly one in five U.S. women will experience forced sexual intercourse, almost half of them before the age of 18 (Holcombe, Manlove, & Ikramullah, 2008; White House Council on Women and Girls, 2014). One in 10 (11.8%) high school girls has been physically forced to have sexual intercourse when she did not want to (CDC, 2012). In fact, about 11% of women between the ages of 18 and 24 who had sex before the age of 20 report that their first intercourse was not voluntary (Martinez, Copen, & Abma, 2011).

Facts and Research Findings

Research suggests that under some conditions, athletic participation may reduce risky sexual behaviors in adolescent girls, such as early sexual initiation, multiple sex partners, or unprotected sex. One possible explanation is that female athletes are better equipped to tap resources needed (such as self-esteem, coping skills, a sense of self-empowerment and efficacy, and even physical strength) to resist pressure to take sexual risks. Another explanation may be that girls who participate in sports have more incentive to avoid risky behaviors, the consequences of which (such as pregnancy) could jeopardize their opportunity to play. Yet a third possibility is that organized, supervised athletic participation narrows the after-school "window of greatest opportunity" for risky sexual experimentation.

In contrast to the protective effects of sports participation in adolescence, the effects for young adult women are less clear. Several studies have found that female college athletes are actually at higher risk than their non-athlete peers for some forms of unsafe sex, particularly in the context of heavy drinking. When they drink, athletes are no more immune to sexual risk-taking than non-athletes. Because alcohol increases the likelihood, associated risks, and potential severity of negative consequences from such behaviors, it is imperative that all young women receive protective screening and alcohol education – whether or not they participate in organized sports.

- High school girls who play sports are generally less sexually active than those who don't. Female athletes tend to delay the onset of sexual activity until later in adolescence; when they do become sexually active, they have intercourse less frequently (Dodge & Jaccard, 2002; Erkut & Tracy, 2000; Miller et al., 2002).
- One study of middle and high school girls found that athletes were more likely than non-athletes to engage in sexual intercourse or oral sex. This discrepant finding might be due to the fact that among early adolescents, athletes tend to be more physically mature and/or have more access to potential sex partners due to coed practice and travel related to their sport. However, athletes were also more likely than non-athletes to report condom use (Habel et al., 2010).
- Among sexually active adolescent girls, those involved in organized team sports are more likely to seek out sexual health-related information or services; for example, they are more likely to discuss contraceptive use or sexual history with their sex partners (Lehman & Koerner, 2004).
- The link between sports participation and sexual victimization is unclear. In one study testing a "sport protection" hypothesis, female athletes were significantly less likely than non-athletes to be victimized during their late high school and early college years (Fasting et al., 2008). A second study, finding that female college athletes actually reported

higher incidences of rape and attempted rape, offered two possible explanations: Female athletes tend to drink more heavily and to socialize with male athletes who have higher-than-average rates of sexual aggression, placing them at greater situational risk for sexual coercion (Brown et al., 2013).

- Girls who play sports engage in less high-risk sexual behavior than those who don't. Female athletes are less likely to have unprotected sex (without birth control or barrier protection), sex with multiple partners, or sex under the influence of alcohol or drugs (Eitle & Eitle, 2002; Lehman & Koerner, 2004; Miller et al., 2002).
- There is an emerging consensus among researchers that the link between college sports participation and unsafe sex is strongly related to excessive drinking. Several studies have found that college athletes of both genders have more sexual partners than non-athletes do, and are more likely to have sex while intoxicated (Faurie, Pontier, & Raymond, 2004; Grossbard et al., 2007). Another study of college-bound high school graduates found that female athletes reported more alcohol use, more sexual partners, and lower perceived risk of negative consequences (Wetherill & Fromme, 2007).
- In a recent nationally representative study of more than 20,000 college athletes, 8% of female college athletes reported having unprotected sex during the past year, and 9% reported having had multiple sex partners. Athletes who reported binge drinking and/or problem gambling were significantly more likely to engage in sexual risk-taking (Huang, Jacobs, & Derevensky, 2010).

Teen Pregnancy

Background

The United States has the highest teen pregnancy rate in the industrialized world—nearly three times as high as that of Canada, four to five times higher than that of most European nations, and seven times as high as that of Japan (Martinez et al., 2011; NCPTUP, 2012). Nearly one-third of women in the United States get pregnant at least once by age 20, and more than 80% of all teen pregnancies are unintended (Finer & Zolna, 2014). Associated costs to taxpayers, including health care, child welfare, criminal justice, public assistance, and lost tax revenues, are conservatively estimated at more than $9 billion annually (NCPTUP, 2013). However, there is a bright side to this picture. Between 1990 and 2009, U.S. pregnancy rates fell 53% for teens aged 15-17 and 37% for teens aged 18-19. These steep declines apply across all major racial and ethnic groups. Historically low pregnancy rates have resulted in correspondingly lower rates of both live births and abortions; since 1990, teen birth rates and abortion rates have each dropped by about 50% (Curtin et al., 2013; Kost & Henshaw, 2014; Martin et al., 2013). In fact, despite the overall growth in the U.S. adolescent population over the past half century, there are fewer babies born to

teen mothers now than in any year since the mid-1940s (Hamilton & Ventura, 2012).

- Teenage mothers are less likely to finish school or go to college. Nearly one-third of adolescent girls who drop out of high school cite early pregnancy or parenthood as a key reason; only 40% of teen mothers finish high school, and less than 2% finish college by age 30 (Shuger, 2012).
- Children of adolescent mothers are at increased risk for low birth weight, impaired cognitive development, abuse, neglect, poor school performance, behavior problems, incarceration, and adolescent childbearing (Hoffman & Maynard, 2008; Mollborn & Dennis, 2012).
- Teens in the United States are about as likely to have sex as teens in other countries, but other countries have lower pregnancy rates. The primary difference is that American teens are less likely to use contraceptives, especially effective hormonal methods such as the birth control pill (Santelli, Sandfort, & Orr, 2008).
- Although more than four out of five sexually active girls used contraceptives during their most recent sexual intercourse, many still do not use them consistently or effectively. Only about half of sexually active teenage girls report having used a condom every time they had sex in the past month. (Martinez et al., 2011; Wildsmith, Barry, & Manlove, 2013).

While the male condom and the birth control pill remain the most common forms of birth control, an increasing number of adolescents are now choosing long-acting reversal contraceptives (such as implants, patches, or injections), which have lower failure rates than more traditional methods. This trend has contributed significantly to declining teen pregnancy rates. One study calculated that 86% of the reduction in teen pregnancy rates since the early 1990s is attributable to more consistent and effective contraceptive use, with only 14% resulting from reduced or delayed sexual activity (Jones, Mosher, & Daniels, 2012; Santelli et al., 2007).

Facts and Research Findings

Most studies found that athletic participation is associated with reduced odds of teen pregnancy. Because girls who participate in sports risk losing their place on the team, as well as any associated benefits (such as social status or scholarship opportunities), they have considerable incentive to avoid pregnancy. Sport may also act as a source of social capital, meaning that sport as a vehicle for greater connection between female athletes and their communities, which is protective against unplanned pregnancy (Crosby & Holtgrave, 2006). In addition, female athletes may be less committed to the traditional, passive image of femininity and, thus, more inclined to see themselves in terms of their own accomplishments, rather than their appeal to boys (Miller et al., 2002; Shakib, 2003). These factors may help to explain why female high school athletes report less sexual

activity overall, less high-risk sexual behavior in particular, and more frequent and consistent use of contraceptives than non-athletes do (Taliaferro, Renzo, & Donovan, 2010).

- Female high school and college athletes are significantly less likely to get pregnant than their non-athlete peers (Dodge & Jaccard, 2002; Kokotailo et al, 1998; Miller et al., 1999; Page et al., 1998; Rome, Rybicki, & Durant, 1998; Sabo et al., 1998).
- The link between sports participation and reduced pregnancy rates is found across racial and ethnic categories, including white, African-American, and Hispanic girls in one nationwide sample (Sabo et al., 1998).
- One reason for lower athlete pregnancy rates is that girls at highest risk for pregnancy are less likely to get involved (or stay involved) with sports. Athletes tend to be younger and better educated, and are more likely to be white, than their non-athlete peers—all factors correlated to reduced pregnancy risk. Athletes also engage in less risky sexual behavior in part because they are more reluctant to risk pregnancy (Dodge & Jaccard, 2002).
- About one in 10 young adult women with a history of extensive sports involvement in high school has a child outside of marriage, while the number for those who had little or no involvement in high school sports is about one in four (Eitle & Eitle, 2002).

SECTION IV. MENTAL HEALTH AND WELL-BEING

Given the physical nature of athletic pursuits, we may at times be inclined to overlook their impact on less-tangible mental health outcomes. Researchers do not yet have a good understanding of the interrelated effects of depression, low self-esteem, and distorted body image on health-compromising behaviors, such as suicide attempts or pathogenic weight control. However, growing numbers of studies are exploring how sports participation may serve to protect girls and women against some of these health risks while considering how it can exacerbate others. All other things being equal, athletes tend to enjoy a greater sense of self-esteem and feel less depression than their sedentary peers. Logically one could deduce that their activities generate a higher level of physical fitness that allows them to feel greater satisfaction with their own bodies than non-athletes. Yet, perhaps because they hold themselves to a more demanding physical standard, athletes are also at greater risk for eating disorders. Moreover, frequent exercise or sports activity may, in some cases, be a red flag for depression, low self-esteem, poor body image, or even suicidality when over-exercise is used as a coping mechanism or a strategy for weight loss. In essence, sports participation in moderation enhances mental health; in excess, it may (literally) be overkill.

Depression

Background

Depression is a treatable illness. Symptoms may include persistent feelings of sadness, hopelessness, and worthlessness; loss of ability to experience pleasure; loss of interest in activities one usually enjoys; difficulty concentrating; and changes in sleep, appetite, weight, and energy levels. Depression has multiple variations, in which people can also suffer from manic episodes in addition to the depressive episodes (Marcus et al., 2012). Though often dismissed or trivialized as "the blues," the annual economic burden of depression in the United States in the early 2000s exceeded $83 billion in medical treatment costs, lost productivity, and mortality (Greenberg et al., 2003). Costs to healthcare plans and employers can be considerable. Some drugs, such as Abilify, can cost more than $1,000 per month alone, with other prescriptions increasing expenses. On an annual basis, employers may pay more than $350,000 per thousand employees for depression-related health concerns (Knopf, 2014). Women are twice as likely as men to suffer depression. Reproductive hormones may play a causal role, particularly

after birth or during menopause. Women may also be more prone to depression than men due to differences in how they respond to stressful life situations, such as conflicting work and family responsibilities. Women are also more likely to experience poverty and sexual or physical abuse, which has adverse effects for mental health (NIMH, 2008).

- Each year, 12 million women in the United States experience clinical depression. Although most can be treated successfully with medication and/or psychotherapy, less than half of these depressed women ever seek treatment (Mental Health America, 2008a).
- An estimated 73 million adult women worldwide experience a major depressive episode each year, and mental disorders following childbirth are estimated to affect about 13% of the women (World Health Organization, 2009).
- There is a higher prevalence of major depression for women who report sexual and emotional abuse as children than for men (Arnow et al. 2011).
- There are common misconceptions that depression is not an illness but a normal part of childbirth, menopause, and aging, and that strong people can "snap out of it." These misconceptions may discourage some women from seeking help (Mental Health America, 2008a, 2008b).
- Approximately half of depressed women in the United States seek treatment for depression (Ko et al., 2012).
- Women's depression frequently co-exists with other serious illnesses, such as eating disorders or post-traumatic stress disorder (Devane et al., 2005; Kessler et al., 2003). Depression is also a complicating factor in chronic medical conditions, such as diabetes, cancer, or heart disease (Cassano & Fava, 2002; Katon & Ciechanowski, 2002).
- The World Health Organization (2001) predicts that depression will be the most prevalent cause of disability among women worldwide by the year 2020. Depression is estimated to affect 350 million people, and the burden of depression is about 50% higher for women. (Marcus et al. 2012).
- Though the rates of depression are comparable among boys and girls in early childhood, by middle adolescence girls are twice as likely as boys to have experienced major depression. This gender gap continues until menopause (Cyranowski et al., 2000; Hyde, Mezulis, & Abramson, 2008).
- Women suffering from depression hesitate to tell other people about what they are experiencing. In a 2012 study the tendency of women who were self-stigmatizing, meaning they had low self-esteem and self-worth, was found to affect their beliefs about disclosing feelings of sadness or depression. Eighty percent of the women in this study indicated they would not disclose feelings of depression to healthcare professionals, nearly 40% indicated they would do what

they could to keep their depression a secret (Oakley et al., 2012).

- In 2007, 12% of girls between the ages of 12 and 17 suffered a major depressive episode, two-thirds of whom suffered severe impairement as a result of her depression. More than half of the girls who experience depression received treatment, counseling, or medication for depression (SAMHSA, 2008).
- Teenage girls are especially vulnerable to depression due to biological and hormonal changes at puberty. Parental conflicts, unrealistic standards of beauty and femininity, and new social expectations related to reaching adolescence also contribute to depression among teenage girls (Mayo Clinic, 2008; NIMH, 2008).

Facts and Research Findings

Across numerous studies and with rare exception, physical activity has been found to be an anti-depressant (Sallis, Pochaska, & Taylor, 2000; Teychenne, Ball, & Salmon, 2008). For both biochemical and psychological reasons, exercise elevates mood and creates a sense of happiness and well-being (Craft, 2005; Cripps, 2008). Moreover, it appears that moderate levels of sports activity can significantly enhance social and psychological functioning in ways that buffer against depression. The evidence for exercise as a treatment for clinical depression remains promising although still inconclusive due to methodological flaws in much of the research to date (Cripps, 2008; Lawlor & Hopker, 2001; Mazure, Keita, & Blehar, 2002).

- Data drawn from a sample of 8,950 women between the ages of 50-55 revealed that those who sat for more than seven hours a day and did not meet daily physical activity (PA) standards were more likely to exhibit depressive symptoms than women who sat for less than four hours a day and met PA standards (van Uffelen et al., 2010.
- The combination of increased preoccupation with screen time (watching television, computer, and electronics use) and sedentary behavior was found to negatively affect depression levels among minority females (Breland et al., 2013).
- Aerobic exercise, toning, and resistance training can each reduce depressive symptoms (Ahmadi et al., 2002; Dunn et al., 2005; Taliaferro et al., 2008).
- Positive effects of exercise on depression apply across the life span, helping children (Sallis et al., 2000), teens (Dishman et al., 2006), young adults (McKercher et al., 2009), the middle-aged (Brown et al., 2005), and the elderly (Strawbridge et al, 2002).
- Lower levels of physical activity in childhood have been linked to increased likelihood of depression in adulthood (Jacka et al., 2011).
- Women who are at risk of depression and have low self-efficacy are less likely to participate in physical activity (Azar et al., 2011).

- Reasons for exercising matter. In a nationwide assessment of more than 40,000 students by the American College Health Association, college women who exercised were less likely to report feeling hopeless or depressed— except for those who exercised frequently to lose weight (Taliaferro et al., 2008).
- Adolescent and young adult women who participate in organized sports report lower levels of depression. Possible reasons include greater levels of parental and peer emotional support (Gore, Farrell, & Gordon, 2001), as well as greater social acceptance (Boone & Leadbeater, 2006), social connectedness and self-esteem (Armstrong & Oomen-Early, 2009), and improved physical self-concept and body satisfaction (Dishman et al., 2006).
- High school seniors who played sports three to six hours per week were less depressed than those who played less often. More frequent participation had no such protective effect, perhaps due to the detrimental effects of overtraining (Sanders et al., 2000).
- Young women who walked at least 7,500 steps a day were 50% less likely to be depressed than sedentary women. However, very high levels of physical activity were associated with greater risk of depression (McKercher et al., 2009).
- Sports involvement may have long-lasting effects on mental health. Female college athletes were less likely to be clinically depressed than their non-athlete peers (Wyshak, 2001).
- Women with major depression who participated in some physical activity were less likely to experience excessive guilt and/or make a suicide plan than inactive women with major depression (McKercher et al., 2013).
- There is an inverse relationship between physical activity and depression symptoms among U.S. women. (Loprinzi, Fitzgerald, &Cardinal, 2012). This relationship is also true of women who may be pregnant (Mikkelsen et al., 2010).
- Women who participate in physical activity as adolescents have better control over anxiety and depression (World Health Organization, 2009).
- There have been discussions about including the measurement of depression and anxiety symptoms on activity diaries as a way to enhance the adherence of exercise (Stroehle, 2009).
- People with mobility impairments (for example, muscular dystrophy, multiple sclerosis, or spinal cord injury) experience much higher rates of depression than the overall U.S. population. The more physically active individuals with mobility impairments are, however, the less depression they experience (Rosenberg, 2013).
- Data analyzed from the Canadian National Health Population Survey revealed that women who were

divorced, separated, or widowed were more vulnerable to depression and that low intensity physical activity was found to influence the likelihood of depression occurrence in those groups of women (Wang et al., 2011).

- There is a decreased risk of depression when a person is physically active for more than 90 minues a day and watches between five or fewer hours of television per week (Lucas et al., 2011).
- When women participated in moderate cardiorespiratory fitness activity they demonstrated a 44% lower rate of depressive symptoms. It was 54% lower when they participated in high cardiorespiratory fitness activity (Sui et al., 2009).

While participation in physical activity and sport clearly has a positive effect on mental outlook and health, there is a growing body of work that suggests that assumptions regarding athletic participation alone as an immunizer against depression and other illnesses are not correct. In studies examining mental health issues among athletes, female athletes exhibit higher tendencies for disorders such as depression than male athletes. The pressures of the athletic environment itself may trigger certain mental health crises or conditions for athletes.

From this emerging area of research here are some findings to consider:

- Among elite swimmers who competed in the Canadian and World Championships, 68% self-reported experiencing one major depressive episode, with more female athletes than male athletes reporting that they had experienced depression. The prospect and reality of failure and the pressure to succeed may contribute to the depression that both female and male athletes experience (Hammond et al., 2013).
- In a survey of former NCAA Division I athletes, findings indicated that injuries sustained during their collegiate playing careers negatively affected their quality of life after their playing days were over, increasing the likelihood of difficulties with physical functioning, suffering from depression and anxiety disorders, sleep disturbances, and necessitating pain interventions. While the study did not focus specifically on female athetes, female athetes were a part of the population studied (Simon & Docherty, 2014).

Anxiety Disorders

Background

Anxiety disorders are the most common form of mental disorders in the general population and can include phobia, panic disorder, generalized anxiety disorder, post-tramuatic stress disorder, and separation anxiety disorders (CDC, 2011). Most disorders are more prevalent in woment then men and can last from a year to a lifetime of systoms (CDC, 2011).

Facts and Research Findings

- Physical activity has helped to reduce the effects anxiety sensitivity has on binge eating when a person does moderate levels of physical activity, but does not mediate the effect of eating as a coping mechanism (DeBoer et al., 2012).
- It has been reported that physical activity may help women with anxiety disorders in an indirect way by increasing self-esteem and self-concept (Herring, O'Connor, & Dishman, 2014).
- Physical activity has helped increase social interaction and provide as a protector barrier to the onset of anxiety disorders (Pasco et al, 2011).
- Phyiscal activity helps to signicically decrease anxiety in women, a finding which does not appear in men (Brunes, Augestad, & Gudmundsdottir, 2013).
- Women who are overweight and obese had a greater likelihood of anxiety and were less likely to work out on a regular basis (De Mello et al., 2013).
- Obese women show more symptoms of anxiety disorders than men do, especially agoraphobica, panic disorder, and mood disorders. (Mather et al, 2009).
- Much like depression, anxiety disorders are treatable. For most anxiety disorders, physical activity helps to moderate the onset of anxiety symptoms; however, it appears in some cases (i.e., elite-level female athletes) exercise may increase the amount of panic disorders (Strohle, 2009).

Suicide

Background

It is impossible to calculate the intangible cost of suicide, and suicide attempts, in terms of human sorrow; however, the economic costs to society (including medical costs, lost productivity, and lost wages) exceed $15.4 billion annually in the United States (Institute of Medicine, 2002). Each suicide leaves an average of six survivors, those family members and friends intimately affected by the death. Suicide is the third-leading cause of death among American teenagers and young adults aged 15–24, accounting for one of every eight deaths in this age group (American Association of Suicidology, 2006; CDC, 2008). Suicide is the seventh-leading cause of death globally for women between the ages of 20-59, the fifth-leading cause of death for women 25-44, and the second-leading cause of death in low-and middle-income countries in the Western Pacific Region (World Health Organization, 2009).

Women are three times as likely to attempt suicide as men, but men are four times as likely to succeed (American Association of Suicidology, 2006). One reason for this difference is that men are more likely to use firearms, whereas women are more likely to use potentially reversible methods, such as poisoning or suffocation (CDC, 2007; Institute of Medicine, 2002).

- According to the Centers for Disease Control and Prevention, 36% of high school girls reported strong and persistent feelings of sadness or hopelessness in the past year, 19% seriously considered suicide, 13% made a suicide plan, and 9% actually tried to kill themselves. One in 50 of those attempts resulted in an injury, poisoning, or overdose that had to be treated by a doctor or nurse (CDC, 2008).
- The Centers for Disease Control and Prevention identified Hispanic girls as being at especially high risk for suicidal ideation and behavior; 42% felt sad or hopeless, 21% considered suicide, 15% made a suicide plan, 14% attempted suicide; and 1 in 25 attempts required treatment by a health professional (CDC, 2008).
- After doubling between the 1950s and the late 1970s, female adolescent suicide rates have declined slightly since 1980 (American Association of Suicidology, 2008; National Adolescent Health Information Center, 2006).
- Suicide attempts are especially common among adolescents; for every completed youth suicide, there are an estimated 100–200 attempts. In a typical American high school classroom, it is likely that one girl and two boys have tried to kill themselves in the past year (American Association of Suicidology, 2006).

Adolescent and young adult suicidal ideation and attempts are often linked to other high-risk behaviors. These include substance use (tobacco, marijuana, cocaine, and other illegal drugs), sexual risk-taking, vehicular risk-taking, delinquency, and interpersonal violence (Bae et al., 2005; Barrios et al., 2000; Hallfors et al., 2004; Schilling et al., 2009; Thompson, Kingree, & Ho, 2006).

- Suicide attempts tended to be higher for women with higher body mass index (BMI), especially for unmarried women (Mukamal & Miller, 2009).
- Higher rates of suicide attempts were most common for white women between the ages of 18-24 and 25-44; however, black women 18-24 were at the highest risk of suicide attempts (Baca-Garcia et al., 2010).
- Women who are obese are more likely to commit suicide, in part due to the trend of greater psychopathology in obese women. (Mather et al., 2009).

Facts and Research Findings

Although the relationship between overall physical activity and female suicidality depends partly on the motive for exercise, multiple studies have confirmed that women who participate in sports are less likely to consider, plan, or attempt suicide (Brown & Blanton, 2002; Brown et al., 2007; Ferron et al., 1999; Harrison & Narayan, 2003; Oler et al., 1994; Page et al., 1998; Sabo et al., 2005; Taliaferro et al., 2008a; Tomori & Zalar, 2000; Unger, 1997). Unlike exercise alone, sports participation generally takes place within the context of a social network of coaches, teammates, parents, and others that fosters

pro-social behavior and provides a therapeutic emotional support base.

- Physical activity can be protective against suicidality (Taliaferro et al., 2008b). In adolescents and young adults who made nearly lethal suicide attempts, one study found far lower levels of physical activity, even after controlling for explanatory factors, such as depression and alcoholism (Simon, Powell, & Swann, 2004).
- Exercise alone is not necessarily protective against suicidality for women; in fact, girls and women who engage in frequent exercise may have an elevated risk of suicidal behavior, possibly because they seek to lose weight in order to compensate for poor body image, low self-esteem, and depression (Brown & Blanton, 2002; Taliaferro et al., 2008b; Thome & Espelage, 2004).
- Female college students who don't participate in organized sports are two-thirds more likely to report suicidal behavior than female college athletes (Brown & Blanton, 2002).
- Girls who consider sport an important part of a healthy life, and as a useful coping behavior during times of distress, are less likely to be suicidal (Tomori & Zalar, 2000). A study showed that college women with depression were less likely to have a suicide plan when they were physically active (McKercher et al., 2013).
- In one nationwide study, high school girls who participated in organized sports were significantly less likely to report feeling hopeless or suicidal, or to report planning a suicide or having made multiple suicide attempts (Taliaferro et al., 2008a).
- A second nationwide study found the protective effect of sports against suicidal thinking to be strongest for girls who participated on three or more sports teams (Sabo et al., 2005).
- Another nationwide study found that female high school athletes were less likely to attempt suicide even after controlling for physical activity levels (Brown et al., 2007).
- Having a sport-related identity influences the relationship between sports participation and suicidality. Compared to college students who do not see themselves in sport-related terms, self-identified athletes are half as likely to attempt suicide—whereas self-identified jocks are twice as likely to do so (Miller & Hoffman, 2009). In this study, the term "jock" was assessed using the degree of agreement on two statements – I tend to see myself as a jock and other people tend to see me as a jock. The term athlete was used to refer to someone who had participated in a sport or on a team and referred to themselves as an "athlete."

Body Image

Background

One of the most pervasive and unchallenged prejudices in U.S. culture is the prejudice against fat people. By the age of 5, children have absorbed the cultural bias against overweight people (Musher-Eizenman et al., 2003). Popular imagery in media, literature, and advertising emphasizes a vision of female physical perfection that is unrealistically thin (Kilbourne, 2004; Lamb & Brown, 2006; Wolf, 2002). To the extent that girls and young women internalize such consistent messages (some subtle, some quite blatant), they are apt to make unfavorable comparisons between this idealized, unrealistic form and their own bodies (Groesz et al., 2002; Yamamiya et al., 2005). Although boys also experience dissatisfaction with their bodies, more commonly revolving around being insufficiently muscular, girls are especially vulnerable to developing and investing in a negative body image (Cash & Pruzinsky, 2002). While the active male body has traditionally been judged on its ability to accomplish desired goals, the objectified female body has traditionally been judged on its sexual attractiveness to men (Smolak, 2004). Negative body image often is associated with disordered eating (Ackard et al., 2002; Ricciardelli & McCabe, 2001), depression (Bearman & Stice, 2008; Brausch & Gutierrez, 2009), poor self-esteem (Clay et al., 2005; Tiggemann, 2005), and even abuse of substances with appetite- suppressing qualities, such as cocaine, amphetamines, and, especially, cigarettes (Clark et al., 2005; Parkes et al., 2008). Body Dysmorphia Disorder (BDD) is a pathological disorder, which has similarities to obsessive-compulsive disorder for which people are focused on imagined physical defects typically on a specific area of the body (Paven et al., 2008).

- The U.S. weight-loss industry has grown rapidly in recent years; it represented approximately $30 billion in 1992, $46 billion in 2004, and is forecasted to exceed $60 billion before the end of the current decade (Adams, 2005; U.S. Food and Drug Administration, 1992).Well over 90% of American girls own at least one Barbie doll (Dittmar et al., 2006; Norton et al., 1996; Rogers, 1999). In one experiment, girls aged 5 to 8 who played with a Barbie doll reported lower body-esteem and a greater desire to be thinner than girls who played with a doll that had more realistic body proportions. According to one estimate, only .001% of women match Barbie's large-breasted, narrow-hipped physical proportions (Anchutz & Engles, 2010).
- In one recent study, about half of girls 9–12 rated their own bodies as too heavy; although fewer than 15% were objectively overweight (Clark & Tiggemann, 2006).
- Women were found to have body uneasiness as a factor for wanting to control weight (Segura-Garcia et al., 2010; Grossbard et al., 2009).
- The body mass index (BMI) scores of women is negatively correlated with the woman's body image (Erbil, 2013).

- Body dissatisfaction in American girls emerges by the age of 6 and is well-established by the age of 9 (Davison et al., 2000; Lowes & Tiggemann, 2003; Sands & Wardle, 2003).
- Only 12% of women (but twice as many men) think they look good in a swimsuit; moreover, 31% of women are so uncomfortable that they avoid wearing a swimsuit in public, while that is true for only half as many men (Frederick et al., 2006).
- Due to societal differences in body image perception, women currently being sampled in surveys tend to show less body dissatisfaction compared to their peers from 10-20 years ago (Lydecker et al., 2014).
- Body dismorpia disorder (BDD) can affect anywhere between 2.5% to 5.3% of the female populace, and those affected have 78% lifetime frequency of suicidal ideation and attempted suicide at the rate of 27.5% (Paven et al., 2008).
- In a study looking at the personality traits among obese women, body dissatisfaction played a significant role especially with those who have a higher level of neuroticism (Provencher et al, 2008).
- The motivation of how to change women's body dissatisfaction is important, since if it is appearance-based rather then health-based, there could be a high emergence of eating regulation (Verstuyf et al., 2012).
- Body image disturbance can be a stronger mediator of socialcultural pressures in girls then in boys (White & Halliwell, 2010).
- Women who have higher physical activity levels are drawn towards images related to exercise and physical activity, while women who do not work out were attracted to the images like a vaccum or cleaning (Berry et al., 2011).
- Cultural ideals of femininity as represented in television images are internalized by women. Once internalized, women often develop anxiety regarding their physical appearance and develop the habit of measuring themselves against those ideals in a way that can be detrimental (Hall et al., 2011).
- Among both teen and preteen girls, weight concern is a powerful motivator for tobacco use. Girls who are dissatisfied with their bodies are more likely to smoke as a means of weight control (Austin & Gortmaker, 2001; Kendzor et al., 2007; Neumark- Sztainer & Hannon, 2000).

Facts and Research Findings

Research on links between female body image and sports and exercise has been somewhat inconsistent. Physical activity can build feelings of competence and self-esteem; it also boosts metabolism, thus improving physical conditioning and, therefore, appearance (Hausenblas & Downs, 2001). However, several studies have found that

female athletes and/or exercisers have poorer body images than their less active peers (Parsons & Betz, 2001; Prichard & Tiggemann, 2008). Social physique anxiety can lead girls and women to either become more active in order to improve their appearance or to avoid social situations where their bodies will be on display (Hausenblas et al., 2004; Niven et al., 2009). For example, discomfort with wearing a swimsuit may be a barrier to swimming (James, 2000). The relationship between athletic participation and body image also depends on the sport; conventionally "feminine" sports may reinforce girls' acceptance of conventional cultural standards of female beauty, whereas non-traditional sports may ease the pressure to conform to those older standards.

- Exercise tends to have a positive effect on body image over time. In one study, college women who participated in a 12-week program of either aerobic exercise or circuit strength training reported significant improvements in body image compared to a non-exercising control group (Henry et al., 2006).
- The promotion of exercise as a way to lose weight is not optimal for women in midlife in terms of motivation and sustainable participation. "Daily well-being" might be a better frame to promote positive body image and exercise to women in midlife who are overweight. This was not found to be true for men (Segar, Eccles, & Richardson, 2011).
- Intervention programs emphasizing physical activity can serve as effective tools for reducing body dissatisfaction and improving body-esteem (Ciccomascolo & Grossi, 2008; Huang et al., 2007).
- Sports participation tends to have a positive effect on body image over time. In one study, women who participated in organized sports prior to college reported having a significantly better sense of positive body image while in college (Richman & Shaffer, 2000).
- In a recent study, aerobic exercise yielded significantly greater improvements in social physique anxiety than strength training for women. However, both aerobic exercise and strength training will lead to significant improvement to overall body image concerns for women with pre-existing conditions (Martin Ginis et al., 2014).
- Girls who participate in sports or athletic activities traditionally considered "feminine" or aesthetic, such as cheerleading, dance, or gymnastics, are more likely to report being ashamed of their bodies, feeling overweight, and actively trying to lose weight than girls who don't participate in sports (Crissey & Honea, 2006; Parsons & Betz, 2001).
- On average, female athletes are more likely to have positive a body image and less likely to consider themselves overweight than female no-nathletes (Hausenblas & Downs, 2001; Miller et al., 2000).
- According to Sabo and Veliz (2008), girls participating in three or more sports per year are more likely to

have high scores on body-esteem measurements at all grade levels.

- According to McVey et al. (2010), preliminary findings have shown that if peer health educators could have a positive influence on how students view their bodies, they could help boost student's resilience and help prevent the onset of eating disorders.
- The type of physical activity can actually matter for women; an increased participation in yoga has a negative association with self-objectification, but cardio-based workouts were positively linked to self-objectification (Lovemark, 2009).
- Placing more emphasis on health reasons helps buffer self-objectification in women and encourages better adherence to exercise programs (O'Hara et al., 2014).

There are positive links between positive body image and engaging in moderate exercise. Another positive link exists between engaging in exercise and healthy eating habits that boost the body image (Wood-Barcalow et al., 2010).

Self-Esteem

Background

Self-esteem, a positive or negative evaluation of one's own worth, is a key indicator of psychological well-being (Rosenberg, 1989). Self-esteem is a product of two factors: a sense of competence or self-efficacy based on our performance or accomplishments and an awareness of how others perceive us (McGee & Williams, 2000). Research on the health and behavioral consequences of self-esteem has been hampered by methodological weaknesses and should not be considered conclusive (McGee & Williams, 2000); some researchers argue that the relationships in question have been significantly exaggerated in popular perception (e.g., Goodson et al., 2006). However, some studies have found links between low self-esteem and substance use (Boden et al., 2008; Swaim & Wayman, 2004; Wild et al., 2004a); sexual risk-taking (Ethier et al., 2006; Spencer et al., 2002); depression and suicidality (Orth et al., 2008; Wild et al., 2004b); and unhealthy eating behavior (Martyn-Nemeth et al., 2009). Women, especially in adolescence, consistently suffer from lower self-esteem than their male peers, particularly in specific areas relating to appearance and physical competence (Gentile et al., 2009, Quatman & Watson, 2001).

- In Western cultures, girls tend to experience a significant decline in self-esteem over the course of adolescence, with the most severe loss found in white girls (Baldwin & Hoffmann, 2002; Biro et al., 2006).
- One important reason for low female self-esteem is that advertising, media in general, and popular culture pervasively sexualize girls and young women (American Psychological Association, 2007).
- For many girls, low self-esteem is linked to negative perceptions of weight, body fat, and body mass (Dunton, Jamner & Cooper, 2003).

- The link between self-esteem and sexual behavior differs considerably by gender; one study found that boys were more than twice as likely to be sexually precocious if they had high self-esteem, while girls were three times as likely to be sexually precocious if they had low self-esteem (Spencer et al., 2002).
- Links between low self-esteem and depression are particularly strong. Both can be buffered by social support and social connectedness (Orth et al., 2008; Williams & Galliher, 2006).
- College women between the ages of 18 and 25 with higher body mass indices (BMI) and body fat tend to base their self-worth on appearance more than women reporting lower body weights. Self-esteem was found to be lower among college women who had higher body weights (Moncur et al., 2013).

Facts and Research Findings

Research is divided on whether exercise and physical activity have positive impacts on women's self-esteem (e.g., Fox, 2000) or not (e.g., Tiggemann & Williamson, 2000). This is due, in part, to a shortage of randomized, carefully controlled research studies that successfully isolate the influence of exercise itself from other factors that influence self-esteem, such as family dysfunction and/or poverty. Studies of the influence of sports participation on overall self-esteem also have had mixed results. One key area in which women and men differ is in athletic or physical self-esteem, a difference that can be seen early in the life span. Among children who play sports, boys report higher athletic self-esteem and perceived athletic competence than girls, a gender gap that increases during adolescence (Jacobs et al., 2002; Klomsten et al., 2004). The strongest findings suggest that sport affects girls' global self-esteem in indirect ways: by influencing other psychosocial factors that, in turn, contribute to a sense of physical and overall self-worth. For example, the relationship between sports participation and global self-esteem may be mediated by peer acceptance (Daniels & Leaper, 2006), sport self-concept (Slutzky & Simpkins, 2009), social connectedness (Armstrong & Oomen-Early, 2009), attachment to school (Tracy & Erkut, 2002), enjoyment of sports (Shaffer & Wittes, 2006), physical competence (Bowker, 2006), positive body image, and gender-role flexibility (Richman & Shaffer, 2000).

- Research shows that sports participation is positively associated with self-esteem in elementary school girls (McHale et al., 2005), 12th-grade girls (Dishman et al., 2006), and college women (Armstrong & Oomen-Early, 2009). There is also evidence that noncompetitive physical activity has the capacity to positively impact self-esteem in girls (Eddy, 2014).
- Tensions over gender-appropriate behavior can complicate the link between sports participation and self-esteem because female athletes risk being perceived as masculine by their peers (Daniels & Leaper, 2006; Richman & Shaffer, 2000). In one study, 11th-grade girls who endorsed a strongly feminine gender-role orientation had lower self-esteem if they

played competitive sports but higher self-esteem if they played recreational sports that were more socially oriented and less competitive (Bowker et al., 2003).

- The more time girls spend participating in team sports, the better they feel about their athletic abilities and the higher their level of self-esteem. The same link has not been found for individual sports (Pedersen & Seidman, 2004; Slutzky & Simpkins, 2009).
- Positive links between sports participation and girls' self-esteem have been found for white, African-American, and Hispanic girls (Erkut & Tracy, 2002; Schmalz et al., 2007; Tracy & Erkut, 2002; Simona et al., 2010).
- The indirect impact of sports participation on self-esteem has a shelf life of at least several years. In one study, preadolescent girls who played sports (ages 9–11) reported higher self-esteem two years later (Schmalz et al., 2007); in another study, women's pre-college sports participation predicted their self-esteem during the college years (Shaffer & Wittes, 2006).
- In a study of Dutch adolescent girls between the ages of 13 and 18 (N=140), more than 80% reported participating in sport for a variety of reasons. Girls who were motivated to participate in sport because of weight reduction reasons had lower self-esteem and higher body dissatisfaction than girls who participated in sport for other reasons (enjoyment of the sport, for example) (de Bruin et al., 2009).
- Research shows that girls who exhibit low self-esteem paired with depression, may stop playing sports due to increased doubt in playing ability (Jerstad et al., 2010).
- Female college students who were learning how to swim for the first time exhibited an increase in self-esteem during the learning process (Muhamad et al., 2013).
- In middle-aged women, increases in physical activity helps to increase self-efficacy and overall self-worth. This also mediates the changes caused by menopause (Elavsky, 2010).
- Data indicates that both self-esteem and self-concept will increase as a consequence of exercise treatment for women (Garcia-Martinez et al., 2012).

Pathogenic Weight Loss Behavior

Background

Eating disorders are on the rise in the United States, affecting as many as 10 million Americans (National Eating Disorders Association, 2009), more than 90% of whom are female (Hoek & van Hoeken, 2003; Mitchell & Bulik, 2006). About 1% of women meet the diagnostic criteria for anorexia nervosa, a condition in which distorted body image and intense fear of gaining weight lead to voluntary starvation. Bulimia nervosa, a cyclical pattern of binge eating and purging, affects 1–2% of women. More than 3% of women

suffer from a recently recognized third condition, binge eating disorder (Hudson et al., 2007).

Far more common is a subclinical but maladaptive pattern of disordered eating that includes the use of dangerous weight-control techniques, such as self-induced vomiting; fasting; use of laxatives, diuretics, or diet pills; and excessive exercise (CDC, 2008; Neumark-Sztainer, 2005). Pathogenic weight control is associated with nutritional deficiencies, chronic fatigue, decreased bone density, erosion of tooth enamel, menstrual and reproductive abnormalities, lowered self-esteem, anxiety, and depression (Academy for Eating Disorders, 2009; Courtney et al., 2008; Fairburn & Harrison, 2003). For individuals with eating disorders, compulsive execise may render treatment more difficult because compulsive exercise can be a sign of relapse when the exercise is being done in order to control weight (Meyer et al., 2011; Taranis & Meyer, 2011; Halmi, 2013).

Eating disorders are most common among adolescent and young adult women; 86% of cases report onset by age 20, and some girls have been diagnosed as young as age 7 (National Association of Anorexia Nervosa and Associated Disorders, 2004; Ricciardelli & McCabe, 2001).

- Anorexia nervosa has the highest mortality rate of any mental illness; as many as 20% of cases end in death, according to some estimates (Eating Disorders Coalition, 2009).
- Unhealthy weight control behaviors are common among young women who are not eating-disordered. Nearly half of the college women in reported attempting to compensate for the effects of eating by fasting (11.3%), exercising vigorously (16.3%), or both (15.4%) in the past month (LePage et al., 2008).
- More than half of adolescent girls use health-compromising weight-control techniques, such as skipping meals, fasting, smoking cigarettes, vomiting, and taking laxatives (Neumark-Sztainer, 2005). Overweight girls are especially prone to use these strategies (Neumark-Sztainer et al., 2007).
- High school girls are more likely than boys to report that in the past month they have fasted for 24 hours or longer (16.3% vs. 7.3%); used diet pills, powders, or liquids without a doctor's advice (7.5% vs. 4.2%); or vomited or taken laxatives (6.4% vs. 2.2%) to lose or avoid gaining weight (CDC, 2008).
- African-American women are at lower risk for anorexia and bulimia than white women, in part because they are less likely to adopt excessively thin beauty ideals (Perez & Joiner, 2003; Striegel- Moore et al., 2003). However, women of color are at no less risk for binge eating disorder and some pathogenic weight-control techniques (Crago & Shisslak, 2003; Taylor et al., 2007).

Facts and Research Findings

Female athletes are at elevated risk for pathogenic weight control behavior. In conjunction with amenorrhea and osteoporosis, eating disorders are part of a "Female Athlete Triad" that undermines health and (ironically) athletic performance (American College of Sports Medicine, 2007; Manore et al., 2007). Sports participation may be a risk factor for eating disorders because unique pressures to maintain a specific body weight and shape; personality traits commonly found in athletes, such as perfectionism, competitiveness, and compulsiveness; as well as competition-related anxiety may play a role in disordered eating (de Bruin et al., 2009; Gulker et al., 2001; Holm-Denoma et al., 2009; Hopkinson & Lock, 2004). Pathogenic weight-control techniques may even be perceived as "normal" within an athletic context, such as ballet dancers who routinely purge or gymnasts who stop menstruating due to self-imposed dietary restrictions.

- Eating disorders are most common in aesthetic sports that are scored on appearance or form (e.g., dancing, figure skating, or gymnastics); after puberty, the small-breasted, narrow-hipped ideal for these sports is difficult to attain without pathogenic weight-control techniques (Bonci et al., 2008; Engel et al., 2003; Greydanus & Patel, 2004; Ryan, 1995; Sundgot-Borgen & Torstveit, 2004).

- Lean sports (e.g., running, swimming, or cycling) may also invite pathogenic weight-control behaviors. Adult women have about 25% body fat; elite female distance runners, 12–16%; and elite female sprinters, 8–10% (Greydanus & Patel, 2004). One recent study found 3% of non-lean-sport athletes at high risk for disordered eating but a much greater percentage (25%) of lean-sport athletes were at risk (Reinking & Alexander, 2005).

- Athletes often face significant social or financial pressure to regulate their body weight or shape. Failure may be noted and sanctioned by coaches, spectators, judges, and the athlete herself (Beals & Manore, 2002; Muscat & Long, 2008).

- Unsurprisingly, the most common weight-control behavior used by female college athletes is exercise. In one study, one-fourth of athletes exercised at least two hours a day for weight-related reasons—in *addition* to their sport training (Greenleaf et al., 2009).

- Elite athletes are at greater risk for pathogenic weight-control behavior than those who compete at a lower level or participate in recreational sports only (Sundgot-Borgen & Torstveit, 2004; Smolak et al., 2000).

- An NCAA study found that 9% of female college athletes have clinically significant problems with bulimia and 3% have clinically significant problems with anorexia. Weekly binge eating is reported by 11%, while 5.5% reported purging through self-induced vomiting, laxatives, or diuretics (Johnson et al., 1999).

- Among Division III female athletes who completed a survey assessing their eating behaviors (binging, purging, restrictive food choices), exercise behaviors, and attitudes toward body image and weight reduction, 27.7% exhibited risky eating behaviors that could develop into eating disorders. The responses of over a quarter of the female athletes in the study (n=436) situated them on a continuum of risky eating. Nearly 6% of female athletes who completed the survey had a clinical eating disorder (Sears et al., 2012).
- Pathogenic weight control also occurs in younger athletes. In one study, 19.6% of female high school athletes reported disordered eating in the past month (Pernick et al., 2006). A second study found middle and high school girls to be at least twice as likely to use vomiting, laxatives, or steroids if they participated in weight-sensitive sports (Vertalino et al., 2007).
- In a study, 24% of the figure skaters studied that showed a greater risk of eating pathology. Those skaters tended to be older and had higher body mass indices (BMIs) than the skaters without elevated risk to eating pathology (Dwyer et al., 2012).
- Some pathological eating habits become normalized in elite sporting cultures since it is believed that a certain diet or weight will give the athlete an edge (Williams, 2012).
- Physical activity levels of women who recovered from anorexia did not differ from women who showed no history of pathological eating; however, the BMIs of the recovered women were typically 2 points lower (Dellava et al, 2011).
- While the vast majority of female college athletes in the sports of gymnastics and swimming and diving (n=414) were found in a study by Petrie et al. (2009) not to display signs of disordered eating, a third of those athletes did report some level of eating disturbance.

A study using the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) to define eating disorders found that such disorders were present in 31% of elite female athletes in "thin-build" sports (such as gymnastics and distance running), compared with 5.5% of non-athletes (Byrne & McClean, 2002).

SECTION V. EDUCATIONAL AND SOCIAL DIMENSIONS

American girls faced gender bias in both education and athletics throughout most of the 20th century. Young girls were not pushed to pursue their own career goals, and society expected women to depend on their husbands in order to survive. Similar to sports, certain academic subjects (e.g., science and mathematics) and careers (e.g., researchers and engineers) were labeled "masculine" by many educators and school advisors (Damarin, 2000). Recently, however, girls have made progress overcoming societal stereotypes by excelling in academics. The pro-education orientation of young females is further demonstrated by the fact that 87.6% of girls graduate from high school (versus 52.8% in 1970) and 29.6% of women earn a college degree or higher (versus 8.1% in 1970) (U.S. Bureau of the Census, 2012). Accordingly, these numbers indicate a 40% increase in the percentage of girls who graduate high school and a 73% increase in the percent of women earning college diplomas since 1970.

Over the past few decades, several major reviews of the empirical literature have typically found that participation in sports is positively associated with many different educational outcomes (Farb & Matjasko, 2012; Feldman & Matjasko, 2005; Holland & Andre, 1987). In general, sports participation has been shown to improve both girls' and boys' academic outcomes, with some studies suggesting that girls may gain an additional academic advantage due to their involvement in sports when compared to boys (Hanson & Kraus, 1998, 1999; Pearson, Crissey, & Riegle-Crumb, 2009; Veliz & Shakib, 2014).

Sport and Academic Gains

Background

Contrary to the notion that participation in sports depletes students' mental and physical energy that could have been otherwise devoted to academic endeavors (Coleman, 1961), the majority of research shows that participation in high school athletics is actually linked to improved academic performance (Farb & Matjasko, 2012; Feldman & Matjasko, 2005; Holland & Andre, 1987). The positive academic outcomes derived from sport participation may include better grades, fewer disciplinary problems, increased attendance, and a greater desire to attend college. Both athletic participation and academic performance are influenced by lots of factors, including socioeconomic background, race and ethnicity, the quality of a school system, and family encouragement. Overall findings show

that sports are an asset for both girls and boys across diverse racial/ethnic and economic backgrounds.

Facts and Research Findings

- A national study of U.S. public high schools found that schools with higher sport participation rates for girls and boys reported significantly fewer crimes (on school grounds) and suspensions during the school year (Veliz & Shakib, 2012). Moreover, higher sports participation rates for girls and boys across U.S. high schools has been found to be associated with higher AP math, AP science, AP foreign language, and overall AP enrollment rates (Veliz & Shakib, 2014).

- The positive effect of sports on academics appears to be similar, if not stronger, in girls than boys (Crosnoe, 2001, 2002; Hanson & Krauss, 1998, 1999; Sabo, Melnick, & Vanfossen, 1993; Pearson, Crissey, & Riegle-Crumb, 2009; Veliz & Shakib, 2014). Positive effects may vary, however, depending on sport, and may be mediated out by racial and ethnic group (Eitle & Eitle, 2002; Hartmann, 2008; Sabo, Veliz, & Rafalson, 2013).

- With respect to the differences in academic outcomes across specific types of sports, a nationwide study of eighth-, 10th-, and 12th-graders found that participants in tennis and soccer were more likely to report an A as their average grade, study for 10 or more hours during a typical week, and have strong aspirations to graduate from college than their peers who did not participate in these sports (Sabo, Veliz, & Rafalson, 2013). However, the same report found that participants in wrestling were less likely to report an A as their average grade, less likely to study for 10 or more hours during a typical week, and less likely to have strong aspirations to graduate from college than their peers who did not participate in this sport (Sabo, Veliz, & Rafalson, 2013).

- In a comprehensive review of the literature pertaining to high school sport participation and educational attainment, Hartmann (2008) concluded, "research has time and again demonstrated a strong and positive correlation between high school sports participation and academic achievement." (p. 3)

- With regard to educational success, interscholastic athletics have a similar positive effect to endeavors, such as band, debate, music, and art, that are commonly considered more "intellectual" (Barber, Eccles, & Stone, 2001; Darling, Caldwell, & Smith, 2005; Eccles & Barber, 1999; Eccles et al., 2003; Marsh, 1992).

- Student-athletes in high school tend to do better academically over time (Crosnoe, 2002; Eccles & Barber, 1999; Marsh & Kleitman, 2003; Videon, 2002).

- A longitudinal study of 22,696 high school students in 1,052 schools found that both female and male athletes had higher grades, higher educational

aspirations and less school-related discipline problems than non-athletes (Fejgin, 1994).

Sport and Academic Gains among Girls Only

Background

For many years girls were pushed away from traditionally "masculine" disciplines, such as math and science (Sax et al., 2009), due to a belief that boys had an "innate ability" for math and science while girls possessed a "natural dislike" for these subjects (Halpern et al., 2007; Hyde & Mertz, 2009; Kiefer & Sekaquaptewa, 2006, 2007). For many girls, this meant that the educational doors leading to technical and scientific careers were closed in their faces.

It is increasingly evident that the gender disparity in math performance between boys and girls is a reflection of cultural expectations rather than hardwired differences between the sexes (Halpern et al., 2007; Hyde & Mertz, 2009). Despite what some have characterized as a general aversion to math and science, a significant number of young girls are beginning to enroll in honors courses and girls' performance on the math portion of the SAT has improved. Further, as Halpern et al. (2007) point out, the differences between women's and men's math- and science-related abilities and choices are far more subtle and complex than the oft-stated, oversimplified, perception that men are "better" than women in math and science.

Facts and Research Findings

Contemporary studies that have found that female athletes are most likely to show gains in male-dominated academic areas, such as math and science, have used a combination of functionalist and critical feminist theories to interpret why females in sport perform better academically in male-dominated educational domains. These studies argued that participating in sport, a "male-dominated" domain, not only teaches female athletes skills and values necessary for success in academics, but also provides a social environment that challenges gender stereotypes about female limitations in other primarily "masculine domains" such as math and science (Hanson & Kraus, 1998, 1999; Pearson, Crissey, & Riegle-Crumb, 2009; Veliz & Shakib, 2014). In other words, these studies theorize that sports participation provides a unique cultural environment for female athletes to challenge stereotypical assumptions about femininity (e.g., men are innately better at math than women).

- A recent study of a nationally representative sample of 4,644 public high schools (2009-2010 school year) found that AP (Advanced Placement) enrollment rates in math (4.32% versus 4.22%), science (4.91% versus 4.09%), and foreign language (3.29% versus 1.93%), as well as enrollment in at least one AP course (18.97% versus 13.53%) were higher for girls than boys. Interestingly, this study also found that schools with increased female representation in sports (e.g., a 1-to-1 gender equity ratio with respect to sports participation)

also had higher female representation in AP science courses (but not math or foreign language) (Veliz & Shakib, 2014).

- High school girls who play sports are more likely to do well in science (Hanson & Kraus, 1998, 1999). Research on the relationship of sport type to academic success in science suggests that females involved in sports that challenge gender stereotypes may manifest better academic success in science classes compared with girls who participate in more "feminine" sports (Crissey, Pearson, & Riegle-Crumb, 2005).
- Using National Educational Longitudinal Survey data, Eitle (2005) found that for female students in grades 8 and 10, the academic achievement benefits in math, science, and history may be greater, and more consistent, for white girls who participate in team and individual sports (with the exception of softball or basketball) than girls from other racial and ethnic groups.
- One study followed a nationwide sample of 11,683 high school students between their sophomore (1980) and senior years (1982). Compared to female non-athletes, female athletes reported greater access to, and more positive attitudes toward, science and math courses. These findings were especially marked among white females from higher socioeconomic backgrounds (Hanson & Kraus, 1998).
- A nationwide sample of 8,325 young women was studied between their eighth-grade year (in 1987-88), through their sophomore year and senior year, and finally two years after high school (1994).Sports participation had a positive effect on math and science access, attainment, and attitude, with the strongest influence occurring in the sophomore year (Hanson & Kraus, 1999).

SECTION VI. ATHLETIC INTEREST AND PARTICIPATION

Interest in Sports

Background

Title IX opened the doors of athletic opportunity for girls in 1972; since that time female athletes are participating increasingly at all levels of American sports. While data exist on female participation rates in sport, little is known about what gets girls interested in sports and physical activity and maintains that interest over time.

Facts and Research Findings

Why some young girls take an interest in physical activity and sports while others do not has attracted the attention of researchers. Cooky (2009) points out that it is not enough to provide structures of opportunity for girls and women to participate, but one also must attend to how women and girls are being included. Girls get involved with sports for many reasons, including self-image, body-image, peer support, parental encouragement, presense of role models, cultural supports, and not encountering barriers to their participation. Girls and their families also need program resources, safe venues, and opportunities to participate in school and community sports programs. A growing body of research reveals:

- When middle school students from four schools were asked about their perceptions of barriers to participation, girls perceived that there were more barriers to participation than boys did, despite the fact that the schools had equivalent percentages of female and male athletes and there were no major differences between boys and girls in terms of playing sports outside of school. Reasons offered for why girls believed that they had more difficulty accessing sport opportunities included more chores and responsibilities at home, less social approval for playing sports, and less self-confidence about their involvement in sport (Casper et al., 2011).
- Using a focus-group format, 24 middle schools students aged 11 to 13 of various skill levels (11 high-skill, 11 moderate-skill, two low-skill) discussed their attitudes about competitive sport within physical education classes. More than half of the group (14) were girls. When given adequate time to develop skills in a caring atmosphere, students indicated that they had positive feelings about physical education

class. When students throughout the class were not supported in order for them to get better and feel confident playing, the greater the gap between skilled and unskilled classmates, where unskilled classmates stood around and were not as engaged (Bernstein, Phillips, & Silverman, 2011).

- Having facility support for programs was found to have a positive impact on the amount of time girls participated in physical activity in a study that examined the degree to which schools were open to sharing facilities with community programs. For schools that entered into arrangements with after-school community programs, there was an increase in the number of minutes girls engaged in after-school physical activity (Kanters et al., 2014).

- Program offerings that appealed to girls affected their enthusiasm and interest in physical education. In a study of 83 high school girls that asked about their preferences for activities offered in physical education class, 74% expressed an interest in fitness activities, compared to 18% who preferred sport units because of competition and skill development. Among the reasons why girls preferred fitness activities, they indicated that fitness activities promoted health, were fun, offered variety in class options, engaged them in being more physically active, were easier to do than skill-based sports activities, and could be continued outside of school (Kanters et al., 2014).

- In a survey measuring athletic participation among 46,596 students (23,153 girls and 23,443 boys) from 54 middle schools and 36 high schools in the Southwest part of the United States, 69.1% of the girls and 73.4% of the boys reported participating in at least one sport. When considered by racial and ethnic group, black, Hispanic, and white boys all were significantly more likely to participate than girls. Girls were less likely to participate in sport as they got older, with eighth- grade girls being 1.98 times more likely to participate than 11th-grade girls. (Pharr & Lough, 2014).

- In Pharr and Lough's (2014) survey of middle and high school students in the Southwest, they found, contrary to most research, that black girls' observed participation in at least one sport was 10.42% higher than expected, while observed participation among white girls was 5.79% less than expected. Students from low socio-economic status (SES) participated more than expected, and high-SES students less than expected. In offering an explanation for why black girls participated more than the national average, they noted that the sports offered by the schools were diverse and that black girls participated in all sports (some more than others). They speculated that attention to the needs of diverse population was reflected in the way these schools ran their programs and the numbers reflected that sensitivity.

- Pharr and Lough's (2014) study of sport participation among middle and high school students reported participation rates that were higher than those reported in the 2009 Center for Disease Control and Prevention Youth Risk Behavior Surveillance (YRBS) national survey. While YRBS data reported boys' participation at 63.4%, participation rates for boys in this study were higher at 73.4%. YRBS participation rates for females were 52.4%; in this study, girls' participation was reported at 69.1%. Black girls reported participation rates of 76.3%.
- A study of 20 middle school girls explored their attitudes toward participating in physical education classes. Findings indicate that when girls of that age feel connected to encouraging teachers, those who emphasize participation and effort over skill per se and who create a safe environment for girls both emotionally and physically, the girls want to compete and stay involved in PE classes. (Constantinou et al., 2009).
- In Bradford and Keshock's (2010) study of 88 NCAA Division I female athletes in the Southwest region of the United States, factors affecting their persistence to play included a lack of free time, a feeling of being overextended, lack of playing time, injury, and their sport no longer being fun to play.
- Holden, Keshock, Forester, Pugh, & Pugh (2014) found that, among NCAA Division I female athletes playing basketball, tennis, softball, track and field, and volleyball, levels of vulnerability for burnout varied by sport. Female basketball players registered high rates of emotional exhaustion and feeling of depersonalization compared to other female athletes in the study. Volleyball players were less likely to experience feelings of personal accomplishment than other athletes, and tennis players were found to be the least likely to experience burnout due to high feelings of personal accomplishment.
- Girls who engage in more "masculine" childhood activities, such as dodge ball, basketball, or football, were more likely to get involved with organized sports (Giuliano, Popp & Knight, 2000).
- Girls who played in mainly male or coed groups as children were more likely to participate in sports later in childhood (Women's Sports Foundation, 1988; Giuliano, et al., 2000).
- Girls (and boys) in grades 4 to 6 are more likely to show interest in physical activity if their parents encourage them, enjoy physical activities themselves, and model a physically active lifestyle (Green & Chalip, 1997; Brustad, 1996).
- For middle school girls, perceptions of belonging (e.g., being part of a team, being with friends, and acceptance by others) were very much related to their interest in, and enjoyment of, physical activity and

sport (Allen, 2003; Prochaska, Rodgers, & Sallis, 2002; Smith, 1999).

- One study of high school girls revealed the main reasons for quitting sports were injury (26%), time conflicts (18%), conflict with coaches (16%), and boredom (14%) (Stewart & Taylor, 2000).
- A study of teenagers in the ninth, 10th, and 12th grades found that, for both girls and boys, peer relationships played a key role in their continuing involvement in, and commitment to, their sport (Patrick, Ryanb, Alfeld-Liro & Fredericks, 1999).
- A survey of more than 500 college students found that the number-one reason female athletes persisted in their participation in a sport was "personal fulfillment" (62%). The most commonly cited reasons for leaving their sport were "other activities prevented participation" (51%) and "low perceived ability" (17%) (Martin, 1997). Excessive commitment to a special sport talent can lead to feelings of entrapment and "burnout" among some female athletes (Weiss & Weiss, 2003).
- Urban girls, especially girls of color, often face unique barriers to participation. Many have jobs to supplement family incomes, while others take care of siblings at home. In some ethnic groups, girls may lack parental support for athletic participation (Place, 2004).
- Through focus group interviews with Hispanic students aged 12–18, Carter-Pokras et al. (2006) found that the students and their parents were positive about physical activity and exercise but believed there were too few programs in Montgomery County (MD). Additionally, other barriers to participation identified in the study included: programs were too costly, lack of transportation, parental English ability, program staff and neighborhood concerns, not having time, and home chores. Findings supported a recommendation to develop more programs for Hispanic adolescents.

New research is exploring in finer detail how gender, along with social class and race, affect opportunities for girls to participate in sport and physical education. In a nationwide study of girls and boys in grades 3 through 12, as well as their parents, a complex picture of gender differences in athletic opportunities and physical activity emerged (Sabo & Veliz, 2008). Selected findings from this study include:

- Similar rates of sport participation exist for girls and boys in suburban communities. However, girls are less involved in sport than boys in urban and rural settings.
- In general, boys overestimate their interest in sport while girls underestimate their interest. Of the children in grades 3 through 8 described as non-athletes, 42% of boys indicated that "sports are a big part of who they are" compared with 16% of girls.
- There is a marked gender gap in physical education (PE), with 84% of urban girls and 68% of rural girls

reporting no PE classes in the 11th and 12th grades (Sabo & Veliz, 2008).

Youth Sport and Physical Activity

In Sabo and Velez's (2008) study, Go Out and Play, girls participated in a wider array of physical activities while boys' menu of activities generally focused on more traditional forms of sport and exercise (e.g., baseball, basketball, football). While dance appeals to girls of all ages, volleyball is especially popular among middle-school girls. Basketball engages boys across all grade levels, and skateboarding is popular among third- to fifth-graders.

- While basketball, swimming, and jogging/running/cross-country are popular with both girls and boys, dancing and football are gender-specific activities.
- There is a gender gap in physical activity. About four in 10 boys (39%) exercised six to seven days per week, compared with 26% of girls. Girls are also slightly more likely than boys to be physically inactive, i.e., 27% of girls and 21% of boys exercised on two days or less per week.
- The gender gap in physical activity widens when activity levels are traced across grade levels. As girls get older they are less likely to engage in high rates of physical activity (five days or more a week), while more boys remain highly involved with physical activity from childhood through high school.
- The steepest decline in physical activity is seen among Asian girls as they move into their high school years.

According to a U.S. Government Accountability Office (GAO) report (2010) focusing on sport opportunities offered through schools for students with disabilities, girls' projected participation rates were 14% points lower than boys' projected rates between the ages of 6 to 12 years and 13 to 18 years.

High School Sports and Physical Activity

Background

Over the course of the past three decades, critics have questioned whether too much emphasis is placed on the link between Title IX, increased opportunities for girls and women to participate in sport and physical activity, and the resulting potential for improvements in their overall health. However, a study examined just that link by examining the health of high school girls during the decade of the 1970s (when Title IX was first implemented). Results show that an increase in activity levels had a beneficial effect on the health of adolescent girls. The 20-point increase in girls' participation in sport in the immediate aftermath of Title IX's passage yielded a 24% increase in physical activity levels (Kaestner & Xu, 2006; Lewis, 2007). It is through the lens of Title IX that current levels of female participation in sport and physical activity at the high school level should be weighed, as well the existing shortfalls evaluated.

Facts and Research Findings

Using 1972 as a baseline, the increase in the number of girls who participate in high school sports is nothing short of spectacular.

- In the 1971–72 school year, 294,015 girls participated in varsity sports. In 2013-2014, the number of girls participating in high schools sports increased for the 25th consecutive year, setting a record of 3,267,664. This number represented an increase of 44,941 in girls' participation from the previous year (National Federation of State High School Associations, 2014).
- According to the National Federation of State High School Associations, the five most popular sports in terms of participation number for girls in high school during the 2013-2014 academic year were track and field (478,885); basketball (433,344); volleyball (429,634); soccer (374,564); fast-pitch softball (364,297); cross country (218,121); tennis (184,080); swimming and diving (165,779); competitive spirit squads (120,593); and lacrosse (81,969).
- Girls' participation in what have historically been called "nontraditional" or "masculine" sports continues to rise as well. The data for the 2013-2014 school year show a female presence in riflery (1,168); 11-player football (1,715); baseball (1,066); wrestling (9,904); weight lifting (9,277); ice hockey (9,150); and water polo (18,899) (National Federation of State High School Associations, 2014). It should be noted, however, that what researchers consider nontraditional and "masculine" sports may not be regarded that way by girls themselves.

While the absolute increase since the early 1970s in the number of female high school athletes has been impressive, the percentage of females playing varsity sports during the past decade has remained relatively stable at 41%, with a slight increase of about a half of a percentage point during that time, up to 41.9% from 41.5% (National Federation of State High School Associations, 2014).

- According to a Women's Sports Foundation study (Sabo & Veliz, 2011), while there was progress towards gender-equitable high school participation in athletic programs between 1993-94 and 2005-06, that progress slowed after 2000.
- Boys at the high school level received a larger proportion of athletic opportunities than did girls between 1993-1994 and 2005-2006 in all communities (i.e., urban, suburban, town, and rural) (Sabo & Veliz, 2011).
- The lowest percentages of athletic participation opportunities in general were found in urban schools; the highest percentages in rural schools (Sabo & Veliz, 2011).
- School districts with greater financial resources offered more athletic opportunities for their students – both

boys and girls – than did school districts with limited financial resources (Sabo & Veliz, 2011)

- Across the board, opportunities for girls to participate in athletics was proportionately less than for boys between 1993-1994 and 2005-2006 in all geographic regions, including the Northeast, Midwest, South, and West. (Sabo & Veliz, 2011).
- While females make up approximately 49% to 50% of the high school population (Davis & Baughman, 2013), female athletes had access to only 41.9% of athletic opportunities in 2013-2014, a gap of eight to nine points. In contrast, male athletes had access to 58.8% of playing opportunities (National Federation of State High School Associations, 2014).
- Contrary to the time period between 2004-2005 and 2008-2009, when participation rates for female athletes dropped slightly from 41.4% to 4.3%, the years between 2009-2010 and 2013-2014 evidenced a slow but modest increase, from 41.3% to 41.9% (National Federation of State High School Associations, 2014).
- In real numbers, female athletes in the 2013-2014 academic year had 1.26 million fewer athletic opportunities than male athletes had (National Federation of State High School Athletic Associations, 2014).

There are also troubling indications that declining rates of participation in physical education and exercise also include younger children, especially in poorer communities and school districts.

- According to the U.S. Youth Risk Behavior Survey (Kann et al., 2013), 57.3% of male students in grades 9 through 12 participated in at least 60 minutes of physical activity per day at least five days during the week. Female participation at that level was 20 percentage points lower, at 37.3%.
- More females than males did not participate in at least 60 minutes of physical activity at least once per week (19.1% of female high school students, compared to 11.2% of male high school students) (U.S. YRBS, 2013).
- When participation patterns from the U. S. YRBS (2013) were considered by race and ethnicity, African-American and Hispanic female students participated less in physical activities throughout the week than did white females. The percent of African-American, Hispanic, and white female students who did not participate in at least 60 minutes of physical activity once a week was 27.3%, 20.3%, and 16.3%, respectively.
- In terms of the percentage of female students who participated in at least 60 minutes of physical activity at least five days a week, white females participated at a higher rate (40.5%) than black (29.3%) and Hispanic (35.4%) females (U.S. YRBS, 2013).

- In a study of how children behave on playgrounds, 39.7% of boys and 37.3% of girls engaged in moderate to vigorous physical activity (MVPA). The difference in the amount of activity boys engaged in compared to girls was statistically significant (Anthamatten et al., 2014).
- An examination of recess physical activity among children participating on school playgrounds revealed that girls evidenced a tendency to participate in a variety of activities while boys gravitated to sport-related activities. Girls were more inclined to run on the playground than boys were (82% to 76.9%). The most popular specific activities for boys were "kick" and "throw" (55% and 55.6%). In turn, the most popular specific activities for girls were "talk" (71%) and "swing" (55%) (Stellino & Sinclair, 2014).
- There were gender differences in the types of activities that boys and girls participated in on the playground. Girls were found to engage in significantly more participation on the "monkey bars," on the "swings," playing with the "big tire," doing activities associated with "balance," "gymnastics," and "skipping." Boys, on the other hand, were significantly more involved in "football," "soccer," and "kick ball" (Stellino & Sinclair, 2014).
- Adolescent girls are significantly less likely than boys to report that they have sufficient levels of vigorous physical activity in their lives (Centers for Disease Control and Prevention, 2002; U.S. Secretary of Health and Human Services and U.S. Secretary of Education, 2000).
- In 2007, the percentage of male students participating in at least 60 minutes of physical activity per day was 43.7%, compared to 25.6% of female students. Whereas 33.2% of male students attended PE classes daily, only 27.3% of female students did so (Eaton et al., 2008; U.S. Department of Health and Human Services, 2008).
- In the Youth, Education, and Society Study, data were gathered regarding participation levels of students in sport and physical activity for the years 2003 through 2005. Although more than 91% of eighth-grade students took physical education classes, only slightly more than one-third of high school seniors did. Varsity sport participation remained consistent across grade levels, with boys participating at a higher rate than girls (37.4% to 33.7%) (Johnson et al., 2007).
- In the Youth, Education, and Society Study, student participation in intramural activity declined for both boys and girls between eighth and 12th grade; boys' participation decreased from 24% to 16%, and girls' participation decreased from 21% to 13% (Johnson et al., 2007). Almost 50% fewer female students in grades 11 and 12 attended PE classes daily than male students did (Centers for Disease Control and Prevention, 2002).

- In one softball league for girls in the largely Dominican Manhattan neighborhoods of Washington Heights and Inwood, child-care responsibilities were a significant issue in reduced athletic participation for girls, along with an increasing lack of parental support as girls grew older (Baker, Freedman & Furano, 1997).
- Overall, male students (87.7%) in physical education classes are significantly more likely than female students (78.8%) to have exercised 20 or more minutes during an average PE class (Centers for Disease Control and Prevention, 2002).
- Recess and physical education are disappearing from urban school schedules (Halpern, 2003).
- Boston boys participate in about 50% more sports and physical activity programs than do girls (Cradock et al, 2002).
- Just over one-fourth of New York City high school girls (26%) participated in high school sports in 1997, compared with 42% of girls nationwide (Centers for Disease Control and Prevention, 1999).
- Of the children who live less than a mile from their schools, fewer than one in five children walk to school on a regular basis (Centers for Disease Control and Prevention, 2002).
- In research compiled by the federal government, 14% of young people reported no recent physical activity. Inactivity was more common among females (14%) than males (7%) and among African-American females (21%) than white females (12%) (Surgeon General of the United States, 1996). Many girls who want to become physically active, particularly poor girls and girls of color, face unique obstacles.
- The majority of youth programs and drop-in centers for older children and adolescents have male-oriented, if not male-dominated, cultures. Although they are welcome and some sports activity is co-ed, girls sometimes feel marginalized (Halpern, 2003).
- Some gender-associated constraints to physical activity for girls include lack of role models, social pressures, body image issues, and fewer sports choices. Girls also lack parental encouragement, a significant factor because reportedly they rely on such encouragement more than boys (Team up for Youth, 2002).
- Girls sometimes feel less safe in public recreation spaces and use those spaces more for social than for physical purposes, including watching boys play sports (Team up for Youth, 2002).
- Nationwide, 51.7% of students are enrolled in PE class. Approximately one-third (32.2%) of students nationwide attend a PE class daily. There are no significant sex differences in participation in ninth and 10th grade, but by grade 11, male students (30%) are significantly more likely than female students (15.6%) to have attended PE classes daily. In grade 12, males (26.1%) are significantly more likely than females (14.7%) to

have attended a daily PE class (Centers for Disease Control and Prevention, 2002).

- Substantial declines in physical activity occur during adolescence in girls and are greater in African-American girls than in white girls. One study of 1,213 African-American girls and 1,166 white girls conducted over 10 years from the time the girls were 9 or 10 to the ages of 18 or 19 found a 100% decline for African-American girls and a 64% decline for white girls in media activity scores. By the age of 16 or 17 years, 56% of the African-American girls and 31% of the white girls reported no habitual leisure-time activity (Kimm et al, 2002).

The discrepancies in the number of females participating in sport and physical activity are often attributed to a lack of inherent interest in sports on the part of girls and women. Although the size of the growth in women's sport from 1972 to the present, in every sector of the sport enterprise around the world as well as in the United States, provides evidence that biological determinism doesn't account for girls' and women's participation shortfall, there are persistent stereotypes that subtly discourage girls from participating in sports and research illuminates factors that contribute to these stereotypes:

- Based on interviews with 44 basketball players (25 females, 19 males) from socioeconomically diverse high schools, Shakib (2003) suggested that communication within a family, particularly between parents and female athletes, can be modified in a way that encourages females to participate in sport. For example, the experience of mothers who had not participated in sport was interpreted by males to mean that their mothers were not interested in sport without consideration for the fact that their mothers may not have had opportunities available to their sons and daughters. Similarly, for girls whose mothers are known to have curtailed their athletic experience due to family and home obligations, there was a tendency for subjects to develop stereotypical expectations that females give up their athletic careers earlier than male athletes. With modest prompts (i.e., discussing female athlete role models in the home or female athletes who have children and careers), there is the potential for both female and male athletes to adjust their views about what female athletes can achieve.

- When male and female high school basketball players were asked to recall formal and informal sport experiences they had as children; results revealed that the females in this study had fewer opportunities to play single-sex sports and were more likely to "gender-cross," meaning that they had played on a mixed-gender team in order to play a sport they liked. They also reported that their high school popularity was contingent on emphasizing traditional femininity and downplaying their athleticism (Shakib, 2003).

- In a study of 17 NCAA Division I female head coaches, parental influence was identified as key to them

having had the opportunity to participate in sport that led to their careers in athletics. Specifically, parents supported these future coaches by attending games and providing the logistical support necessary to allow their daughters to compete. Mothers, in particular, played a role in creating an atmosphere in which sport participation seemed appropriate for girls, especially during adolescence. The female coaches in this study also credited their parents with offering them encouragement without pressure (Dixon, Warner, & Bruening, 2008).

College Sports Participation

Background

While female athletes participated in college sport throughout the 20th century in small enclaves around the country, it would take the passage of Title IX in 1972 to foster a social revolution in the United States that embraced the values of sport for women not simply as a pastime but as a serious pursuit that held the prospect of athletic scholarships for performance, television exposure for the elite, and the possibility of professional sport careers in selected sports (beach volleyball, women's basketball, women's soccer). The thousand-fold increase of athletic participation opportunities for female athletes in the nation's colleges and universities attest since 1972 attests to this the progress that has been made. At the same time, with Title IX's stipulation that sex-segregation may remain intact within athletic departments, some of the challenges of achieving equity remain up for debate and discussion. The patterns documented here reflect both the progress that has been made and the challenges that remain.

- Between 1971–72 and 2000–01, overall female participation in college athletics increased from 15% to 42%. The increase among women of color was 7% to 15% for that time period (Women's Sports Foundation, 2003).
- According to the *NCAA Sports Sponsorship and Participation Rates Report 1981-82 – 2013-2014,* female athletes received 47.86% of athletic opportunities in the academic year 2013-2014 compared to 52.14% for male athletes across Divisions I, II, and III (Irick, 2014).
- In the NCAA's most elite division, Division I, male participation rates were 20% higher than those for female athletes (60% to 40%) (Irick, 2014).
- Across NCAA divisions, the lower the division the more gender equitable the athletic programs. Thus, at the Division III level, female athletes received 54% of athletic opportunities compared to 47.86% at the Division II level, and 40% at the Division I level (Irick, 2014).
- While the participation rates within NCAA Division III may appear favorable and suggest a pattern of opportunity that addresses proportionality concerns under Title IX, the fact that female participation ratios

fluctuate sometimes dramatically suggests that the figures reported may warrant greater review and understanding. For example, between 2012-13 and 2013-14, there was a nearly eight-point drop in the rate of participation for female athlete in NCAA Division III from 61.7% to 54.0% (Irick, 2014).

- What further complicates the reading of data related to participation rates as reported by colleges and universities is the issue of whether schools are engaging in numbers manipulation in an attempt to comply with Title IX regulations by double-counting female athletes and suppressing the number of male athletes who participate on teams (Beidiger v. Quinnipiac, 2012; Galles & Staurowsky, 2013; Thomas, 2011; Women's Sports Foundation Statement, 2012).
- During the 10 years between the years 1995–96 and 2004–05, the number of females participating in college athletics grew by 26,000. The rate of growth, however, slowed in the last four years of this time frame (Cheslock, 2007, 2008).
- Both men and women's participation levels have increased over the last 25 years (Cheslock, 2007, 2008).
- Early growth in women's college sports favored sports with the highest level of racial and ethnic diversity. In recent years, growth is seen in women's sports characterized by less diversity because NCAA schools already sponsor most of the sports with high representation among female athletes of color (Cheslock, 2008).
- During the 2007–08 academic year, according to the NCAA, approximately 412,768 athletes participated in the varsity sports for which the NCAA sponsors championships. Of that group, 57.4% were male. The average NCAA member institution provided 232 athletic opportunities to males and 168 athletic opportunities for females (DeHaas, 2009).
- In 1978, the average number of athletic teams that colleges and universities offered to female athletes was only slightly greater than 2.00; the average number of athletic teams offered had grown to 8.65 by 2007 (Acosta & Carpenter, 2008).

Facts and Research Findings

Despite these gains in participation, gender inequalities persist.

- Few intercollegiate institutions provide participation opportunities for female athletes in proportion to the number of women in the general student body. For 2005–06, females comprised approximately 55% of all students attending NCAA member institutions. Across all divisions, with the exception of Division I non-football, 41% to 45% of all athletes were women. For schools in the highest division without football teams, women comprised almost 50% of the athlete population (DeHaas, 2008).

- Within the average NCAA Division I athletic department in 2005–06, male athletes received 55% ($2,175,200) of the scholarship money available, while women received 45% ($1,799,000) of those funds (DeHaas, 2008).
- During the 2005–06 academic year, NCAA Division I athletic departments devoted 68% ($247,300) of available recruiting dollars to male athletes,with 32% ($115,900) allocated to recruit female athletes (DeHaas, 2008).
- In an analysis of Equity in Athletics Disclosure Act (EADA) data for 555 public two-year institutions, women made up 55% of the overall student population during the four-year time period between 2003–04 and 2006–07. However only 37% of athletic opportunities were available to women, resulting in an 18% gap in athletic equity. In real numbers, while female athletes had access to 25,576 playing opportunities in 2006–07, their male counterparts had access to 44,778 opportunities (Staurowsky, 2009).

Incentives for Future Careers in Sport

Background

In the first two decades following the passage of Title IX, much of the research on women in the sport workplace dealt with issues pertaining to the representation of women in college coaching and administration. In recent years, a growing body of research has expanded that frame to include the career paths of women serving in a wide range of positions within the vast array of sport organizations.

More women than ever before are working in the sport industry, occupying positions at every level. They work as executives for professional franchises, conference commissioners, broadcasters, marketers, sports medicine professionals, coaches, and administrators. Despite increased numbers, women remain in the minority within the sport workplace.

A consistent finding across the expanse of this research is that, despite more female athletes than ever before participating in the sport system, obstacles persist for women who wish to be leaders and decision-makers in the sport industry. The career aspirations of young women often collide with the gender barriers that exist in most male-dominated sport organizations.

Facts and Research Findings: Women in College and High School Coaching and Administration

Very little research exists gauging the involvement of women in high school coaching and athletics administration. In one of the few studies focused on this area, only 10% of the 423 high school athletic directors surveyed were female. When the male and female directors were given opportunities to apply for promotions to the position of athletic director, the females were as successful as their male counterparts (Pedersen & Whisenant, 2005). However, the question of when those opportunities arise is important. In many instances, the position of athletic director was paired with

the position of head football coach. In those circumstances, women were not likely to apply. This is borne out in a study of 301 job advertisements. Of those positions advertised, 73% (220) required the applicant to coach a boys' sport, predominantly football (94%) (Miller, Whisenant, & Pedersen, 2007).

- Recent studies by LaVoi (2014) reveal that women have made slow inroads into the ranks of head coaches at the high school level.
- According to LaVoi (2014), 27% of all head coaches are women, and women comprised less than 40% of the coaches working with female athletes.
- In contrast, 7.5% of coaches working with male athletes were female (LaVoi, 2014).
- White (2012) reported that 15% of high school athletic directors were women, based on a figure provided by the NIAAA.

Within state high school associations, women are far outnumbered by men.

- In 2012-13, 6% of state high school association executive directors were women (Staurowsky & Proska, 2013).
- Thirty-three percent of state high school association deputy executives, associate, assistant, and manager levels were filled by women in 2012-13 (Staurowsky & Proska, 2013).
- In state high school associations, the only job categories in which women dominated, at 95%, included administrative assistant, officials secretary, and office manager (Staurowsky & Proska, 2013).
- At the board of director's level of the National Interscholastic Athletic Administrators Association (NIAAA) in 2012, women comprised 13% of the board (two out of a 15-member board) (Staurowsky & Proska, 2013).

A 37-year national study of women in leadership positions in college and university athletic programs, conducted by researchers Vivian Acosta and Linda Carpenter (2014), substantiates that despite the gains in girls' and women's participation since 1972, women lost considerable ground in the areas of program leadership and decision-making.

- In 1972, 90% of all the coaches of women's college and university athletic teams were women. By 2014 women represented 42.9% of head coaches of NCAA women's sports teams (Acosta & Carpenter, 2008). For 30 years, the percentage of women coaching men's intercollegiate teams remained under 2% (Acosta & Carpenter, 2004). Between 2004 and 2014, there was a slight up-tick with 2 to 3% of men's teams being coached by women (Acosta & Carpenter, 2014).
- Women administrators directed 90% of women's intercollegiate sports programs in 1972, compared with 32.4% of such programs in 2013-14 (Acosta & Carpenter, 2014).

- In American college and university athletic departments, 12.1% of the head sports information directors were women as were 27.3% of the full-time athletic trainers (Acosta & Carpenter, 2014).

Whereas the Acosta and Carpenter (2014) study provides baseline data to demonstrate this decline, several other studies in recent years have yielded findings that offer insight into the perceptions of female college athletes and the degree to which they aspire to pursue careers in athletics. They also provide possible explanations for why there are so few women coaches and athletics administrators at the college level.

- A three-part study of NCAA member institutions in 2007-08 examined the perceptions of female athletes, coaches, and athletics administrators about careers in athletics. Approximately 30% of 8,900 female athlete respondents indicated they would likely or very likely have a career in athletics or exercise science. Of that group, 16% indicated that their long-term career goal was to work in college athletics (Bracken, 2009).

- Of the nearly 70% of NCAA female athletes who indicated that they did not anticipate pursuing a career in college sport, 70% expressed a desire for a higher salary than they could expect to earn in college coaching, while approximately 60% of respondents expressed concern about the time demands of the job. When asked to identify reasons they believe qualified women leave careers in intercollegiate athletics, NCAA female athletes identified time requirements (37%), salary (27%), and unfavorable gender discrimination (11%) as the top three (Bracken, 2009).

- The perception among female college athletes that coaches of women's teams are not compensated equitably is borne out in a study of head coach and assistant coach salaries for colleges and universities in the state of Ohio between 2002–03 and 2005–06. Using EADA data, the wage gap for coaches of women's teams increased during those four years from approximately $7,500 to $13,440. There was also a gap in assistant coach compensation favoring coaches of men's teams, with assistant coaches of women's teams earning on average $5,000 to $6,000 less than assistant coaches of men's teams were making (Staurowsky, Morris, Paule, & Reese, 2007).

- In the 2005-2006 NCAA Gender Equity Report (DeHaas, 2008), the average Division I athletic department spent $1,202,400 on salaries for male coaches and $659,000 on salaries for female coaches. Athletic departments, on average, spent $1,128,110 on salaries for male assistant coaches and $481,700 on salaries for female assistant coaches.

- In a study of 201 (100 males, 101 females) Division I athletes measuring intentions to coach and identifying perceived barriers to entering the coaching profession, women collegiate athletes expressed less interest in coaching at all levels except the youth/recreational

level than did their male counterparts. Results mirrored the absence of female coaches at each level, where women athletes were less inclined to consider coaching at Division I and professional sport, arenas where there are fewer female coaches (Kamphoff & Gill, 2008).

- In the Kamphoff and Gill (2008) study, female college athletes were more likely to agree that women coaches receive different treatment than men coaches, evidencing an awareness that discrimination does exist in the coaching ranks.

- Female athletes may, in fact, be basing their perceptions on their observations of the few female coaches with whom they interact. According to the 1,475 female coaches in another study, 32% believed that they did not have work-life balance in their careers. Work-life balance appears to be even more difficult to achieve for female athletics administrators. Of the 1,107 surveyed for this study, 40% indicated they did not have balance between their work and personal lives (Bracken, 2009).

- Using an online focus group interview format, 41 mothers who are Division I head coaches discussed issues related to conflicts between work and family. Results indicated that work-family conflict affects work outcomes, including staffing patterns, relationships with athletes, and team performance, as well as relationships at home, where they feel diminished time for children, spouses or partners and other family members. Head coaches who were mothers also commented on the guilt and exhaustion they experience and their efforts to maintain perspective and balance (Bruening & Dixon, 2007).

- Documenting the experiences of five college coaches, Cruz (2009) explored what she called the "microcompetitions" that are the hallmarks of a female coach's experience and very existence working in a male-dominated setting. She found that female coaches face a number of dilemmas on a daily basis – routine lack of respect from colleagues, challenges in being seen as competent, threats to their economic and personal survival - as they attempt to maintain their equilibrium in a culture that is both hypercompetitive and masculine.

- Reporting on the culture of athletic departments and workplace expectations, Dixon and Bruening (2007) found that a large majority of women head coaches (38 out of 41) believed there was flexibility in work situations that allowed for bringing children to the office, working at home when necessary, and otherwise adjusting to the demands of work and family. Three of the coaches reported a work environment that was very different, stressing that colleagues and administration were not as tolerant of women bringing children to work and noting that supervisors believed accommodations to family life disrupt time in the office.

- According to 70% of the female coach respondents and 95% of female athletics administrators studied, qualified women do not apply for open positions in coaching and athletics administration. Further, 40% of the female administrators and 60% of the female coaches believed that the most qualified applicants, regardless of gender, are being hired (Bracken, 2009).

- Regarding hiring of women in college sport, 83% to 84% of the female administrators in the 2007- 08 NCAA study agreed that there was gender discrimination in athletics administration specifically as well as in athletics in general (Bracken, 2009).

- According to the Coaching and Gender Equity (CAGE) Project (Drago et al., 2006), the imbalance in the lives of coaches and athletics administrators does seem to have a substantive foundation. Based on Census 2000 data, full-time male coaches reported working 2,600 hours per year, while full-time female coaches were putting in 2,400 hours per year, far above the averages for women and men in other occupations.

- Describing a "family-unfriendly" work culture, the CAGE report documented that men college coaches were just as likely to be married as other men, while women coaches were far less likely than their female counterparts in other occupations to be married (29.8%, compared to 55.3%) (Drago et al., 2006). Although there may be myriad reasons why female coaches may be less likely than their male counterparts to be married (sexual orientation being one, women in sport possibly being more independent), nevertheless there is considerable support not just in this study but in the larger discussion regarding work-family conflict to identify this as an issue for coaches and for young women aspiring to become coaches. To further compound this picture, lesbian coaches in same-sex relationships with children may potentially be in a less-tolerant atmosphere in terms of family culture than their heterosexual counterparts, either female or male.

When the college coaching and administrative ranks are examined through the intersection of race and gender, there are signs of progress as well as indicators that change still needs to happen. According to the Black Coaches Association (BCA) Hiring Report Card for 2011-2012, from the time the Hiring Report Card started in 2008, "there has been a marked improvement in the opportunities for people of color to become head coaches of women's basketball teams at FBS (Football Bowl Subdivision) institutions" (p. 14) with nearly 20% of head women's basketball coaches being women of color. While there has been a steady upward trend during the seven years of report card's existence, there is a great deal more to be done.

- In an examination of hiring practices and patterns for the academic year 2012-13 in NCAA FBS institutions and major athletic conferences, Lapchick, Farris, and Rodriquez (2012) reported that 90% of the presidents, 87.5% of the athletic directors were white, and 100% of the conference commissioners were white; 76%, 84.2%,

and 100% of the presidents, athletic directors, and conference commissioners were white males; and of the 366 campus leadership positions monitored in this study, 90.7% were held by whites.

- Given the pattern, Lapchick et al (2012) concluded, "The stagnant nature of diversity in campus leadership does not reflect the America that we know." (p. 1)
- According to NCAA Race and Gender Demographics for the 2013-14 coaches, athletics administrators, and conference commissioners, the stagnation that Lapchick et al. (2012) reported had not improved. Among head coaching ranks for women's teams, women comprised 39.8% (4,204 out of 10,554 positions in total.
- Thirty-four percent (34%) of women head coaches of women's teams were white. Black women comprised 3.2% of all head coaches of women's teams, with Native American/Alaskan Native, Asian, Hispanic/Latina, Native Hawaiian/Pacific Islander women as well as women of two or more races and non-resident aliens comprising one percent or less.
- Just over 20% of all directors of athletics were women, with 17% being white women, 2% being black women and the remaining one percent comprised of Asian and Hispanic/Latina women and women of two or more races.
- At the associate director of athletics level, approximately half are women. Of that group, the vast majority are white women (43%).

Facts and Research Findings: Women in Other Sectors of the Sport Workplace

- During the 2012-13 season, just under 25% of National Basketball Association (NBA) franchise owners were women, while women comprised less than two percent of chief executive officers, 18.3% of team vice-presidents, 21.9% of senior level administrators, and 35% of professional administration (e.g., managers, supervisors, or coordinators in areas such as marketing, promotions, and publications) (Lapchick, Gunn, & Trigg, 2012).
- Within the professional baseball industry, there has been little progress in the hiring of women. During the 2012 season, positions for majority owner, team vice-president, and senior team administrator were filled by 16.3%, 17.7%, and 26.9% of women, respectively (Lapchick, Costa, Sherrod, & Anjorin, 2012).
- Relying on data from the 2012 season, Lapchick, Costa, Sherrrod and Anjorin determined that 9% of National Football League (NFL) majority owners were women. As was the case in previous years; 3% of NFL chief executive officers and 15% of vice-presents were women. Women comprised 20% and 34% of senior and professional team administrators, while 1% of those announcing NFL games were women.

- Major League Soccer (MLS) has presented a mixed profile in terms of their hiring of women, being more likely to hire in the league office but less likely at the professional team level. Lapchick, Gunn, and Trigg (2012) assigned a failing grade to the MLS for their record of hiring into senior administration positions. In the 2011-12 season, there were no women owners or general managers, only 13% of vice presidents were women, and women comprised only 21% of senior administration.
- The Women's National Basketball Association (WNBA) exceeds all other professional sport leagues in the United States in terms of its record of hiring women and minorities. In 2011, the WNBA hired Laurel Richie as president. Richie became the first female of color to serve as head of a professional sports league. In 2012, the majority of employees in the league office are women (79%), while over half of senior administrators in the WNBA were women (Lapchick, Milkovich, & O'Keefe, 2012).
- Even in the most progressive league, the WNBA's record does evidence similar underrepresentation patterns found elsewhere in the sport industry. Women occupying chief executive officer positions and roles as presidents have fluctuated over time, from a high of 40% in 2010 to 13% in 2012 (Lapchick, Milkovich, & O'Keefe, 2012).
- In several job categories (head coach, general manager, and athletic trainer) the representation of women has declined over time. Between 1998 and 2012, the representation of women in WNBA head coaching jobs has declined from 70% to 42%; women general managers from 77% to 33%; and women athletic trainers from 100% to 63% (Lapchick, Milkovich, & O'Keepfe, 2012).

Facts and Research Findings: Female Athletes in the Workplace

Previous athletic participation has been found to be an asset and valued quality among global business leaders. According to a 2013 study issued by Ernst & Young, a corporation that does business around the world, women at the executive level were found to have participated in university sport more frequently than women who were in manager positions (55% to 39%).

The Ernst & Young (2013) study also found that more than 75% of women agree that adopting behaviors and techniques from sport in the corporate environment can be an effective way of improving the performance of work teams, which is a high management priority.

- Among female executives, 87% agreed that inclusive leadership, which attracts and encourages diverse perspectives and dissent, is an effective way of improving team performance (Ernst & Young, 2013).

- Similarly, in a 2012 study conducted by Catalyst, 82% of women executive indicated that they had participated in organized sports beyond elementary school.
- A clear majority of women (60%) credited athletic participation for helping to give them what they called a "competitive edge" in working with others in business environments (Catalyst, 2012).
- In interviews with women from business, education, and the military, Wentworth (2009) found that they believed that their sport participation helped to develop leadership qualities that they drew upon in their work as businesswomen. Exposure to competition, getting along and working as a team member, and having opportunities to be in charge were identified as formative experiences t created foundational skill sets.
- As a measure of what is happening in the sport workplace relative to women, a 2011 Turnkey Sports Poll of 1,100 senior level executives revealed that less than half had ever reported to a female supervisor during their career working in sport. In more than half of those polls (54%) those polled believed that women face more obstacles to success compared to their male counterparts working in the sport industry.

SECTION VII. EMERGING RESEARCH

Female participation in sport and exercise has substantially increased over the last 50 years, resulting in benefits to women's health. For many highly active females, however, there can be negative health consequences associated with exercise training that can affect reproductive, skeletal, and metabolic health. The identification of a clinical syndrome referred to as the Female Athlete Triad has helped to explain these effects and prompt research on prevention and treatment. The triad involves three interrelated components: low energy availability (EA) with or without disordered eating, menstrual disturbances, and low bone mineral density (BMD). A recent Consensus Statement provides the latest information on prevention and treatment of the female athlete triad (DeSouza et al. 2014). In the following section, three areas of emerging research are covered that compile studies done on the female athlete triad, summarize current knowledge about female athletes and injury, and introduce information regarding female athletes and energy drinks.

The Female Athlete Triad

Background

Despite the numerous important benefits that accrue to girls and women who participate in regular physical activity, a small percentage of females who exercise may fall victim to one or more serious medical conditions that are collectively known as the Female Athlete Triad. The Female Athlete Triad consists of three interrelated conditions that, in their most severe form, include low energy availability with or without eating disorders, amenorrhea, and low bone mineral density (Nattiv et al., 2007; DeSouza et al., 2014) Although any one of these problems can occur in isolation, inadequate caloric intake for a woman's level of physical activity represents the etiology of the female athlete triad.

Triad-related conditions begin to emerge when a female athlete, intentionally or unintentionally, fails to consume enough calories through the food she eats to meet the caloric demands of her sport and or overall energy expenditure. Female athletes may exhibit various behaviors that fall within the spectrum of disordered eating. They can range from skipping meals occasionally to severely restricting calories and engaging in pathological weight-control behaviors similar to those of individuals diagnosed with clinical eating disorders such as anorexia nervosa and bulimia nervosa (American Psychiatric Work Group on Eating Disorders, 2000).

Although female athletes make conscious decisions at times to cut back on eating and/or engage in excessive physical activity because of poor body image or a high drive for thinness (Sundgot-Borgen, 1994), female athletes may acquire eating disorders or manifest unhealthy

eating behaviors inadvertently as a result of heavy training schedules, decreased hunger, poor knowledge of nutrition, or lack of food availability throughout the day. Regardless of the reason(s), when a female athlete is operating with an energy deficit, her body responds physiologically by trying to conserve energy. Mirroring patterns found in undernourished populations, exercising women with Triad-related conditions have been found to exhibit lower resting metabolism, low body temperature, low body weight, and alterations in metabolic hormone profiles (De Souza & Williams, 2004).

When women who exercise do not consume enough calories to keep up with the physical demands placed on their bodies, they are likely to experience menstrual irregularities. The spectrum of menstrual disturbances observed in female athletes and exercising women can range from subtle changes in the menstrual cycle length to the absence of ovulation and finally to the complete absence of menstruation known as amenorrhea (De Souza & Williams, 2004). Individuals who display severe menstrual disturbances for a prolonged time experience what is known as hypoestrogenemia or low estrogen levels. Bone loss can result when hypoestrogenemia is combined with chronic energy deficiency (Nattiv et al., 2007). It is important to note that although metabolic, reproductive, and skeletal consquences make up the conditions included in the Triad, other physiological systems such as the cardiovascular, endocrine, immune, and gastrointestinal systems can be negatively impacted by the presence of low energy availability and or prolonged hypoestrogenemia (De Souza et al., BJSM 2014).

Similar to disordered eating and menstrual disturbances, there is a spectrum of severity for bone loss. Osteoporosis is the most severe form of bone loss afflicting amenorrheic athletes (see the earlier section on Chronic Diseases on page 45 for definitions and more information on osteoporosis). Current methods to assess bone are two-dimensional as in dual X-ray absorptiometry (DXA) and only determine bone mineral density (BMD) without measuring fully dimensional bone architecture or bone quality. Newer methods, including peripheral quantitative computed tomography (pQCT), axial quantitative computed tomography (QCT), and peripheral QCT (pQCT) are now being used to determine the effects of exercise, energy deficiency, and hypoestrogenemia on bone quality. Both energy deficiency and menstrual irregularities have been linked to bone loss (De Souza et al., 2008), as the preservation of bone mass and increased bone mass during growth and development depend on adequate energy and nutrient intake (calcium and vitamin D) as well as adequate exposure to estrogen as occurs with normal menstrual cyclicity.

Facts and Research Findings

The prevalence of eating disorders and bone loss has been discussed earlier in this report (see sections on osteoporosis, depression, and pathogenic weight-loss

behavior). This section will cover the third condition of the Female Athlete Triad, athletic amenorrhea.

Athletic amenorrhea is defined as the interruption of the athlete's menstrual cycle in the absence of any other factors or medical conditions classically associated with amenorrhea, such as pregnancy, hyperprolactinemia, thyroid disease, metabolic diseases, etc. (Golden & Carlson, 2008). Among the most significant findings regarding this prong of the Female Athletic Triad are the following:

- Clinical menstrual disturbances, such as amenorrhea or oligomenorrhea (cycles > 36 days), have been shown to range from 1% to 61% in exercising women and are documented at much higher rates than that in non-athletic women, for whom the prevalence is < 5%. Subclinical (less pronounced) menstrual disturbances, such as luteal phase defects and anovulation, occur in approximately half of exercising women. Self-reported menstrual history alone does not provide the appropriate information to indicate presence of menstrual disturbances (Gibbs, Williams & De Souza, 2013).
- The wide ranges of prevalence of menstrual disturbances are attributed to differences between sports in terms of the predisposition of athletes toward leanness, the aesthetic component of scoring, or the high energy demands of a particular sport (Gibbs et al., 2013).
- Subclinical menstrual disturbances, such as anovulation and luteal phase defects, can occur even in women who have normal-length menstrual cycles and report their participation in athletics to be largely recreational as opposed to competitive (De Souza et al., 1998).
- In numerous studies, BMD has been lower in amenorrheic athletes than in eumenorrheic athletes, athletes with regular menstrual cycles. Oligomenorrhea or amenorrhoea has also been associated with a two to four times greater incidence of stress fractures (Bennell, Matheson, Meeuwisse & Brunker, 1999) and low bone mass, particularly at the spine (Keen & Drinkwater, 1997).
- While no research has yet determined the minimum number of normal menstrual cycles per year necessary to prevent bone loss, irregular cycle lengths—as well as a history of irregular cycle lengths—have been associated with reduced BMD (Drinkwater, Bruemner & Chestnut, 1990).

When researchers evaluate bone loss and low bone mass, they often follow the criteria established by the World Health Organization, which are based on comparing individuals' BMD with that of an average healthy 30-year-old of the same gender and ethnicity. Definitions that apply to physically active and athletic premenopausal women and children are: for low bone mineral density, a bone mineral density Z-score between -1.0 and -2.0, and for

osteoporosis, a bone mineral density Z-score < -2.0 together with secondary risk factors for fracture (e.g., undernutrition, hypoestrogenemia, prior fractures) (Nattiv et al, 2007).

Recent studies have found that between 22% and 50% of female athletes suffer from osteopenia (compared with 12% of the general population), and up to 13% of female athletes suffer from osteoporosis (compared with 2.3% of the population) (Khan et al., 2002). While these statistics are certainly cause for concern, it's important to note that there are currently no epidemiological data directly linking fracture risk to low BMD in adolescents and premenopausal women. More research needs to be done to determine the risk of fracture in young athletes as it relates to BMD. It is important to note that bone stress injuries, including the spectrum of stress reactions and stress fractures, are more common in female athletes with menstrual irregularities and/or low BMD (De Souza et al., 2014).

In terms of bone health assessment, the International Society of Clinical Densitometry (ISCD) recently redefined its osteoporosis criteria for premenopausal women. Now, osteoporosis can be diagnosed if an individual's BMD falls at least two standard deviations below average (Z score: < -2.0) and there is at least one secondary clinical risk factor, such as chronic malnutrition, an eating disorder, hypogonadism, glucocorticoid use, or previous fractures. This new standard is widely accepted in some medical fields, but it may not be a perfect fit for female athletes, whose average BMD should be greater than that of the general population. The American College of Sports Medicine recommends that athletes whose BMD falls one to two standard deviations below average (Z score: -1 to -2) should be diagnosed as having low bone mass. A BMD (DXA) test result in this range is serious enough to warrant a referral for treatment.

Diagnosis & Treatment

Many physicians are not familiar with the Triad and are dismissive of its signs and symptoms (though considerable progress has been made in this area). Amenorrheic athletes are still frequently prescribed hormonal contraceptives to prevent or slow bone loss, but this does not address the underlying problem—it only addresses the symptoms. Contraceptives may normalize menstrual periods and provide exogenous estrogen, but the literature is undecided as to whether benefits to BMD result (Liu & Lebrun, 2006). In fact, long-acting progesterone-only contraceptives like Depo-Provera have been shown to cause bone loss, and the packaging now includes a warning to this effect. Nevertheless, this particular drug remains popular among athletes who feel normal menstruation impairs their performance. Moreover, newer preparations of oral contraceptive pills that contain ultra low doses of ethinyl estradiol may pose additional risks to skeletal health in young women. Athletes on birth control pills often believe they have addressed their Triad-related problems, and thus are probably not being counseled to improve dietary habits. As a result, they may continue to fall further down the energy availability spectrum, which can negatively affect

athletic performance, skeletal health, and overall health physiological function.

Few studies have determined the prevalence of the "full" Triad, i.e., the occurrence of all three components at the same time in the same individual. Using the new ISCD criteria, one study found the prevalence of all three components in elite athletes from a wide variety of sports to be similar to the control group (4.3% vs. 3.4 %) (Torstveit & Sundgot-Borgen, 2005). But in that study the control subjects were not strictly "non-athletes"—they exercised an average of five hours per week. Additionally, every Triad-positive control group member was overweight and had a history of pathological weight-loss behavior. Two other studies have found the existence of all three Triad components among 2.7 % of female college athletes and 1.2 % of high school athletes (Beals & Hill, 2006; Nichols et al., 2006). A recent review reported that a relatively small percentage of athletes (0%–15.9%) exhibited all three Triad conditions (nine studies, n = 991), and that the prevalence of all three Triad conditions in lean sport (LS) athletes versus non-lean sport (NLS) athletes ranged from 1.5% to 6.7% and from 0% to 2.0%, respectively (Gibbs et al. 2013).The major limitation of these studies that attempt to quantify prevalence of the "full" Triad is that none reported to date has menstrual status evaluated beyond reporting cycle length. Examining only menstrual cycle length will clearly minimize the presence of menstrual disturbances, such as luteal phase defects and anovulation, given that detailed hormonal evaluations are required to define these irregularities.

Facts and Findings

Ongoing studies are attempting to determine just how many "extra" calories are needed for normal menses to resume, but thus far it appears that even small increases in body weight, less than five pounds, can lead to subtle changes in metabolic hormones (reflecting modest positive changes in energy balance) and may be all that's required to resume normal ovulation and menstrual cycles.

Female Athletes and Injury

Injuries are routine occurrences in sport with considerable attendant costs, including the physical and emotional toll on athletes personally and the costs of medical treatment and rehabilitation. Until recently, analyses of the incidence and risk factors for sport-related injuries paid little attention to gender or to women's sport. With the dramatic rise in women's sport participation over recent decades has come a similar rise in the incidence of injuries among women athletes. This development has, in turn, prompted expanded research on injuries in women's sport. Much of the attention has been devoted to knee injuries, and specifically ruptures, or "tears" of the Anterior Cruciate Ligament or ACL. This review will first consider the available information on injuries in women's sport generally and then discuss ACL injuries specifically. Following this, information is presented on concussions, which also are gaining attention.

Background

The upsurge in women's sport participation that began in the 1970s was followed initially by reports of gender differences in patterns of injuries; these differences were subsequently attributed to training and conditioning programs. By the mid-1980s, literature on sports injuries reported that after conditioning programs had been instituted, men and women competing in the same sports demonstrated similar injury rates and while some exceptions were noted, injuries typically were understood to be more sport-specific than gender-specific (Arendt, 1994).

Understandings of the gendered basis of injuries began to change in the 1990s as growing evidence appeared of higher rates among women athletes of knee injuries and in particular ACL injuries. A particular source of interest was the publication of data compiled in the Injury Surveillance Program, formerly called the Injury Surveillance System or ISS, maintained by the National Collegiate Athletic Association (NCAA), the main governing body of university sport in the United States.

The ISS tracks injuries for 15 men's and women's sports across a sample of institutions and enables researchers to compare the incidence of different injuries across time and sports, as well as the circumstances under which they occur (for example, games and practices).

While rates vary across sports, in both men and women's sports sprains are by far the most common injury (Hootman, Dick, & Agel, 2007).

Female Athletes and ACL Injuries

ACL injuries account for 50% or more of all knee injuries (Joseph et al., 2013) and have been described as the "largest single problem in orthopaedic sports medicine" (Renstrom et al., 2008). ACL ruptures have considerable costs, including extensive loss of time from work, school, or sports, as well as the possible increase in the probability of chronic knee problems, including osteoarthritis. Knee injuries also are among the most economically costly of sports injuries, frequently requiring expensive surgery and rehabilitation (Joseph et al., 2013). These factors are irrespective of gender.

Incidence

A variety of analyses of the NCAA data highlight the rates of ACL injuries among women athletes with particular attention paid to gender differences in basketball and soccer, sports in which the rules of play are largely the same for men and women and thus gender comparisons are thought to be especially meaningful.

- Over a 16-year period, from 1988-89 to 2003-04, the rate of ACL injuries was .07 for men and .23 for women in basketball and was .09 for men and .28 for women in soccer. Both the rate of ACL injuries among women athletes and the gender gap remained stable over this period (Hootman, Dick & Agel, 2007).
- The NCAA data also showed that three of the four sports with the highest rates of ACL injuries were

women's sports (gymnastics, basketball, and soccer). The fourth sport with a high rate of this injury is spring football. All had significantly higher ACL injury rates than any other sport (Hootman, Dick & Agel, 2007).

- An analysis of ACL injury rates in a sample of U.S. high schools found that, overall, girls and boys had similar rates of ACL injuries, and, consistent with the NCAA data, the sports with the highest rates were football, girls' soccer, and girls' basketball (Joseph et al., 2013).
- An expanding body of research, employing different measures and samples from different countries provides further support for the finding that females have higher rates of ACL injuries than males when exposed to the same sport (Moses, Orchard & Orchard, 2012).
- Gender differences in the incidence of ACL injuries occur after the onset of puberty (Hewett, Myer, Ford, Paterno & Quatman, 2012).
- While research and commentary continues to focus on gender differences in rates, leading to a common belief that ACL injuries are a problem particular to women athletes, it is important to note that the highest incidence, that is number of ACL injuries, occurs in men's sports. Both the early analyses of collegiate athletes by Hootman, Dick & Agel (2007) and the more recent high school data reported by Joseph et al. (2013) indicate that football had the highest number of ACL injuries.
- The overall incidence of ACL injuries is low, constituting approximately 3% of all injuries in the NCAA sample (Hootman, Dick & Agel, 2007). Following from this, it is important to note that references to an "epidemic" of ACL injuries in women's sport are inaccurate.

Mechanisms of ACL Injuries

Research consistently demonstrates that the majority of ACL tears among women athletes are non-contact, that is to say, the forces applied to the knee at the time of injury were a result of the athlete's movements, not contact with another athlete or object (Shultz, 2008; Arendt, 2007).

- Typically, these injuries occur during planting, cutting, and landing maneuvers (Giugliano & Solomon, 2007).
- The occurrence of a high proportion of ACL injuries through non-contact mechanisms is significant, as it points to features of the athlete's movement and not the circumstances of the sport activity as the precipitating event for the injury.
- This presents possibilities for prevention through training to alter movement patterns. Accordingly, recent research has concentrated extensively on identifying and understanding the mechanisms whereby risk factors operate and following from this, prevention strategies that are based on understanding risk factors and mechanisms.

Risk Factors

Investigations employing different techniques, most notably video analysis, have identified gender differences in movement patterns that place athletes at risk for ACL tears. While these patterns are not exclusive to women, research suggests that females perform riskier neuromuscular patterns more often than men when doing similar sporting moves (Arendt, 2007; McLean, 2008). A variety of factors have been studied to determine why females are more at risk than males for sustaining a noncontact ACL injury.

The most extensive research has been directed to landing techniques and neuromuscular recruitment patterns, as well as anatomical and hormonal influences. Notable about these is that the first two offer the greatest potential for modification through training programs, whereas the anatomical and hormonal influences are largely not modifiable.

- Research on neuromuscular and biomechanical factors has examined factors such as muscle activation, strength, balance, control, and lower-extremity biomechanics. Deficiencies in these factors may leave athletes more susceptible to the knee motions that are considered mechanisms of ACL injury (Hewett et al., 2012).
- Research on anatomical factors has concerned knee geometry and alignment. Hormonal research has been directed to determine the influence of hormonal variations associated with menstrual cycle phase (Smith et al., 2012, part 1). There is also preliminary evidence of genetic influences on familial disposition to ACL injuries (Hewett et al., 2012; Smith et al., 2012, part 2) Research advances in these areas may enable the identification of individuals at higher risk, who may be targeted for interventions (Hewett et al., 2012).
- External risk factors, that is those external to the athlete, that have been identified for ACL injuries relate to shoe surface interaction and include weather, playing surface, and footwear (Smith et al., 2012, part 2). These factors may interact with those that are gender-related.
- Individuals who have sustained an ACL injury are at high risk for a subsequent ACL injury (Shultz et al, 2012; Smith et al., 2012, part 2).
- There is consensus that the causes of ACL injuries are multifactorial and risk factors operate in combination (Shultz et al., 2012)

Prevention

The main development in research on ACL injuries since the previous version of this report was issued is the growing attention to research on prevention and the accumulating evidence on the components of successful interventions to reduce the incidence of ACL injuries.

Prevention programs concentrate on reducing neuromuscular deficits that increase the incidence of ACL injury, and there is evidence that neuromuscular training reduces the level of risk factors (Hewett et al., 2012).

- Successful training programs involve extensive training volumes and time commitment on the part of athletes and coaches. These can deter the implementation of successful interventions (Hewett et al., 2012).
- Research in Norway on the reduction of ACL injuries in team handball provides evidence of the importance of a comprehensive approach to injury prevention. Results from the Norwegian experience emphasize the importance of educational initiatives to promote the importance of injury prevention and reinforce the importance of support and involvement by coaches and team and club officials (Myklebust, Skølberg & Bahr, 2013).
- There is growing recognition of the importance of the timing of prevention initiatives. The emergence of gender differences in joint laxity and neuromuscular control during maturation, coupled with a divergence in the incidence of injuries after puberty, indicates that injury prevention efforts should be introduced in preadolescence or early puberty (Hewett et al., 2012).

Future Research and Actions Needed

While there is evidence of the success of training programs to reduce the incidence of ACL injuries, research is needed to understand more clearly the elements of the programs that contribute to injury reduction, in order to improve their efficiency and effectiveness.

Publicizing the importance of interventions to reduce injuries and to gain the support of coaches and team and club officials could help to ensure compliance with training programs.

There also is a need to identify barriers and facilitators to maximize acceptance, compliance, and retention of community-based interventions to reduce ACL injuries (Shultz et al., 2012).

Concussions

Background

Because of the possibility of neurological damage, traumatic brain injuries are particularly serious and warrant attention. In recent years there has been growing attention to the problem of sport-related concussions, with much of this deriving from media reports of debilitating conditions arising from traumatic brain injuries (a category that includes but is broader than concussions) among male professional athletes, particularly in football and hockey. There also is growing attention to concussions across all levels of sport and among both male and female athletes in a range of sports.

A concussion is a brain injury induced by forces caused by a direct blow to the head, face, neck, or elsewhere on the body wherein force is transmitted to the head. Concussions typically result in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. In some cases, symptoms and signs may evolve over a

number of minutes to hours. It is important to note that in some cases symptoms may be prolonged (McCrory et al., 2012).

Information on concussions is particularly difficult to obtain because of variable definitions, clinical indicators and reporting procedures, including reliance on self-reporting.

Facts & Research Findings

Research on the incidence of concussions generally shows higher rates among female athletes at both the collegiate and high school levels. Particular attention has been given to analyses in soccer and basketball, in which men and women play by similar rules, and ice hockey, a sport that is largely similar in the men's and women's game with the important difference that intentional body checking is prohibited in the women's game. Data for all three sports show higher rates among females at both the high school and collegiate levels (Hootman, Dick & Agel, 2007; Dick, 2009; Rosenthal, Foraker, Collins & Comstock, 2014).

Even more alarming is that there is emerging evidence that indicates that female soccer players playing elite or select soccer before high school sustained concussions at a rate higher than their high school and college counterparts, most of whom continued to play despite experiencing symptoms, and less than half sought medical attention. Analyzing data collected over a four-year period from 351 players between the ages of 11 and 14 on elite and travel soccer teams, researchers at the University of Washington documented a concussion rate four times higher than the rate in the most recent study of high school soccer players (O'Kane, etal, 2014).

Findings of higher incidence of concussions among women athletes are a subject of debate. Reported gender difference in incidence may be the result of measurement differences, in the form of more frequent self-reporting by females or in injury surveillance and diagnosis, with greater attention among health professionals to identification of injuries in women's sport (Arnold, 2014; Dick, 2009).

There is little evidence on possible reasons for gender differences in the incidence of concussions. The greatest attention has been directed to head and neck size and musculature, although there is little evidence on how these figure in the mechanism of the injury. There also has been some discussion of hormonal influences, though again, there is little research on the role that hormones may play in the occurrence of the injury (Covassin, & Elbin, 2011).

There also is evidence of gender differences in the outcomes of concussions, with evidence suggesting that female athletes present more concussion symptoms acutely, take a longer period to recover from concussions, and report a greater number of and more prolonged post-concussion symptoms than do male athletes (Dick et al., 2009; Covassin & Elbin, 2011) .

As with data on gender differences in incidence, findings on presentation of symptoms and recovery are confounded by differences in measurement and reporting, as well as findings of baseline differences between men and

women on a variety of neurological variables (Covassin & Elbin, 2011).

The cornerstone of concussion management is physical and cognitive rest until the acute symptoms resolve and then a graded program of exertion prior to medical clearance and return to play. Evidence on the need for gender-specific protocols in the management of concussions is inconclusive (McCrory et al., 2013).

Among women, the mechanism of concussion is most often contact with a surface or ball, rather than with another player (Dick, 2009).

Prevention

A variety of strategies to prevent concussions have been identified, including equipment; rule changes and enforcement; refereeing; coaching technique; neck strength; emphasis on fair play; education; and legislation (Benson et al., 2013). There is varying evidence on each of these, and no conclusive evidence on the effects of any one strategy (Benson et al., 2013; McCrory et al., 2012).

Considerable attention has been focused on the use of protective equipment, including mouth guards and helmets. While there is evidence that this equipment can contribute to reduction of dental and facial injuries and skull fractures, there is limited evidence of their impact on concussions, which are caused by the impact of force transmission (Benson et al., 2013; McCrory et al., 2012).

There is evidence that individuals with a history of concussions have a lower threshold for subsequent concussions, which are also more severe. This risk of "second impact" concussion has prompted heightened attention to the management of initial injury, as a prevention strategy for subsequent injury. These efforts are focused on the importance of identifying the initial injury and proper management to reduce the risk of subsequent injury (Wilson, 2010).

Notwithstanding debates about the accuracy of findings of gender difference in the incidence, experience, and outcomes of concussions; there is agreement that concussions are a serious injury, with potentially serious consequence for all athletes, and growing awareness and attention to the problem of sport-related concussions are a important steps to addressing this sport-related health concern.

Energy Drinks

Energy drinks made their debut in the United States in 1997 with the introduction of Red Bull to American consumers (Chang, 2009). A product with global reach, Red Bull has sales that were estimated to reach $20 billion in 2013 in the U.S. market alone (Azagba, Langille, & Ashbridge, 2014). Two companies, Monster and Red Bull, generate about a fifth of the energy drink sector of the beverage industry (approximately $4 billion in sales) (Trefis Team, 2014). Corporate beverage giant, Coca Cola, has relied on energy drinks to help buffer the effects of modest

decreases in sales in the carbonated beverage category due to consumer concerns about high sugar and calorie content that have been attributed in part to the obesity crisis in the United States (Trefis Team, 2014).

Although constituting what appears to be a small percentage of the overall beverage market (Trefis Team, 2014), energy drink sales in the U.S. domestic market has soared, with sales increasing by 60% during a five-year span between 2008 and 2012 (Whiteman, 2014). Distributed across generations, estimates suggest that energy drinks are consumed by 68% of adolescents, 30% of adults, and 18% of children who are under the age of 10 (Whiteman, 2014).

The upswing in energy drink popularity is attributable in many ways to the obvious, the perceived cure for those needing a boost in their energy levels and stamina during the day that can be purchased over the counter in major retail outlets, including grocery chains, stand-alone convenience stores or ones connected to gas stations, and pharmacies. Featuring a universally familiar ingredient, caffeine, along with other substances such as vitamins and "natural ingredients," energy drinks were thought to be comparable to coffee and other caffeinated products when initially introduced (Fogger & McGuinness, 2011). Sometimes confused with sport drinks, energy drinks differ in purpose and design. While sport drinks are intended to help replenish the body with minerals, electrolytes, and carbohydrates after a vigorous workout, energy drinks contain stimulants believed to increase concentration and physical performance (Larson, DeWolfe, Story, & Neumark-Sztainer, 2014; National Federation of State High School Associations, 2011).

The fact that the levels of caffeine in energy drinks are unregulated and far exceed levels found in other caffeinated substances, such as soft drinks, coffee, and candy, has resulted in a growing awareness over time that there are genuine health risks associated with energy drinks for vulnerable populations, including athletes, children and teens, college students, and individuals with underlying health conditions (heart issues, as a case in point) (Atila & Cakir, 2010; Blair, 2014; Dikici, Saritas, Besir, Tasci & Kandis, 2012; Goldfarb, Tellier & Thanassoulis, 2013; Hoyte, Albert & Heard, 2013; Reynolds, 2010; Seifert, Schaechter, Hershorin & Lipshultz, 2011). Several anecdotal reports confirm that females have died after ingesting energy drinks (Faberov, 2014; Haiken, 2012). Energy drinks differ from other beverages because they are categorized by the U.S. Food and Drug Administration (USFDA) as dietary supplements. As a result, they are not subject to the marketing and ingredient regulations that are in effect for other beverages. This explains why energy drinks may have three or four times the amount of caffeine per fluid ounce that other products have (Larson et al., 2014).

With names like Venom, Burn, and Adrenaline Rush, the industry has come under fire for targeting children as potential customers. In a report issued by the Yale Rudd Center for Food Policy & Obesity, in 2013, beverage

companies spent $866 million advertising unhealthy drinks. The primary targets of that advertising were children and teens (Blair, 2014). While that advertising was dispersed across a range of products, including sugary as well as energy drinks, brands that generated the most interest in social media categories (Facebook likes, Twitter followers, and YouTube views) were Coca-Cola, Red Bull, Pepsi, Monster Energy, and Rockstar. A product called 5-hour Energy received 46 million views on Youtube, and the Red Bull YouTube channel features 4,200 different videos. From 2010 to 2014, Spanish-language TV advertising increased by 44% for sugary drinks and energy shots (Blair, 2014).

While some researchers report that athletes using energy drinks may realize a range of benefits, including greater alertness, improved focus, deferral of fatigue, modest or equivocal impact on weight loss, and increased performance (Duchan, Patel, & Feucht, 2010; Hoffman, 2010; Klepacki, 2010), energy drink use has been linked to adverse effects, most often in children, adolescents, and young adults with seizures, diabetes, cardiac abnormalities, or mood or behavioral disorders, or those who are taking certain types of medications (Seifert et al., 2011). Research studies document the combustibiity that results when energy drinks are mixed with alcohol (Attila & Cakier, 2011).

Facts and Findings

- According to the American Academy of Pediatrics, "energy drinks pose potential health risks primarily because of stimulant content; therefore, they are not appropriate for children and adolescents and should never be consumed." (Committee on Nutrition and the Council on Sports Medicine, 2011, p. 1188)
- Researchers at the Rudd Center for Food Policy & Obesity at Yale University reported that "Energy drinks are emerging as a public health threat and are increasingly consumed by youth internationally." (Pomeranz, Munsell, & Harris, 2013, p. 254)
- In a survey of U.S. parents, 85% agreed that warning labels should be placed on energy drinks (Pomeranz, et al., 2013).
- Of college students who used energy drinks, about 40% of them mixed energy drinks with alcohol (Attila & Cakir, 2011).

While there has been little research attention directed specifically to female athletes and their use of energy drinks, there are some findings that recommend greater attention to these trends.

- Among college students in Turkey, those who used energy drinks were more likely to be in the arts or in athletics (Attila & Cakir, 2011).
- Energy drinks, as pharmacologically active substances, have been associated with adverse effects on health. Among college-aged male athletes, the combination of energy drinks with alcohol has been associated with "toxic jock identity" (a sport-related identity that is anchored in propensity for risk taking and being

hypermasculine) (Ballard, Welborn-Kidd, & Clauson, 2011). While less is known about how this may affect female college athletes, the fact that female athletes use energy drinks at slightly lower levels than male athletes indicates they may be vulnerable to this as well.

- In a study of 462 college students who reported they were involved in some form of athetics, 85.9% reported that they had used energy drinks, dietary supplements, or prescription medications for the purposes of improving their athetic performance. Just over 80% indicated that they used energy drinks, while 64.1% used dietary supplements, and 53.3% used prescription medications (Hoyte et al., 2013).
- When college students who reported being involved in athletics were asked about their use of energy drinks, 84.95% of male athletes and 74.19% of female athletes reported using energy drinks (Hoyte et al., 2013).
- In a study of 2,793 boys and girls in grades 6-12, over a third reported consuming sport drinks, while 14.7% indicated that they used energy drinks. For both boys and girls, the consumptions of sport and energy drinks was related to higher video game use; sugar-sweetened beverage and fruit juice intake; and smoking. The use of sport drinks was positively related to higher moderate to vigorous physical activity rates and participation in organized sport for both genders (Larson et al., 2014).
- The National Federation of State High School Associations (2011) cautions that athletes should not use energy drinks for the purpose of hydration prior to, during, or after completion of sport activities, and athletes taking over-the-counter or prescription medication should first seek permission from a primary care provider before using energy drinks.
- Among college athletes who were alcohol users, 92% of them reported engaging in binge-drinking, while 47.6% combined alcohol and energy drinks. Just over 63% of male athletes and 60% of female athletes reported engaging in energy-binge-drinking, meaning that they had three or more combined alcohol/energy drinks on one occasion (Woolsey, 2010).

Media Representations of Women in Sport

In an age where media dominates the cultural landscape, how girls and women are represented in physical activity, as female athletes and as women working in an ever-growing and lucrative sport industry, speaks to possibilities for girls and women in sport and physical activity. By virtue of media being such a ubiquitous part of everyday life – with hundreds of television channels (broadcast and network), along with video content produced by myriad sources

(hand-held devices to major film studio productions), the immediate access of individuals to photographically document their lives through the modern form known as "selfies" (photographs taken by individuals of themselves and friends and shared on numerous social media sites including Facebook, Twitter, and Instagram) – there is no doubt that there are more images of girls and women participating in sport and physical activity. While the digital age offers unprecedented opportunities for girls and women to be celebrated for their participation and accomplishments, long-standing social stigmas born from attachments to gender boundaries and conceptions of masculinity and femininity continue to create tensions that females contend with in pursuing exercise, fitness, and sport activities for their health, well-being, and enjoyment, as well as the entertainment of others. Further, the propensity of media to focus on beauty and sex appeal rather than athleticism has undermined the ability of female athletes to be taken seriously (Daniels, 2009; Daniels & LaVoi, 2013). In the following subsections, the extent and type of media coverage and representation of female athletes will be presented along with discussions that occur regarding the uniforms that female athletes wear. As journalism professor Pamela Creedon (2014) wrote, "Yes, sports – and news – coverage is 24/7, but the full-court press for gender equity in sport – and news – reporting has yet to score. For the news(s) media, the values used to cover and construct representation of women athletes and women's sports have not changed." (p. 5)

Women's Sport History Is Missing History

Historically, women's sport has received little media coverage. As a consequence, the stories that are passed on about famous athletes across the spectrum (from local heroes to international stars) have been dominated by stories of men (legendary coaches and athletes, teams and events). Thus, the representation of women athletes in the present is decontextualized, offered up with less media infrastructure than that which exists for men athletes. Thus, women's sport is confronted with the reality of having to reassert its position, to stake its claim within each new generation. To illustrate, consider these findings from recent research:

- Women's boxing was included in the Olympic Games for the first time in 2012. At that time, media accounts characterized the sport for women as "still in its infancy" despite the fact that women have been competing in prize fights since as early as the 18th century (van Ingen & Kovacs, 2012).

- When those shortcomings in women's sport history are considered in light of the intersection between gender and race, there is evidence to show that female athletes of color are often invisible. As a case in point, until the work of van Ingen in 2013, the earliest mention of black female boxers was 1978. Her work revealed that black women had been participating in the sport of boxing as far back as 1882, with two women who

were trained by their husbands, Bessie Williams and Josephine Green.

- According to Knapp (2012), "As the history of women's football is unearthed, information regarding women playing on football teams in the early part of the 20th century has been uncovered." (p. 52)
- Writing about the structural barriers to girls and women participating in the sport of baseball, Ring (2009) wrote, "The contrived exclusion of girls and women [from the sport of baseball] ignores their long-abiding affection for and participation in baseball from the early 19th century onward." (p. 373)
- ESPNW, an attempt on the part of ESPN to recognize the vibrancy of the women's sport audience and an attempt to fulfill its claim as the premier site for women's sport, was launched in 2010. Among the efforts it has undertaken is a documentary series under the umbrella of ESPN Films entitled "Nine for IX," nine short films on the lives of some of the most influential and inspiring figures in women's sport (Hiestand, 2010; Wolter, 2013).

For Female Athletes What Is More Important: Accomplishments or Uniforms?

A natural inclination in considering what girls and women should wear when participating in sport and physical activity is optimization of performance and health benefits and comfort. The pressures associated with perceived femininity standards continue to hold sway, however, with some sport federations seeking to pass regulations dictating uniforms that will reinforce differences between female and male competitors and assure viewers that those differences are intact. Media controversies involving female athletes often emanate from conversations around their uniforms.

- Two breaking news stories in the lead-up to the 2012 Olympic Games involved women's attire, one involving the option that female beach volleyball players had to wear bikinis if they wished in competition and the permission that the International Olympic Committee granted for Muslim women to wear hajibs (garments that covered the head and hair) (Creedon, 2014).
- International boxing commissions and governing bodies have been attempting during the past decade to encourage female boxers in international competitions to wear skirts so as to distinguish them from male boxers to television and other viewing audiences (van Ingen & Kovacs, 2013). Brennan (2011) reported that the Polish and Romanian national women's boxing teams are required to wear skirts.
- While some federations have been concerned regarding female modesty and/or maintaining a visible distinction between female and male competitors, the Colombian women's cycling team caused a media firestorm in 2014 when riders elected to wear uniforms that were color-blocked, with red at the shoulders and on the thighs and gold in the mid-section. When

photographed, the uniforms gave the appearance that the riders were naked (Chappell, 2014). Deemed unacceptable by the International Cycling Union, Columbian cyclist Angie Tatiana Rojas was quoted as saying, "It's sad that it takes something like this for cycling, and women's cycling, to get this much press." (BBC Sport, 2014)

Media Coverage of Female Athletes and Women in Sport Media: Extent and Quantity

- An analysis of the media coverage of the 2012 Olympic Games revealed that gender frames that have been used for decades were still in operation (Billing et al., 2014).
- While social media in the digital age produced unprecedented coverage of women's sport during the 2012 Olympic Games, with 711,646 tweets being posted during the two hours of the U.S. women's soccer gold-medal performance against Japan, "there was little improvement in the construction and coverage of women athletes and women's sports." (Creedon, 2014, p. 3)
- According to Cooky and LaVoi (2012), readers are "more likely to see a female athlete in her swimsuit lounging on a beach than in her uniform on the field" (p. 44) as a result of the increasing trend in sexualizing female athletes for male audiences.
- From two decades ago, television coverage of female athletes has improved in production quality and quantity. That said, an analysis of coverage of the leading provider of sports content in the United States, ESPN, for the years 1989-2010 showed that ESPN's nationally-televised program, *SportsCenter*, devoted less time to the coverage of women's sport in 2009 than in the previous decade. This constituted less of a little because in 1999, only 2.2% of *SportsCenter* included coverage of women's sport. In 2009, that percentage had dropped to 1.4% (Cooky, Messner, & Hextrum, 2013; Messner, Cooky, & Hextrum, 2010).
- Researchers Davis and Tuggle (2012) reported that an analysis of the National Broadcast Company's (NBC) coverage of the 2008 Olympic Games revealed that, although female participation in the Games had increased (female athletes comprised 34.2% of athletes at the Olympic Games in 1996 and 48% in 2008), coverage of women's sports actually declined. In 1996, 47.4% of NBC's coverage was dedicated to women's sport; in 2008, that dropped to 46.3%. Consistent with the quantity of coverage over decades, 97% of the airtime that was devoted to women's events was limited to the six most "socially acceptable" sports (women's gymnastics, beach volleyball, swimming, diving, and track and field). Beach volleyball quickly surpassed other women's sports in coverage despite being included in the Olympic menu of sport offerings for the first time in 2008.

- In a commentary on the coverage of girls and women in sport, *New York Times* reporter Karen Crouse (2013) noted that women's sport continues to be covered infrequently by televised news media. She also reports that when female athletes are the subject of news stories, they are often trivialized and sexualized.
- In ongoing research on the appearance of women in influential and mainstream sport publications, Weber and Carini (2012) found that representation of female athletes on the cover of *Sports Illustrated* was less during the decade between 2000-2011 than during the first decade of the magazine's existence between 1954 and 1964.
- While female athletes of color are often overlooked by sport media, Douglas (2012), in her analysis of media coverage of African-American tennis stars Venus and Serena Williams, documents the racialized language used in reporting and how this constitutes a form of "race talk" that marginalizes and excludes racial minorities.
- In a five year analysis of the *ESPN the Magazine Body Issue,* Hull, Reichert Smith & Schmittel (2015, in press) challenges the rationale for the issue itself by noting that, while female athletes are included in the issue purportedly on their merits as athletes, their sexualization in the issue and the fact that they are being presented primarily to a male audience results in female athletes being viewed as sex objects rather than athletes. Cranmer, Brann & Bowman (2014), in their analysis, reached a similar conclusion.
- In a 2010 comparison of new media coverage of the NCAA Division I men's and women's basketball tournament, there were signs that women might, in certain limited circumstances, be receiving more equitable media treatment (Messner & Cooky, 2010).
- In an examination of photographic representation of female athletes by the British press in its coverage of the 2012 Olympic Games in London, female athletes continued to receive less coverage than male athletes. However, there were signs of progress in terms of gender equality in other aspects of coverage. The placement of photos, page prominence, and camera angles were all more favorable to female athletes than in previous studies (Godoy-Pressland & Griggs, 2014).
- Improvement in media coverage of female athletes also may be occurring at the local level in press attention directed to high school female athletes. According to Righter-McDaniels (2014), U.S. newspaper coverage of female athletes at the interscholastic level is showing signs of affirming the value of female athletes and avoids persistent frames that reduce, trivialize, and underestimate female athletes.
- In her dissertation on the level of equity in media coverage devoted to NCAA men's and women's basketball during the 2006-07 season, Maxwell (2010) found that coverage compared favorably between

the two sports in areas of photograph impressions, presentation of athletes in uniform and on the court, and female athletes being depicted as athletes. There were still gaps favoring males in areas of new feature photographs and headline articles, game reporting, and themes of coverage.

- According to Riebock and Bae (2013), female college athletes from various racial and ethnic groups were negatively affected after viewing sexualized images of female athletes, exhibiting greater body shame and responding to pressure to conform to societal expectations regarding feminine appearance. Potential consequences include hesitation to be fully involved in training and getting strong, increased body dissatisfaction, and difficulty reconciling the demands of sport with cultural expectations regarding appearance.

Girls, Women, Sport and Sexual Violence

The Centers for Disease Control and Prevention High School Youth Risk Behavior Survey revealed in 2011 that 11.8% of girls reported being forced to have sexual intercourse at some time in their lives. Women from racial and ethnic minorities are more vulnerable to sexual violence. A national survey by Black et al. (2011) found that 42.2% of female rape victims were first raped before age 18, 29.9% of female rape victims were first raped between the ages of 11-17, and 12.3% of female rape victims were first raped before age 10 or younger. Among adult women who were surveyed in 2010 who reported experiencing an attempted or completed rape at some point in their lives, 26.9% were American Indian/Alaskan Native; 18.8% were non-Hispanic whites, 14.6% were Hispanics; and 35.5% were of multiple races.

Sexual Violence Perpetrated Against Girls and Women: General Trends

According to statistics reported by the National Center for Injury Prevention and Control, Division of Violence (2012),

- Nearly one in five adult women (18.3%) reported being raped at some point during their lives;
- Approximately one in 20 women experienced sexual violence other than rape in the 12 months prior to the survey; and
- 13% of adult women reported being subjected to sexual coercion at some time in their lives.
- More than a third (37.4%) of female rape victims were first raped between the ages of 18-24 (college aged) (Black et al., 2011).
- Among undergraduate women, 19% reported experiencing attempted or completed sexual assault

since starting college (Krebs, Linquist, Warner, Fisher, & Martin, 2009).

In July of 2014, under the direction of U.S. Senator Claire McCaskill, the U.S. Senate Subcommittee on Financial and Contracting Oversight issued a report entitled *Sexual Violence on Campus: How Too Many Institutions of Higher Education Are Failing to Protect Students*. Based on a survey of 440 four-year institutions of higher education,

- Only 16% of the institutions surveyed conducted a campus climate survey despite the fact that less than 5% of rape victims attending college report their attack to law enforcement;
- Only 51% of institutions provide a hotline to offer support to survivors of sexual assault;
- Only 44% of institutions provide the option for victims to report sexual assault online;
- Approximately 8% of institutions do not allow for confidential reporting of sexual assault; and
- More than 20% of institutions in the sample offered no sexual assault training for their faculty and staff.

The survey results found in the McCaskill report documents a disconnect between lawful requirements to investigate reports of sexual assault on college campuses, the number of investigations conducted by institutions, and the percentage of undergraduate women reporting attempted or completed sexual assault that occurred since they started college. Specifically,

- More than 40% of schools in the sample had not conducted an investigation into sexual assault during the past five years; and
- More than 20% of nation's largest private universities conducted fewer investigations than the number of incidents they reported to the Department of Education. Some institutions reported as many as seven times more incidents of sexual violence than they investigated.

As reported in Staurowsky (pending):

- Sexual victimization of girls and boys has been defined as "behavior ranging from sexual comments and inappropriate touching to rape." (Fromson et al., p. 151)
- Sexual victimization occurs throughout the lives of girls and boys in school, from elementary through college.
- The American Association of University Women (AAUW) reported that during the 2010-2011 academic year, half of students in grades 7 through 12 encountered some form of sexual victimization (Hill & Kearl, 2011).
- As young adults make their way through school, girls report higher rates of sexual victimization. By senior year of high school, 62% of girls reported being

subjected to sexual victimization, compared to 39% of boys (Hill & Kearl, 2011).

- Among the most common forms of sexual victimization young adults report being subjected to are sexist jokes, comments, and gestures, followed by the use of homophobic slurs, the display of sexual pictures, and being touched in an unwelcome sexual way (Hill & Kearl, 2011).
- Cyber-harassment has increased as the influence of social media has grown. One-third of girls and almost one-quarter of boys reported being targets of cyber-harassment during their school years (Hill & Kearl, 2011).
- The most frequent form of sexual victimization in schools is student-to-student misconduct. However, 10% of students in the AAUW study reported that educators engaged in sexual misconduct with them sometime during their time in school (Hill & Kearly, 2011).

Sexual Violence, Sport, and Gender: General Findings

Research on sexual victimization of athletes and sexual victimization that occurs within athletic communities has lacked clarity due to the use of different definitions to describe various behaviors. As a consequence, there is no clear picture of the frequency with which coaches become sexually involved with athletes (Brake, 2012). Further, unlike the ongoing work that has been done to chronicle sexual victimization in U.S. schools, the most comprehensive work on issues associated with sexual victimization in sport has been undertaken outside of the United States. Brake (2012) speculates that this reflects "...an ideology that idealizes coaches and overlooks or minimizes the harmful aspects of sports" (p. 399).

Research on abusive behaviors in sport has also been hampered by the culture in which abusive behavior sometimes, perhaps often, goes unrecognized. Within the realm of sport, sexist behavior is commonplace, tolerated by athletes and perceived to be "part of the game" (Rodriquez & Gill, 2011). As a result, reported prevalence rates may not reflect that actual level of sexual victimization in sport because "Athletes do not always (or even most of the time) recognize harassing and abusive behavior when they experience it." (Brake, 2012, p. 400)

- According to various research reports, 15% to 48% of female athletes reported being subjected to sexual harassment in a sport context (Fasting et al., 2000; Fasting & Knorre, 2005; Kirby et al., 2000; Toftegaard Nielson, 2001; Volkwein et al., 1997).
- According to Brackenridge (2008), prevalence rate for sexual abuse in sport based on available research falls between 2% and 22%.

With a lack of local and national reporting mechanisms to help establish the frequency with which sexual abuse is perpetrated by coaches and sport officials, news

accounts and the public announcements of specific sport organizations lend support to the assertion that sexual victimization in sport is a serious concern.

- In 2013, 85 coaches were listed on the USA Swimming website as having received a lifetime ban from the organization, resigned their membership, or were no longer eligible for membership, the majority having violated the code of conduct.
- According to USA Gymnastics (2013), 89 coaches were similarly barred from membership as a result of "conduct determined to be inconsistent with the best interest of the sport and the athletes being served" (n.p.).
- In a report from the *Seattle Times*, 159 coaches in the state of Washington were fired or reprimanded for sexual misconduct ranging from harassment to rape. Nearly all were male coaches victimizing girls. "At least 98 of these coaches continued to coach or teach." (Willmsen & O'Hagan, 2003, n.p.)

In order to bring the picture of the sexual victimization of girls and women in sport into sharper focus, more needs to be understood about the relationships that exist for females, not just with coaches but also with other sport officials, peers, athletic training and sports medicine personnel, spectators, and the array of other individuals who are a part of the broader athletic community beyond the playing field per se.

- In interviews with 25 athletes done by Fasting, Breckenridge, and Walseth (2007), the perpetrators of sexual harassment were authority figures, primarily male coaches along with a sport manager and a coach.
- The women in the study indicated that they were subjected to sexual harassment from male peer athletes as well (Fasting et al., 2007).

Within athletic departments, the incidents of athlete-to-athlete sexual victimization are not captured adequately by research statistics. The complications of sexual assaults occurring among athletes and perpetrated by athletes are evidenced in two recent cases.

- For Beckett Brennan, a women's basketball player at the University of the Pacific, attendance at a campus party led to acquaintance rape by two players from the men's team (Couric, 2011).
- In an interpersonal violence case, University of Virginia women's lacrosse player, Yeardley Love lost her life at the hands of her boyfriend, George Huguely, a member of the men's lacrosse team (Ng, 2013).

Less is known about the degree to which women working in sport experience sexual harassment. In one of the few studies of a specific group of women sport workers, sport print media professionals, half of the 112 respondents indicated that they had been sexually harassed during the 12 months previous to participating in the study (Pedersen, Lim, Osborne, & Whisenant, 2009).

- Controversy following complaints of inappropriate conduct on the part of players from the New York Jets towards broadcaster Inez Sainz led to the National Football League (NFL) to "reaffirm publicly that 'all employees and associates of the NFL have a right to work in a positive work environment' free from all harassment, intimidation, and discrimination" (Schulman & Clifton, 2011, p. 1).
- In one of the most widely publicized cases, former NBA executive Anucha Browne Saunders received an $11.5 million settlement in 2007 from Madison Square Garden and then New York Knicks coach Isaiah Thomas after alleging she had been fired for filing a sexual harassment claim against Thomas (Diamond, 2011).

Due to unique aspects of athletic environments, they may be "at risk" locations for sexual violence to occur (Brake, 2012). Those unique aspects include:

- The nature of the trust relationship that develops between a coach and athlete, where coaches are viewed as "gods" and "father figures" (Brake, 2012).
- Long-standing understandings that boundaries between coaches and athletes are blurred, creating an atmosphere that can lead to abuses of trust (Brackenridge, 2007).
- In the aftermath of the highly publicized case of former Penn State football coach, Jerry Sandusky, a sexual predator who used the platform of sport as a way of identifying and grooming victims, there is greater awareness of this potential in the sport realm. Hartill (2013) noted, however, "...the concealment of CSA [child sex abuse] is a historical feature of organized sport."

Coaching has historically been viewed as a touching profession in which physical contact with athletes is believed to be a necessary part of the instruction/learning process. Athletic injuries require physical assessment and treatment and aids to physical recuperation, such as massages, have often been administered by coaches. The physical and emotional connections athletes and coaches build over time often occur within a "family atmosphere" born out of long hours spent together in informal situations, traveling together to contests, overnight stays at hotels, and team dinners. The more intimate the connections become, the less objective the position of the coach. Benign territory for the collaborative, nurturing, and supportive coach, this shared physical space between coach and athlete can serve as a convenient avenue for coaches to groom potential targets, to press boundaries, gain trust, and cultivate a level of interdependence where female athletes are unable or unwilling to challenge the coach.

The internalization of a patriarchal system that values male privilege to the detriment of female students and athletes is revealed in individual and focus-group interviews with male high school coaches and administrators regarding their attitudes about sexual aggression against girls and

women (Lyndon, Duffy, Smith, & White, 2011). The authors concluded that the male coaches interviewed "...may be transmitting values and beliefs that support and condone the sexual aggression of their athletes" (Lyndon et al., 2011, p. 1) given the degree to which they minimized the problem of sexual aggression, expressed supportive views of rape myths, and evidenced a lack of education about the serious consequences of sexual aggression.

According to Lyndon et al. (2011), "Overall, participants [high school male coaches] held a narrow and rather simplistic view of sexual assault, expressing beliefs that girls who consent to any sexual activity are consenting to all sexual activity and that 'promiscuous' girls are to blame for being or putting themselves in bad situations." (p. 8) They further reported that male coaches stated that "...once girls engage in some sexuality they give up their right to say 'no.'" (Lyndon et al., p. 9)

Rodriguez and Gill (2011) speculated that "It is possible that female athletes have to deal with persistent unwanted sexist and sexual behaviors in order to maintain their sport participation while camouflaging or tolerating the complexity of the societal gender expectations and cultural values (e.g., respect and dignity)." (p. 325) In their study of elite Puerto Rican female athletes, they described a "love and hate relationship" with the coach who harassed them. One athlete put it this way, "He was a person with a split personality. The part of him related to his knowledge was the part that I needed to reach my goals. That was the part that I wanted! But there was the other part...and that part is the one that I had to battle with." (Rodriquez & Gill, 2011, p. 330)

Education & Prevention Programs

Several organizations have sought to address issues of sexual violence in sport through education and prevention efforts. Some of those efforts include:

- Safe4Athletes, a group formed by Katherine Starr, a former Olympic swimmer who turned the pain of the sexual abuse she endured by her coach into a passion for making change within club-level sport organizations at which children have the least amount of advocacy. In a comprehensive handbook that outlines policies and procedures that club officials should have in place to "create a safe and positive environment free of sexual abuse, bullying, and harassment," Safe4Athletes provides recommendations that call for coaches to be vetted through background checks, and mechanisms should be in place to receive complaints about abuse, and processes in place to investigate complaints when the arise (Starr, 2013).
- In 2012, the NCAA put forward to its membership a model policy to prevent inappropriate relationships between college athletes and athletic department personnel in a report entitled *Staying in Bounds* (Burton Nelson & Brake, 2012).
- In one of the first concerted efforts of its kind, the NCAA recommended model policy urges athletic

departments to forbid relationships between college athletes and athletic department personnel, regardless of whether the athlete is of age and whether mutual consent exists between both parties (Burton Nelson & Brake, 2012).

- According to Burton Nelson and Brake (2012), the power differential between an athlete and those who run athletic departments is sufficient to jeopardize the validity of the consent that is given. They write:
- The National Coalition Against Violent Athletes (NCAVA), an organization founded by Kathy Redmond, works to hold athletes and those around them accountable for the sexual violence they perpetrate.
- Through a program called INTERCEPT, the program focuses on leadership development and accountability. NCAVA also provides continual education and guidance in helping victims as well as educating coaches and athletes (ncava.org).
- In 2013, Colby College students Connor Clancy and Carmen Rios created the SPARK Movement on social media. They approached the National Federation of State High School Associations to encourage that sexual assault prevention programs be included as part of coaches' annual accreditation requirements.
- Working with a coalition, including the Ohio Alliance to End Sexual Violence, Futures Without Violence, Mentors in Violence Prevention, California Coalition Against Sexual Assault, National Sexual Violence Resource Center, and the Pennsylvania Coalition Against Rape, a curriculum was developed for coaches to empower them to take on the work of sexual violence education with their own teams.
- Rios and Clancy (2013) put out a call to athletes to exert their power as role models to work toward a rape-free culture in sport. They further argued that there should be an expectation that coaches initiate and foster dialogue with athletes around issues of sexual violence in productive and educational ways.

Girls, Women, and Disability Sport

According to Lakowski and Long (2011), "The benefits of physical activity and athletic programs are equally important for individuals with disabilities as they are for all individuals." (p. 3) According to the United Nations (2009), 10% of the world's population are disabled. Based on U.S. Census Data statistics, approximately 56.7 million people, or 18.7%, of the civilian population (non-institutionalized) had a condition that qualified as a disability in 2010 (Brault, 2012). The likelihood of having a disability increases with age, with people in the oldest group being eight times more likely (70.5%) to have a disability than younger populations. For children less than 15 years of age, 8.4% have some kind of disability (Brault, 2012).

Disabled populations are especially susceptible to obesity and related heart conditions (U. S. Government

Accounting Office, 2010; McPherson, Keith, & Swift, 2014). Research also demonstrates that members of disabled groups who participate in some form of physical activity experience a range of important outcomes, such as higher self-esteem, better body images, and higher rates of academic success that translate into greater success in school and greater likelihood of getting jobs (Lakowski & Long, 2011). Physical activity participation may also help control or slow the progress of chronic disease and improve muscular strength (Harada & Siperstein, 2009; Murphy, 2008).

While the benefits are well known, individuals with disabilities simply have not had access to the same amount of physical activity and sport opportunities that have been available for able-bodied individuals in the United States (U.S. Department of Education, 2011). The implications of this are particularly troublesome when it comes to disabled girls and women. As is the case with general physical activity and sport participation trends, girls and women in disabled populations are also underserved (Mullins, 2008).

Statutes passed at the federal level to prohibit discrimination targeting individuals with disabilities include The Individuals with Disabilities Act (IDEA), which requires that states receiving federal funds under the act must work to ensure that students with disabilities receive free appropriate education; Section 504 of the Rehabilitation Act of 1973 (the Rehab Act), which applies to federally funded educational institutions; and the Americans with Disabilities Act (ADA), Titles II and III of which requires that programs and services in public places be accessible and available on an equal basis to individuals with disabilities.

In the intervening decades since these laws passed, progress has been made. Sagas and Cunningham (2014) report in the Aspen Institute's *Project Play Research Brief* that "Disabled youth have achieved a great deal of access and opportunity for sport as several levels, especially physical education at school." (p. 1) They go on to note that the overall picture for individuals with disabilities is far from ideal or equitable. They write, "However, opportunity to play sports for youth athletes with disabilities are exceptionally rare at almost all of America's publically funded schools." (p. 1)

In a 2011 Inclusive Fitness Coalition policy briefing document, the following concerns were noted:

- Individuals with disabilities are almost three times as likely to be sedentary as individuals without disabilities (29% v. 10%);
- Nearly 56% of people with disabilities do not engage in any physical activity, compared to 36% of people without a disability;
- Only 23% of people with disabilities are active for at least 30 minutes three or more times per week;
- Nearly 1.5 million students in public primary and secondary schools with physical impairments are excluded from having access to participate in athletic competitions;

- People with disabilities are more likely to experience attitudinal, social, and programmatic barriers that may limit their inclusion in physical activity, fitness, sports, recreation, and physical education;
- Healthy behaviors are just as important for promoting health and wellness and preventing disease in people with disabilities as they are for those without a disability. Yet, people with disabilities have been left out of many health promotion efforts; and
- Many fitness and recreation facilities, outdoor spaces, and some types of fitness equipment are not accessible to people with disabilities making efforts to participate in physical activity very difficult (as reported in Lakowski & Long, 2011).

In a June 2010 report from the U. S. Government Accounting Office entitled *Students with Disabilities: More Information Could Improve Opportunities and Athletics*,

- Students with and without disabilities were found to receive similar opportunities to participate in physical education from their schools;
- Among students who attend at least one physical education class per week, 53% were students without disabilities and 52% were students with disabilities;
- In an analysis of the amount of time students spent engaged in physical activity during physical education classes, there was little difference between students with and without disabilities;
- Schools, however, faced challenges when serving the needs of students with disabilities in physical activity settings;
- While students with disabilities often take the same physical education classes as their classmates who are non-disabled, teachers may accommodations for students with disabilities based on their circumstances and conditions; and
- There was a need for physical education teachers to be trained more fully in meeting the needs of students with disabilities along with resources and time to support that training.

Data reporting for students with disabilities in the area of extracurricular school activities offers a somewhat incomplete picture of what is actually going on. While the U.S. GAO (2010) reported that students with disabilities participate more in school or community sports programs than in other performance groups, such as band or choir, scouting, or other special-interest groups (chess, for example), how those levels of participation compare to students without disabilities is not reported. Based on data organized by age and gender,

- Sport participation rates are consistently higher for boys with disabilities than for girls with disabilities;
- Among students with disabilities defined as athletes aged 6 to 12, 45% of boys and 31% of girls participated in at least one sport; and

- Among students with disabilities defined as athletes aged 13 to 16 years, 37% of boys and 31% of girls participated in at least one sport (U. S. Government Accounting Office, 2010; Sagas & Cunningham, 2014).

Researchers DePaw and Gavron (2005) reported that athletes with disabilities encounter a number of issues that serve as barriers to participation. Those include:

- Prejudicial attitudes towards athletes with disabilities;
- Second-class status of athletes with disabilities;
- Lack of sport programs;
- Lack of access to trained staff;
- Lack of access to accessible facilities; and
- Lack of financial resources for specialized equipment.

In a January 2013 clarification to schools receiving federal funding with obligations to provide equitably for students with disabilities under Section 504 of the Rehabilitation Act, the United States Department of Education Office for Civil Rights (OCR) reminded administrators, teachers, and coaches that students with disabilities must be afforded opportunities to participate in extracurricular sport programs on a fair and equitable basis. Students with disabilities are not to be excluded from sport participation based on generalizations or stereotypes, are to be afforded the opportunities to play through reasonable accommodations, and should be accommodated through separate or different athletic opportunities when appropriate (example: wheelchair basketball).

SECTION VIII. GIVING VOICE: THE LAST WORD FROM ACTIVE GIRLS AND WOMEN

Some of what we know about girls and women in sport and physical activity can be seen in fitness centers where they exercise and work out, on the streets where they run, and on the athletic fields where they compete. And in those visual displays, we see girls and women chasing their dreams, confronting obstacles, taking care of themselves, and enjoying life. Data in the report also speaks to a reality that goes unseen and unnoticed for the large number of girls and women who, for a variety of reasons, do not have access to sport and physical activity or whose life circumstances does not allow them to participate. In our last report, we noted that there was also an emerging body of research that has begun to offer insight into what girls and women, young and old think and feel about their experiences as they engage in sport and physical activity. Five years out, that research continues to develop, offering an avenue for the voices of girls and women to advise what we know from their perspective. In effect, this research reminds us all that there is a need to ensure that girls and women have the ability to control the terms under which they participate in sport and physical activity. Here is a sampling of what girls and women are saying about how they view themselves and believe others view them, their relationships with their own strength, and the empowerment they feel from being in control of their own lives.

With new media providing new opportunities for girls and women to express their own views, the blogosphere offers interesting possibilities for finding out what girls and women really think about their involvement in sport, physical activity, exercise, and fitness. Going to the "Sports Blog" directory of a women's blog network called BlogHer, Antunovic and Hardin (2013) found 449 profiles of women bloggers who were writing about their sport and physical activity experiences. They found that the experiences women were documenting on BlogHer "defied both stereotypical representations of women in mainstream sports media and hegemonic masculine discourses replicated in the blogosphere." Unlike mainstream sport blogs that cover professional sports and offer information for consumers, the trend found in the blogs written by women on BlogHer documented their experiences getting

and staying physically active and sharing information that would contribute to the well-being of readers.

In 2010, Krane et al. embarked on a new kind of study of female college athletes, asking them how they would want to represent themselves if given the opportunity. Some of the female athletes in that study preferred to be depicted in their team uniforms in action shots because they took pride in their identities as athletes. One young woman expressed a wish to be presented wearing an A-line skirt, pumps, and her letter jacket while carrying her books, because she wanted to illustrate her belief that athletic participation was going to help her move forward into a career in business. Other female athletes wanted to be seen as physically strong, thus preferring to be represented in action shots that highlighted their athletic skill and competence.

In a follow-up to that study (Krane et al., 2011), 52 girls aged 8 to 14 were asked similar questions. In keeping with the preferences of the female college athletes, the younger girls also wanted to be viewed as authentic female athletes, represented in athletic gear appropriate to their sports. When looking at images of female athletes, girls also were in agreement that they preferred representations of female athletes as competent and passionate about their sports. When it came to female athletes being represented in more feminine attire, there was greater disagreement among girls. Some thought that the roles of being an athlete and a female were consistent with each other. Others thought that the two were not compatible.

In interviews with 36 team- and individual-sport female athletes, the overwhelming choice for the image that best represented them as female athletes was a skilled female athlete who was competent in her sport. However, 47% of the female athletes selected what was called "soft porn" (female athletes in sexually suggestive poses) as the best way to generate interest in their sport, reflecting a belief (which has not been born out in research) that sex sells (Kane, LaVoi, & Fink, 2013). As Kane has noted, "sex sells sex, not women's sports." As obvious as that is, the "common sense" belief regarding this has been internalized by female athletes.

Interviews with female elite athletes revealed that female athletes sought to legitimize their own efforts by using stereotypical notions of masculinity (Kristian, Brock, & Pedersen, 2014). They also offered a window into the process female athletes go through in internalizing values that undermine the ability of female coaches to be viewed as capable of doing the job. This paradox is one that has existed in women's sport for decades.

- Indicative of an increasing number of female athletes taking on the challenge of full-contact sports, Knapp's (2012) interviews with 10 female professional football players (60% black, 40% white) from a highly successful team (five championships) from a league in the Midwest of the United States revealed a concern among players to be seen as football players, to be technically sound in blocking and tackling, and to exhibit the physical and mental toughness associated

with the game. Giving voice to the demands of the sport, the players interviewed offered perspective and enthusiasm for "smash mouth" football, which required players to aggressively play the game full-out and occasionally to smash their opponents in the face. Follo (2008) reported on the breaking of gender norms that occur when female athletes play contact sports. Echoes of her work are evidence in the interviews conducted by Knapp (2012).

- While female athletes pursuing careers in contact sports, such as football, are often called upon to embrace what have historically been viewed as masculine values, McDowell and Schaffner's (2011) study of *The Gender Bowl*, a reality TV program featuring a full-contact football game where men and women competed against each other, revealed that the women who played adopted masculine linguistic practices to push back on the pressure to conform to masculine expectations ("I have to play like a man to prove that women can play this game") through the use of insult. The men who played who were concerned about losing to a women's team, used reasoning that suggested that women would pay by being hurt for transgressing gender boundaries, and women had no place on the field with them.
- In Carlson's (2011) project involving interviews with 31 female athletes who competed in the sport of roller derby, she found that the skaters "satirically and self-referentially engage contradictions within femininity," dressing in feminine and sexual ways while participating in a sport that requires considerable athletic skill and relies on elements that have historically been antithetical to standards of femininity (fighting, throwing elbows, engaging in a sport where skaters will get bumped, bruised, and hurt).
- Examining the influence of "tawdry" stories about female athletes (a female athlete posed nude in a magazine or engaged in flirtatious behavior), a study of perceptions among college students (80 female and 16 male) revealed that female athletes depicted in such a way were viewed as subscribing to femininity standards but were not worthy of respect (Harrison & Secarea, 2010).
- When encouraged to talk about their experience, female athletes discussed the challenges they faced in attempting to navigate the dual paths of being female and being an athlete (Krane et al., 2004). At the same time, these female athletes talked about the pride they have in being physically strong and powerful.
- In a study of African-American female college athletes, voices of both triumph and frustration could be heard. (Bruenig, Armstrong, & Pastore, 2005). These athletes talked poignantly about the educational opportunities afforded to them through athletics but also talk about how they are silenced. The intersections between gender and race were further evidenced in interviews conducted with seven NCAA Division I

female college athletes by Pierce in 2013. She found that the interviewed athletes confronted racism within the sport environment as well as outside of it. The types of racism these seven African-American female athletes encountered were verbal and non-verbal, overt and covert. The stress associated with high level competition was exascerbated by the general stress of dealing with daily forms of racism.

- Eighteen African-American girls between the ages of 7 and 13 were asked about their views on factors that affected their participation in health-promoting activities. They emphasized the need for sport spaces that were safe, programs that included them in decision making and creativity, and an environment that valued physical activity. Existing physical activity programs in community programs were not viewed positively by either the girls or the staff (Burke & Shinew, 2013).
- Through interviews with 14 elite collegiate athletes (seven gymnasts and seven softball players), appreciation of their physical power was the primary theme when this group of female athletes talked about themselves (Ross & Shinew, 2008). Although these women were aware of societal pressures to conform to standards of femininity, they appeared to have created strategies to deal with them while supporting one another as they individually and collectively develop the inspiring sense of an athletic ideal.
- Women who had retired from athletics, and had been out of college for at least two years, were interviewed about their experiences and what it was like to have been an athlete in school (Stoelting, 2004). They described the empowerment they felt at having had control over their own bodies and the ability to maintain control over other things in their life, expressing pride in having been able to handle the multiple demands of their academic and athletic lives.
- Through participant-observation and interviews, George (2005) chronicled the complicated lives of members of a female collegiate soccer team. Through the female athletes in this study, we learn how women relate to their developing muscles. Although some players were ambivalent about recognizing signs that they were getting visibly stronger (e.g., developing biceps), others took great pride in how they were developing strength and power, both literally and figuratively.
- Madsen (2007) engaged women college presidents to speak about their formative experiences. While these women describe themselves variously as being obedient, reflective, observant, smart, and self-directed as children, they also talk about having been competitive, having had moderate-to-high levels of confidence, and the ways in which sport experiences were significant for some of them in their overall development.

SECTION IX. RESEARCH, POLICY, AND ADVOCACY

Her Life Depends On It III Principles for Decision Making That Affect Girls and Women in Sport

When viewed in its totality, the findings in this report argue for a set of principles that should guide recommendations and decision making in the creation, development, promotion, and sustainment of opportunities for girls and women to participate in sport and physical activity. These include:

8. **Continued Efforts to Provide for the Needs of Girls in Sport and Physical Activity:** Equity in sport and physical activity settings does not organically happen but is moved forward with conscious efforts to consider the needs of girls and women. With only 25% of the nation's girls getting the appropriate levels of physical activity to slow or discourage the development of chronic disease and enhance quality of life, more work needs to be done in ensuring that programs meet the needs of girls and are developed in environments that foster participation in safe, secure, accessible, and affordable environments. The ability of girls and women to access sport, whether recreational or high-performance, community-based or offered through a national sport governing body, is a fundamental right that has implications for an individual's dignity, happiness, health, personal freedom, and success. This right should be accorded unequivocally and without reservation to every American girl and woman regardless of ability/disability status, age, ethnicity, marital status, political persuasion, race, religious affiliation, sexual identity and orientation, and socio-economic status. As a general trend over the span of decades, fewer financial resources have been made available for girls and women. Funding needs to match the need for more programs for girls and women.

9. **Development of Management and Executive Infrastructures That Include Women Leaders:** Since the 1800s there have been calls for attention to be paid to the inclusion of women in key leadership and decision-making positions within sport and physical activity organizations and programs for two reasons: 1) to allow the best and most talented leaders to contribute their skills, and 2) to ensure that female perspectives were being included in decision making about physical activity and sport programs. All these

years later, women continue more often than not to be on the periphery of decision making and leadership when it comes to sport and physical activity programs. This reflects a systemic pattern of discrimination. As Staurowsky and Weight (2011, 2012) have documented, women are at times undervalued for their work in sport organizations through pay inequities, a hostile environment that hampers women from speaking up and holding institutions accountable, and a climate of retribution. The nation will not achieve its myriad health objectives with this dysfunctional infrastructure. The absence of female leaders also results in fewer role models for young girls, and thus their not envisioning themselves in such leadership positions.

10. **Facilitating Pursuit of Athletic Excellence Among Our Most Gifted Female Athletes:** While Title IX has served as an important tool in promoting varsity athletics in school-based programs for female athletes, the nation's schools, at every level, have not yet come into full compliance with Title IX. Greater effort to ensure Title IX compliance is critical to achieving the end goal of increasing both participation levels and the quality of that participation for girls and women. Further, additional research attention should be directed toward the access challenges girls encounter when seeking participation in non-school club programs and the impact those have on early age skill development and the recruitment process.

11. **Representation of Women in Sport Media:** The digital age offers unprecedented opportunities for girls and women to be celebrated for their participation and accomplishments. Yet, long-standing social stigmas born from attachments to gender boundaries and anachronistic conceptions of masculinity and femininity continue to create media-promulgated tensions that females must contend with in pursuing exercise, fitness, and sport activities for their health, well-being, and enjoyment, as well as the entertainment of others. Further, the propensity of media to focus on beauty and sex appeal rather than athleticism has undermined the ability of female athletes to be taken seriously (Daniels, 2009; Daniels & LaVoi, 2013). A revision of how athleticism is conceived and represented in mediated forms needs to be undertaken with consideration given to capturing the beauty, power, and accomplishments of female athletes fairly and accurately.

12. **Promote Sport and Physical Activity Participation Among U.S. Girls and Women:** The research record offers abundant evidence that there are numerous economic, educational, health, psychological, social, and vocational benefits that girls and women experience as a result of participating in sport and physical activity. While the benefits are clear, more research needs to be undertaken to better understand how to foster those opportunities, as well as to identify barriers to participation with the goal of developing strategies and public policy to overcome them.

13. **Ensure the Health of Girls and Women Participating in Sport & Physical Activity:** Research on the incidence of concussions generally shows higher rates among female athletes at both the collegiate and high school levels. Particular attention has been given to analyses in soccer and basketball, in which men and women play by similar rules, and ice hockey, a sport that is largely similar in the men's and women's game with the important difference that intentional body checking is prohibited in the women's game. Data for all three sports show higher rates of concussions among females at both the high school and collegiate levels (Dick, 2009; Hootman, Dick & Agel, 2007; Rosenthal, Foraker, Collins & Comstock, 2014). This research must continue with a focus on the differences in presenting symptoms and recovery as well as prevention.

14. **Ensure the Safety and Security of Girls and Women Participating in Sport and Physical Activity:** Research on sexual victimization of athletes and sexual victimization that occurs within athletic communities has lacked clarity due to the use of different definitions to describe various behaviors. As a consequence, there is no clear picture of the frequency with which coaches become sexually involved with athletes (Brake, 2012). Further, unlike the ongoing work that has been done to chronicle sexual victimization in U.S. schools, the most comprehensive work on issues associated with sexual victimization in sport has been done outside of the United States. Brake (2012) speculates that this reflects "...an ideology that idealizes coaches and overlooks or minimizes the harmful aspects of sports" (p. 399). Sport authorities need to be mindful of the vulnerability that exists for female athletes within sport settings. A commitment to safe and secure play environments for girls and women requires an investment of resources, personnel, and programming that will educate athletes, parents, coaches, and administrators on the prevention of abuse of female athletes and the extension of athlete protection policies to all members of national sport governing bodies.

Research Recommendations

As an outgrowth of the current state of what is known about girls' and women's participation in sport and physical activity, these future research directions are recommended. These recommendations are designed to create the knowledge base to implement the principles outlined above.

1. **Continued Efforts to Provide for the Needs of Girls in Sport and Physical Activity:** More research is needed to identify and quantify the immediate and long-term social, psychological, educational, and health benefits of participation in sports with a special emphasis on intersections between and among gender, age, ability/disability, race/ethnicity, religious affiliation, immigration, socio-economic status, and sexual identity and orientation. The complexity of these intersections poses areas of research warranting

further investigation. In addition, selected research agendas to be pursued include:

- measurement and assessment of what is lost if girls and women do not get an opportunity to participate (in other words, what are the economic and educational consequences? health and social consequences?);
- measurement and longitudinal tracking of participation opportunities available to women and girls of color (broken down by subgroups);
- identification of the forces motivating (or preventing) girls of color from participating in physical activity; and
- longitudinal research and cross-sectional studies examining whether female athlete academic success in high school and college is linked to success in education, the work place, and in the community.

2. **Development of Management and Executive Infrastructures in Sport Organizations That Include Women Leaders:** Because women remain underrepresented throughout the sport industry in leadership positions (coaching, administration, executive positions), continued monitoring of the sport workplace and the barriers to recruitment, retention, and promotion is called for. The array of workplace issues (pay equity and equal treatment) that affect the lives of women working in sport speak to the culture in which girls and women play and participate. Women in key leadership roles within sport and physical activity settings is important because these upstream issues prevent women and girls from fully participating in sports and physical activity.

3. **Facilitating Pursuit of Athletic Excellence Among Our Most Gifted Female Athletes:** Compliance with Title IX requires that schools receiving federal funds regularly monitor how resources in sport and physical activity programs are allocated and how those resources are employed to provide equitable opportunities for female and male students. An important aspect of public accountability in the enforcement of Title IX relies on an informed citizenry. Despite the importance of public awareness in Title IX enforcement, research has shown that the citizenry in general does not know what Title IX does and does not require. Lines of research regarding local school allocation patterns, Title IX compliance, and what Americans (e.g., parents, students, educators, administrators, and reporters) know about Title IX all hold the prospect of yielding information to support decisions to fund more sport and physical activity programs for girls and women.

4. **Representation of Women in Sport Media:** With the explosion in digital media, more coverage of female athletes now exists throughout the culture. Remarkably, the percent of coverage compared to

men's sport remains at levels similar to what they were in the 1950s. Further, depictions of female athletes and the narratives told about them continue to reinforce traditional stereotypes. Support of research that offers new models for media coverage of female athletes and interventions to interrupt long-standing journalistic practices that undermine women in sport is encouraged.

5. **Expansion of Research Agendas Beyond Risky Behaviors, Disease, Mental Health and Injury:** While much work has been done around the general concept of getting girls and women moving and in the game, there remains a great deal yet to know about the benefits of participating in sport. From a larger macro health perspective, research agendas should be expanded beyond the disease syndromes and mental health areas identified in this report. Further, there is a whole vista of research opportunities yet to be explored relative to the effects of participation in specific sports (i.e., crew, weight lifting, etc.) and little is known about health, education, and social benefits of participation in specific sports (i.e., basketball vs. snowboarding).

6. **Ensure the Safety and Security of Girls and Women Participating in Sport and Physical Activity:** At present, research has not caught up with the increase in sport participation among girls and women. There is much to be learned about what it takes to diagnose injury in active girls and women, what are the causes of sport-related injuries among active girls and women, and what it takes to support them after injury has occurred to facilitate their reengagement. Further, comparisons between males and females and understanding potential differences between females and males in sport and physical activity is warranted. Research attention needs to be directed toward better screening protocols for The Female Athlete Triad and prevention strategies. And analyses of the quality of service provided by athletic trainers and sports medicine personnel available to girls and women in the sport system is a largely unexplored area.

7. **Sexual Assault/Violence/Hazing of Girls and Women Participating in Sport and Physical Activity:** There needs to be more research on sexual assault and violence against girls and women as it manifests in sport and physical activity settings. This includes the assessment of the need for and educational impacts of sexual harassment prevention programs for coaches and athletic administrators, as well as broad educational programming around Title IX requirements and obligations relative to incidents to sexual violence and hazing in school-based and open amateur sport settings.

Because the need for more research is so great, we have included a review of existing data sets that lend themselves to quantitative studies of girls and women in sport and physical activity settings (see Appendix A).

CONCLUSION

This report's user-friendly format provides a toolbox of information, analysis, and sources for parents interested in the health of their daughters; coaches interested in the well-being of female athletes; media interested in informing readers about strategies to achieve optimal health for females, both young and old, from every sector of society; health consumers; sport leaders and program heads; public health advocates; and public policy makers interested in reducing healthcare costs while emphasizing prevention and health promotion for female citizens. With increasing specificity and urgency, calls are being sounded across the United States for greater and better opportunities for all Americans to become more physically active. As those calls roll across the land, it is imperative that the needs of girls and women be taken into account and met.

APPENDIX A. RESEARCH, POLICY AND ADVOCACY

The Women's Sports Foundation (WSF) has historically deployed the use of evidence-based research in its efforts to advance the lives of girls and women through sports and physical activity. The wide scope of WSF research includes media coverage of female athletes, women's participation and leadership in the Olympic and Paralympic Games, racial and ethnic minorities in sport, challenges facing LGBT athletes, girls' and women's health, female professional and amateur athletes, educational achievements of female athletes, and physical activity and sport among students with disabilities. Research fueled efforts of women's sport advocates to dispel myths about women's bodies and athletic abilities, as well as to debunk false claims about the interest and involvement with sport. Research findings and analyses also informed ongoing policy debates about gender equity at all levels of athletic opportunity – stretching from grade school through the professional ranks.

While this report highlights the scope and magnitude of research efforts that affirm the importance of sport and physical activity in the lives of girls and women, there remains a critical disconnection in research communities regarding available sources of data that might be tapped to expand what we know. This section provides several examples of a research practice called "secondary analysis" – which refers to a form of research in which existing data that is collected by one researcher, an organization, or a government agency is later reanalyzed by another researcher for another purpose. Below we summarize several national data bases that contain a wealth of information about athletic participation among U.S. youth. Researchers can tap these sources of data in order to assess participation rates among girls and boys, or to better understand how sports involvement is related to the social, physical, and educational development of children and adolescents. Some of the national data sets discussed below measure athletic participation in general, while others supply information about involvement with specific sports like basketball, cheer, football, lacrosse, swimming, or volleyball. *Her Life Depends On It III* provides these profiles for the first time in order to alert and inform educators, policymakers, athletic administrators, public health advocates, and youth sports proponents. We invite readers to learn more about the contents of these existing resources, and to consider how these data resources might be used to meet further your social scientific, organizational, or advocacy needs.

Evidence-based research is especially important to policymakers. Public policies reflect and guide the decisions

and priorities of organizations, governmental agencies, and legal mandates. The formulation and enactment of public policy are highly complex processes that often engage organizational leaders, political factions, interest groups, legal experts, school districts, and community agencies. Public policy helps people and organizations to describe existing realities that influence constituents, identify priorities, and develop strategies for action. Policy initiatives are particularly effective when aims are based on evidence as well as claims.

As evidenced in the report, a subset of public policy focuses on key sport policy concerns for girls and women that revolve around equitable provision of athletic opportunity, health and educational impacts, and sexual harassment prevention. Proponents of women's sports have focused on disparities among racial and ethnic minorities, GLBT persons, and economically disadvantaged children and teens. Empirical research has furthered the understanding and assessment of sports and physical activity in the lives of girls and women. The history of exclusion, discrimination, and devaluation of women in sport is well documented (Brake, 2012; Hogshead-Makar & Zimbalist, 2007; Sack & Staurowsky, 1998). Girls' interest in sport has been consistently underestimated, and their involvement in school and community sports has been misunderstood and misrepresented, which in turn reflects and reproduces gender disparities in the provision of program assets and participation opportunities. Systematic program evaluation can help spur the growth and appreciation of many athletic programs for girls and women. Finally, many school and community-based program leaders have learned that facts and systematic research can fuel their mission and fund-raising initiatives. Evidence-based program evaluation that optimally deploys both quantitative and qualitative research methods can underpin program assessment and propel fundraising initiatives.

Ironically, while sports are the most prevalent form of extracurricular involvement among American youth, they have been rarely studied by social scientists and are often off the radar screens of public health advocates. In addition, the processes and outcomes of athletic programs from the intercollegiate level down to entry-level youth organizations remain largely understudied and under-evaluated. The five national data sets summarized in this section can be strategically used by individuals and organizations that seek to better understand and develop sports for girls:

1. Social scientists across a widening spectrum of disciplines looking to expand their research knowledge of gendered facets of sport and physical activity; e.g., psychologists, economists, demographers, historians, sociologists, epidemiologists, and public health researchers;

2. Non-profit leaders, such as the National Women's Law Center, American Association of University Women, LA 84, the Women's Sports Foundation;

3. Sport national governing body leaders, such as the National Women's Basketball Coaches Association, the

USTA Serves, the United States Olympic Committee, USA Wrestling, USA Volleyball, USA Field Hockey, USA Track & Field, USA Football Association;

4. Educators and school administrators; e.g., national and state Parent Teacher Associations, state-level teacher and administrator associations, or school district leaders;

5. Community-based program administrators seeking to identify, recruit, and collaborate with experts from local colleges and universities in order to tie in national or regional data analyses with program evaluation; and

6. Program evaluators at all levels of the youth sport delivery system.

The Monitoring the Future (MTF) Database: Background

The MTF is a federally funded longitudinal study of American secondary school students. About 50,000 students are surveyed every year (eighth-, 10th- and 12th-graders) and pertinent information is gathered pertaining to educational outcomes, health behaviors, social engagement, and substance use. The primary question posed to respondents that addresses athletic participation was as follows: "In which competitive sports (if any) did you participate in during the LAST 12 MONTHS? Include school, community, and other organized sports. (Mark all that apply.)"

The large sample sizes and information by the MTF surveys enable researchers to examine participation rates among eighth-grade, 10th-grade, and 12th-grade students in a variety of sports. In 2006 the MTF began gathering information about the specific sports that respondents reported participating in during the previous 12 months in their school or community: baseball/softball, basketball, cross country, field hockey, football, gymnastics, ice hockey, lacrosse, swimming, soccer, tennis, track, volleyball, weightlifting, wrestling, and "other sports" (cheerleading, crew, equestrian, golf, and water polo were included in 2010). The respondents could also report participating in "other" sports, which includes organized, competitive sports that were not specified in the survey; e.g., double-dutch, flag football, netball, climbing, martial arts, skiing, cheer, weightlifting, bowling, or equestrian competition.

Research and Policy Applications

The storehouse of nationwide survey data on different types of sports participation across the 2006-2013 time frame can enable researchers to conduct secondary analyses that examine how athletic participation is related to a variety of variables such as: alcohol use, drug use and related areas; educational lifestyle, values, and experiences; concern for others; a variety of health habits, including physical activity; values; voluntary and charitable activities; overall happiness; and life satisfaction. "Athletic participation" can be measured generally (across all sports) or within specific sports (e.g., basketball, cheer, football, soccer, volleyball). Comparisons can be made between eighth-

grade, 10th-grade, and 12th-grade students in the samples. And finally, the database includes key demographic data on respondents such as gender, race and ethnicity, mother's educational attainment (that can be used as a proxy measure for family socioeconomic status), metropolitan area, and geographic region.

For example, Sabo & Veliz (2014) tapped the MTF data across the 2006-2012 time frame in order to compare athletic participation rates and attrition rates among boys and girls from different racial and ethnic backgrounds, as well as socioeconomic backgrounds. Some key findings included:

1. Athletic participation rates in most sports decreased markedly between eighth grade and 12th grade. The average attrition rate across all sports is 32%.

2. The attrition rates for girls between eighth grade and 12th grade were significantly higher in all sports than for boys.

3. A statistically significant association between attrition between eighth grade through 12th grade and race and ethnicity was found. The sports with larger percentages of white participants showed the lowest attrition rates across the high school years. Conversely those sports with a larger percentage of minorities showed high rates of attrition between eighth and 12th grades.

The Youth Risk Behavior Surveillance Survey (YRBSS)

The Youth Risk Behavior Surveillance Survey, conducted by the Centers for Disease Control and Prevention, surveys high school students regarding health-risk behaviors, including both athletic participation and a variety of sexual/reproductive behaviors. The YRBSS generates a nationally representative sample of U.S. high school students. Questionnaires are administered in selected classrooms to students in schools chosen on the basis of urbanization, racial/ethnic makeup, and size. African-American and Hispanic respondents are oversampled in order to facilitate hypothesis testing.

Athletic participation is currently measured by one item in the YRBSS items: "During the past 12 months, on how may sports teams did you play? (Count any teams run by your school or community groups.)" There is no measurement of participation in specific types of sports.

Research and Policy Applications

Researchers can tap the YRBSS database in order to describe and assess how athletic participation varies by grade level, age, gender, and race and ethnicity. Athlete subgroups can be compared to non-athlete subgroups. A wide array of health behaviors are measured within the survey, including safety (helmet and seatbelt use), school attendance, expulsion and suspension, experiences with bullying, suicidal ideation and attempts, smoking and

smokeless tobacco use, alcohol use, marijuana and a variety of other forms of drug use, questions about sexual intercourse and contraceptive use, the frequency of exercise and physical activity, attendance at physical education classes, and some additional health behaviors. Researchers can use the YRBSS data to compare "athletes" and "non-athletes" in relation to the preceding variables. Finally, multivariate analyses can be used to assess the extent that the ties between athletic participation and educational achievement or health risks are mediated by grade level, age, gender, and race and ethnicity.

The National Longitudinal Study of Adolescent Health (Add Health)

The National Longitudinal Study of Adolescent Health (Add Health) has studied a nationally representative sample of seventh- through 12th-grade U.S. adolescents beginning in the 1994-95 school year. The research design follows the same group (or cohort or "waves") of young people across time, stretching from early adolescence across young adulthood (age 24-32 by 2008).

The Add Health asks about different types of sports participation during their baseline year only. The question appears this way: "Here is a list of clubs, organizations, and teams found at many schools. Darken the oval next to any of them that you are participating in this year, or that you plan to participate in later in the school year": Baseball/softball, basketball, field hockey, football, ice hockey, soccer, swimming, tennis, track, volleyball, wrestling, and 'other sport.'"

The Add Health database contains both survey data and interview data (derived from in-home interviews). Several measures of physical activity and athletic participation fall under the heading "daily activities" with the response alternatives ranging between "not at all" to "7 or more times." "In the past seven days how many times did you...

- "...bicycle, skateboard dance, hike, hunt, or do yard work?
- "...roller blade, roller skate, downhill ski, snowboard, play racket sports, or do aerobics?
- "...participate in strenuous team sports such as football, soccer, basketball, lacrosse, rugby, field hockey, or ice hockey?
- "...participate in individual sports such as running, wrestling, swimming, cross-country skiing, cycle racing, or martial arts?
- "...participate in gymnastics, weight lifting, or strength training?
- "...play golf, go fishing or bowling, or play softball or baseball?
- "...walk for exercise?"

Researchers can tap into the Add Health data in order to measure how frequently U.S. adolescents and young

adults engage in the above activities, as well as to study how participation rates change through adolescence and young adulthood. Subgroup differences in athletic participation rates can also be generated and assessed; e.g., by gender, race or ethnicity, family characteristics, or type of community. Researchers can also choose to test for associations between the extent of athletic participation (or the type of athletic participation) and a host of educational, developmental, or health variables such as:

- tobacco, alcohol, and drug use
- general health and diet
- relationships with others
- personality
- suicidal ideation and behavior
- sexual experiences, sexual transmitted diseases
- educational attainment and aspirations
- parental support and relationships

Research and Policy Applications

Finally, because the Add Health study follows the same respondents across time, researchers can test hypotheses whether athletic participation during high school is related to such factors as educational achievement, tobacco or alcohol use, psychological well-being, or general health and diet in late adolescence or young adulthood.

The Office of Civil Rights Database

The Civil Rights Data Collection (CRDC), administered through the U.S. Department of Education's Office of Civil Rights, is a nationwide survey that periodically collects information from representative cross-sections of elementary and secondary public schools. Both school-level and district level data are generated.

Administrators at high schools respond to questions that deal with the number of different sports offered to girls and boys, the number of athletic teams offered to girls and boys, and the number of girls and boys who participate on teams throughout the school year. School administrators report the total number of sport participants for each sport during the school year. This means that some students are counted more than once if they participated in more than one sport (e.g., a student would be counted once if she is on the volleyball team and twice if she also plays basketball). The surveys are distributed during the specified years, but school administrators are asked to report on the previous school year. Some examples of sample sizes include 1994 (n = 44, 151), 2000 (n = 88,650), and 2006 (n = 62,484). CRDC data has been collected in 1994, 2000, 2002, 2004, 2006, 2010, 2012, and 2014 (in process).

Research and Policy Applications

By tapping into the CRDC database, researchers or organizational stakeholders can describe and analyze changes in the number of different sports, athletic teams,

and the percentage of athletic opportunities that U.S. public high schools provided to girls and boys within a specific year or across time. For example, the National Women's Law Center (NWLC) used key results from its secondary analyses of the CRDC data in order to identify and assess school districts that appeared not to "provide opportunities for girls to play sports in numbers substantially proportionate to their enrollment"(Staff, 2010, p. 2). The NWLC utilized the empirical results of its analyses of "participation gaps" in a variety of school districts around the nation to file complaints with the Department of Education's Office of Civil Rights. Sabo and Veliz (2011, 2012) analyzed CRDC data in order to conduct two nationwide studies in collaboration with the Women's Sports Foundation and the SHARP Center at University of Michigan. "Progress Without Equity" (2011) examined a nationally representative sample of 24,370 public four-year high schools between 1993-94 through 2005-06 in order to measure gender differences in the provision of athletic opportunity. Their follow-up study (The Decade of Decline: Gender Equity in High School Sports, 2012) documented changes in the numbers of athletic participation opportunities provided to girls and boys across a 10-year period (1993-94 through 2009-10). The analysis merged CRDC data with Common Core of Data (CCD) and clearly documented that gender equity was not achieved in high school sports in America during the decade and, indeed, girls actually lost ground after 2005. Both of these research reports can be found on the Women's Sports Foundation website; i.e., www.womenssportsfoundation.org See Sabo, D. & Veliz, P. (October, 2012). The Decade of Decline: Gender Equity in High School Sports, and Sabo, D. & Veliz, P. (October, 2011). Progress without Equity: Gender the Provision of Athletic Opportunities in U.S. High Schools, 1993/1994 through 2005/2006. Released online through the Women's Sports Foundation.

Go Out and Play: Youth Sports in America

There are few sources of reliable data that can guide policy debates and planning in sport, education and public health. Current scientific research is consistently requested of the Women's Sports Foundation (WSF) by the American public, media, prospective funding sources, governmental agencies, and girl-serving organizations. In order to help meet these information and policy needs, a nationwide study of athletic participation and physical activity among girls and boys was conducted under the banner *Go Out and Play: Youth Sports in America* (2008). A collaboration was formed among the WSF, the Center for Research on Physical Activity, Sport & Health (CRPASH) at D'Youville College, and Harris interactive, Inc.

The research design included telephone interviews with a nationally representative sample of 863 parents of children in grades 3 through 12. In addition, a total of 2,185 students in grades 3 through 12 were surveyed during an English class. Questionnaires were administered during 2007 by the classroom teacher, who proctored the class

and was available to answer any student questions. The surveys were intended to explore children's participation in sports and physical activities, with a particular focus on organized and team sports.

A great deal of information was gathered through this study. Demographic measures included race and ethnicity, gender, family type, family socioeconomic level, immigrant family status, and community income level. Some of the key measures within the respective student survey and parent interview are listed below. For the complete variable list, see Sabo, D. and Veliz, P (2008). Go Out and Play: Youth Sports in America, at www.womenssportsfoundation.org.

Student Survey Measures

- athletic involvement
- academic achievement
- age of entry into sport
- age at drop-out from sport
- athletic ability, athletic identity
- family type (single-parent, dual-parent etc.)
- body mass index (BMI)
- body esteem
- quality of life
- popularity at school

Parent Survey Measures

- family type (single-parent, dual-parent, etc.)
- perceived drop-out reasons for children
- extent of parental involvement
- immigrant family status
- family satisfaction
- perceptions of gender equity in sport
- perceptions of children's interest in sport
- perceived importance of sport for children
- perceived importance of exercise for children
- extent of involvement with child's sport

Research and Policy Applications

Although the *Go Out & Play* data set is not current (i.e., dating back to 2007), it flows from nationally representative samples of students and parents. The information is also unique in that sport and physical activity data were collected across a wide span of youth development—third grade through 12th grade, and that both children and parents were studied. And finally, the survey gathered basic facts about athletic participation among children in immigrant families as well as children with disabilities. Access to the *Go Out & Play* data set can be requested through Marjorie Snyder, Ph.D., at the Women's Sports Foundation and Don Sabo, Ph.D., or Renee Cadzow, Ph.D., at D'Youville College. The

results of these studies have been used in legal efforts to establish gender equity in sports, to educate national sport governing boards, and to inform journalists, parents, educators, and athletic administrators.

The Youth Athletic/Fitness Survey (YAFS): A Guide for Program Heads, Coaches and Instructors

All of the databases profiled above are sources of existing data that can be accessed and analyzed. This section summarizes the contents and applications of a questionnaire that can be used to evaluate appropriate existing girls sports programs. The inclusion of the YAFS in an overall program evaluation can enhance program effectiveness and credibility, thereby facilitating fundraising efforts.

The YAFS has been developed by Don Sabo, Ph.D., as part of program evaluation work with the Boston Girls' Sports & Physical Activity Project (BGSPAP), the Women's Sports Foundation's GoGirlGo! program, Western New York Girls in Sport, and other community-based programs. This brief survey is designed to provide program heads, coaches, or instructors with basic information about the girls in their programs. The YAFS is a practical four-page questionnaire that contains 27 distinct measures of girls' backgrounds, behaviors, interests, attitudes, and identities. When used effectively, the YAFS can be a valuable component of your overall program evaluation.

The YAFS provides program heads with a list of 27 concepts that are measured in the survey and where to find them in the questionnaire. It provides instructions for administering the YAFS in your program and, once the data are gathered, some guidelines for analyzing the results. Finally, the questionnaire is available in both English and Spanish language versions, and designed for girls 10 years old or older.

The YAFS is designed to be an evaluation resource for community-based programs. Like any measurement tool, it has strengths and weaknesses. On the "strengths" side, the YAFS packs 27 distinct measures into its four pages. It is concise and informative, and can be administered to the girls in a program in about 30 minutes. It can help staff better understand the girls in a program, and, as an assessment tool, it can be part of an evidence-based program evaluation. Program heads can recruit a willing researcher or local university faculty member to help enter and analyze the survey results. The YAFS can be integrated into a "pre-test/post-test" design in which program heads gather key information at the beginning and end of a program intervention in order to measure change. Finally, the questionnaire and its instructions for use can be a cost-effective tool in an overall program evaluation.

The YAFS is made available through the Center for Research on Physical Activity, Sport & Health (CRPASH) at D'Youville College in Buffalo, New York. For information, contact CRPASH co-directors Don Sabo, Ph.D., (donsabo3@gmail.com) or Renee Cadzow, Ph.D. (cadzowr@dyc.edu).

What Does the YAFS Measure?

The YAFS provides simple (one-item) measures of the following 15 concepts.

1. Sports team participation
2. Socioeconomic status
3. Exercise frequency
4. Sources of encouragement for participation
5. Peer support for involvement in sports
6. Self-reported attendance in the program
7. Sources of encouragement for exercise
8. Age
9. Peer support for involvement in exercise
10. Racial and ethnic identity
11. Academic performance
12. Type of family (single-parent, dual-parent)
13. Attitudes toward same-sex and coed exercise
14. Attitudes toward same-sex and coed sports
15. Interest in boys
16. Number of friends who exercise

The questionnaire also includes four basic scales (multiple items) that measure concepts that are often considered important facets or outcomes of girls' participation in sports and exercise.

1. Perceived ability to engage in sports and fitness activity
2. Interest in sports and exercise
3. Athletic identity
4. Body image

The YAFS also includes items that will give program heads and staff information about some of the barriers and/or supports that girls perceive in relation to their access or opportunity to participate in sports and exercise. Each of these items or measures can be treated separately.

1. Family cannot afford for sports involvement
2. School lacks interesting sports
3. School supports boys' sports more than girls' sports
4. Family responsibilities interfere with sports/exercise
5. Parents' worry about safety
6. Availability of travel to sports/exercise programs

At the end of the YAFS an open-ended question is included that asks the girls to write down two things that they "like most about sports and exercise." The written responses to these questions can be analyzed and assessed. Program heads can also insert a different question here that is tailored to meet some specific information goal for your program.

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Section I. Prevention of Chronic Diseases in Later Life

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Section II. Substance Abuse

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Founded in 1974 by tennis legend, Billie Jean King, the Women's Sports Foundation is dedicated to advancing the lives of girls and women through sports and physical activity.

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