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**ATHLETIC AMENORRHEA: PREVALENCE AND AWARENESS AMONG  
FEMALE ATHLETES AT WESTERN MICHIGAN UNIVERSITY**

by

**Michele R. Chupurdia**

**A Thesis  
Submitted to the  
Faculty of The Graduate College  
in partial fulfillment of the  
requirements for the  
Degree of Master of Arts  
Department of Anthropology**

**Western Michigan University  
Kalamazoo, Michigan  
June 2004**

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2004

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Michele R. Chupurdia

# **ATHLETIC AMENORRHEA: PREVALENCE AND AWARENESS AMONG FEMALE ATHLETES AT WESTERN MICHIGAN UNIVERSITY**

**Michele R. Chupurdia, M.A.**

**Western Michigan University, 2004**

Women who participate in competitive sports are under enormous pressure to maintain an extremely low body weight through diet and exercise. While exercise is viewed as widely beneficial to women of all ages, the pressure to succeed in sports by achieving or maintaining an unrealistically low body weight through food restriction and high intensity training may lead some women to develop eating disorders, amenorrhea, and osteoporosis.

The research conducted for this thesis and presented here investigates female college athletes (18-24 years) from Western Michigan University, a Division I school, who are undergoing strenuous training. The goal of this study is to determine if these female athletes are showing signs of menstrual dysfunction and whether or not they understand the long-term consequences of amenorrhea on their health and bone density. An additional focus is on the information given to these female athletes in training regarding the possibility of menstrual dysfunction as a result of the duress of weight reduction and stress of competition. Furthering this is an understanding of the information being offered to these women regarding the potential long term health effects of athletic stress on their bodies, particularly their skeletal structures, and reproductive system.

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## CHAPTER I

### INTRODUCTION

Even now at the beginning of the twenty-first century, body image poses a considerable problem for females, and for the most part it does so because of cultural ideas about body shape and size. While no woman seems to be immune to these culturally bound ideals, women who participate in competitive sports are forced to face the challenges of body images on a daily bases. As there is increasing recognition of women who participate in sport at all levels, there is also growing awareness that there are biological and cultural differences between the sexes, among different races, and across cultures that may require different training rules and practices, especially for young female athletes. Women who participate in sports are under enormous pressure to maintain their bodies at extremely low body weights through diet and exercise to be competitive. While exercise is viewed as widely beneficial to women of all ages, the pressure to succeed in sports by achieving or maintaining an unrealistically low body weight through food restriction and high intensity training has been shown to lead some women to develop eating disorders, amenorrhea, and osteoporosis.

This research undertakes an investigation of college age female elite athletes from Western Michigan University who are undergoing strenuous training in order to determine the incidence of menstrual dysfunction, as well as the level of awareness

among these athletes, regarding the causes and effects (both long term and short term) of amenorrhea on their bodies. The prevalence and awareness of menstrual dysfunction, ideals of body image, the biology of women, and gender equity in female sports will be discussed in the context of understanding women's long-term health. To properly contextualize this study within the anthropological and medical dialogues, a review of the literature concerning constructed body image, menstruation, menstrual dysfunction, and adequate bone health will be discussed. Furthermore, this thesis will conclude that by challenging the cultural construction of femininity, women in sport do not fit the limited Western body ideal.

### Literature Review: Constructing Body Image

Societal influences such as media, adult support, and peer pressure have made coming of age in a female body a more difficult and complex experience than it was a century ago. American females today actually suffer from body problems more pervasive and more dangerous than constraints applied decades ago (Brumberg 1997). But, the current issue with body image is not just an external issue resulting from lack of societal awareness or adult support; it has also become an internal and psychological problem (Brumberg 1997). “[G]irls today make the body into an all-consuming project in ways young women of the past did not” (Brumberg 1997, p.xvii). They are concerned with the shape and appearance of their bodies as a primary expression of their individual identity and are obsessing about losing weight, getting contact lenses, new hair cuts, good make-up, new clothes and accessories.

Girls today view the body as something to be managed and maintained, usually through clothes and personal grooming items, with special attention to exterior surfaces, such as their contours (Brumberg 1997).

Body image today is considered to be a multidimensional construct, with such factors as perception, attitude, cognition, behavior, fear of fatness, body distortion, body dissatisfaction, preference for thinness, and restrictive eating, all contributing to its conceptualization (Banfield and McCabe 2002). Banfield and McCabe (2002) view body image as the accuracy of individuals' judgment of their size, shape, and weight relative to their actual proportions, while Slade (1994) defines body image as a loose mental representation of body shape, size, and form which is influenced by a variety of historical, cultural, social, individual, and biological factors, which operate over varying periods of time. However it is defined, body image incorporates perception, awareness, and behavior of the body. Throughout the decades, the ideal body has reflected the times and today there is a new idea of the female body: *thin and fit* (Banfield and McCabe 2002). The look of "Amazon" is in and looking fit is a booming part of the beauty industry, offering a potentially healthy alternative to the tiny-waisted waif ideal that has sent women to plastic surgeons and on crash diets. But the fitness ideal does not always translate into more women appreciating their bodies, and it may just present another limiting and unattainable ideal.

Limiting this ideal is the association of competitive sports as intimately male. But with the new ideals of the female body rooted in "thin and fit" there have been increasing numbers of women who participate in competitive sporting activities, thus altering the image of the "ideal woman" (McCrone 1988). This increase in female's

participation fuels tensions and conflicting attitudes, and to changing images of athletic ability as well as body image. Although an analysis of the history of sport has demonstrated the ways in which women participate in the rejection of patriarchal notions of female inferiority, the majority of women who take up sports today participate as a means of liberating themselves from restricting social norms, such as western ideals of body image (McCrone 1988).

To define body image through a discussion of the anthropological and medical literature allows for a clearer understanding of the conflict female athletes face between the culturally assumed masculinization of their bodies and the constructed western ideals of femininity. For example, in the anthropological literature there have been a myriad of topics that involve the body, including: evolutionary assessments; sex differences; health and nutrition; and culturally defined ideas of physical attractiveness and societal norms (Lock 1993; Ruff 2002). While today varying perceptions of body and the resulting picture of femininity often have a direct and lasting effect on the health of women, the goal here is to conceptualize body image beyond theoretical interests of the academic and medical community, and to recognize how the long history of body image and its contemporary manifestations have fueled the way in which disturbances, such as athletic amenorrhea, are treated.

## Anthropology of the Body

### Evolution and body shape and size

Today, physical anthropologists view human variation as the result of such evolutionary factors as genetic drift, gene flow, and adaptation to environmental conditions, both past and present (Jurmain 2000). Body size and shape fluctuate considerably among living populations, and varying perceptions of the body can have a lasting effects on women's ideas concerning body image. Mean body mass, or weight, varies by 50% or more in a worldwide sampling of populations, whereas variation in height only varies by about 10% and breadth about 25% (Ruff 2002). Average body mass in living humans is smaller than it was during most of the Pleistocene, due most likely to technological improvements during the past 50,000 years that no longer favor large body size (Ruff 2002).

Differences in body form among modern humans were likely to result from an interaction between long-term genetic factors, including climatic adaptation, as well as developmental environment, including diet and exercise (Ruff 2002). Human diversity in physical traits is the foundation of adaptation to differing environments. For example, the study of geographic variation is highly important in the field of evolution (Ashton et al. 2000). The best known of the ecogeographic rules is Bergmann's rule, in which warm blooded animals mammals from cooler climates tend to be larger than the same species from warmer climates (Ashton et al. 2000). Allen's rule states that populations in cold climates will tend to have shorter



extremities, a physiological difference that serves to minimize the surface area to volume ratio (Ashton et al. 2000). Other geographic and climatic adaptations take place in: facial form, in which people in colder climates are more likely to have narrower noses and flatter faces; subcutaneous fat, in which people with more subcutaneous fat who are exposed to cold air and water have lowered heat loss, and; vascular adaptations, diverting blood from the surface of the body to deeper levels, is a way of insulating the core from a cold environment (Ashton et al. 2000).

An appreciation of these long-standing differences in body form between human populations can help with the assessment of health and nutrition of living individuals, and are real concerns of biological anthropologists within areas of anthropology of the body (Ruff 2001). All organisms, including humans, must adjust to environmental problems to survive and reproduce and the study of these adjustments constitutes an important part of the anthropology of the body. Furthermore, cultural ideals about body image and perception can be related to differences between humans, particularly the sexes, in perceptions of body image, and health and nutrition.

### Difference between the sexes

Historically, American cultures' concern with body image has been more prevalent among women than men (Abell and Richards 1996; Borchert and Heinberg 1996; Brewis 1999). However, there is increasing evidence that men are not immune to body image concerns or dissatisfaction with their body size and shape (Borchert

and Heinberg 1996). Furthermore, there is an important difference between the past and the present when it comes to social support for the adolescent girls' preoccupation with her body (Brumberg 1997). Beauty essentials in the nineteenth century were kept in check by consideration of moral character in which vanity and self-indulgence were looked down upon, yet today, at the beginning of the twenty-first century, the body is regarded as something to be managed and maintained through food restriction, diet, and exercise (Brumberg 1997).

Viewed historically, the normalization of the female body, perhaps the only gender oppression that implements itself (across race, age, class, and sexual orientation), is a strategy of social control (Bordo 1993). The contemporary preoccupation with appearance affects women far more often than men, and is often exhibited in newspapers, magazine, and television (Bordo 1993). During the 1920's American beauty culture was institutionalized through the fashion, modeling, and cosmetics industries and the advent of beauty contests and motion pictures (Brumberg 1997). Advertising, for example, was a means in which women were encouraged to study themselves visually and to compare their own appearance with those of others (Bordo 1993). Furthermore, in Western societies, over the past forty years, the ideal woman has been depicted as thin or "svelt" (Borchert and Heinberg 1996; Demarest and Allen 2000; Nasser 1997; Thompson 1994). This depiction has fueled the desire to be thin and has been related to a serious increase in eating disorders such as bulimia and anorexia nervosa for women of the western world (Demarest and Allen 2000). As a result, dieting and the cultivation of the body have evolved as legitimate social pursuits as well as lucrative industries (Bordo 1993).

American girls are constantly on guard against gaining weight, and, as a result, appetite control is a major feature of adolescent experience (Brumberg 1997). In 1995, middle-class white girls define perfection as five feet seven inches tall and 110 pounds, and many work long hours at exercise and body sculpting in order to achieve the body of their dreams (Brumberg 1997). While gender differences do exist in body-related thoughts and activities, the most dynamic differences focus on women's affective concerns about shape and weight (Demarest and Allen 2000). In addition, gender differences in body dissatisfaction are expressed in different terms: women tend to desire a thinner figure, express more anxiety about becoming fat, and are more likely to diet than men. In contrast, men report a desire to have a heavier physique or a thinner physique with more muscle or to want to gain weight (Borcher and Heinberg 1996). A number of studies that examine body-shape perception reveal that gender differences are real and are reflected in body shape satisfaction, ideal body image, and self-esteem, but are often opposite in nature from men to women (Abell and Richards 1996; Borchert and Heinburg 1996; Brewis 1999).

It has been shown that idealization of slim bodies and motivation to achieve them is associated with low self-esteem and distorted perceptions of individuals' own body images (Abell and Richards 1996). Abell and Richards' (1996) research examined body shape satisfaction and self-esteem of 41 male and 43 females ages 18 to 22. The study aimed to determine if feelings about body image are as powerful for young men as they are for young women. Both self-esteem and body image ideals were determined through the use of questionnaires and participants reactions to a series of progressively heavier human figure drawings. Each participant's report of

their actual weight and ideal weight were used to measure overall satisfaction with weight and body image for the individual, and the larger the differences the greater the dissatisfaction of an individual's perception of their current body size. The researchers found that males and females reported a positive relationship between overall body image and self-esteem. However, males were significantly more dissatisfied than females with their weight, wanting to be heavier, while the women reported a greater desire for thinner figures.

In another study conducted by Borchert and Heinberg (1996) self-reported discrepancies in actual and ideal femininity and masculinity of college aged women and men were shown to be linked to body image. This research included 82 female and 77 male participants and utilized the Bem Sex Role Inventory (BSRI), a questionnaire which measures self-reported masculine and feminine characteristics, which was used to assess actual and ideal masculinity and femininity. What the researchers found was that in accordance with cultural expectation, college women continue to have more negative body images than do men. However, possessing less masculinity than ideal was predictive of more negative body image for men. It was also proposed that for women, the cultural focus on female appearance and gender role characteristics of body image may emphasize body size, although, physical size has been shown to be an important predictor of body image for both men and women.

Brumberg (1997) acknowledges the urgency of addressing the current crisis concerning the fact that fifty-three percent of females are dissatisfied with their bodies by the age of thirteen, and many begin a pattern of weight obsession and dieting as early as eight or nine. In *The Body Project* (1997), Brumberg's goal is "to

initiate a multigenerational dialogue that speaks to the reality of earlier maturation, the need for sexual expression, and the nature of contemporary culture” (209). By drawing on diary excerpts and media images from the 1830’s to the present, Brumberg convinces readers of the dire necessity to understand and correct the forces behind the process that prompted an exchange of “external controls of the body for the internal controls”(197), or the ways in which the body became a central paradigm for the self in the twentieth century, thus altering the experience of coming of age. In addition, she provides all aspects of adolescence, including menstruation, growing hips, developing breasts, and learning about one’s budding sexuality. Through diary excerpts, Brumberg speaks of young girls’ worries about the contours of their bodies, especially shape, size of breasts, muscle tone. This concern is a deep-seated belief that the body is the ultimate expression of the self. “The body is a consuming project for contemporary girls because it provides an important means of self-definition, a way to visibly announce who you are to the world” ( 97). Bloomberg’s research has shown that instead of thriving on their newfound autonomy during the twentieth century, American women have managed to find themselves caught in an intimidating world that has created new ways of endangering their bodies.

Patterns of body image distortion are considerably pronounced in women, as shown in the above studies, which may be reflective of the exposure to and internalization of the cultural values of slimness that women are bombarded with everyday (Brewis 1999). Women are constantly presented with the need conform to body-size ideals, consequently they are more likely to be less satisfied with their bodies, they weigh themselves more often, they perceive weight gain more

negatively, and have higher levels of exercise and eating disorders (Brewis 1999).

Clearly this suggests that there is a need to discuss the role of Western ideals of body image, but, first a look at the cross-cultural differences of body image.

### Cross-Cultural Differences

Though highly variable between groups, cultural values about attractive bodies tend to be strongly, consistently, and widely held within them. There is a large body of research on college women in the United States concerning body image, and therefore, conclusions are generally relevant only to populations of young, predominantly white, educated middle-class women (Abell and Richards 1996; Borchert and Heinberg 1996). As so many diverse cultures are represented in the United States and face the same bombardment of body image distortions, it is important to discuss cross-cultural ideals of body on the construction of body size judgment, both in and outside the boundaries of the United States. Thus, the examination of a number of cross-cultural studies of body image from African Americans to other cultures such as the depiction of self and the body among Fijian women in various villages will be undertaken here.

In all cultures individuals are born with a sense of embodiment, or image of how their body should look, based on their cultures ideals, making the experience all but universal. The meanings ascribed to the body, while culturally bound, are influenced dramatically through social injustices that violate embodiment and vary across gender, race, sexuality, class, religion, and nationality (Thompson 1994).

Negative body image and body dissatisfaction play a crucial role in the etiology of eating disorders (Cann et al. 1996; Garfinkle et al., 1992; Thompson 1994). For example, in the United States it has been shown that European American women's negative body image and body dissatisfaction often plays a crucial role in the etiology of eating disorders. Contrary to this, African American women have a very low prevalence of eating disorders which has been attributable to the relatively greater satisfaction they have with their bodies (Cann et al. 1996; Thompson 1994). These differences reflect variations in culturally bound values regarding the relative importance of thinness and appearance in women (Cann et al. 1994; Demarest and Allen et al. 2000; Patel and Gray 2001).

Furthering this culturally constructed body identity, in a study conducted by Cann et al. (1996), a clearer picture of the complex relationship between ethnicity and body satisfaction was obtained. These researchers examined the degree in which ethnic differences in body satisfaction are affected by positive or negative social feedback. The participants, 97 White women and 42 Black women, were given bogus positive or negative social feedback so that the effect of the feedback on their body satisfaction could be determined. Results indicated positive feedback increased and negative feedback decreased the body satisfaction of White women in the expected directions, but there was no such effect for the Black women. The participants were also given questionnaires to determine reported weight, ideal weight, body dissatisfaction, drive for thinness, body esteem, and presence of eating disorders. The results showed that Black women reported heavier ideal body weights, higher body satisfaction, less problematic eating behaviors, and less dietary restraint than White

women did. Even more striking was that the Black women were more than twenty pounds heavier than the White women.

In another study conducted by Patel and Gray (2001), it was also demonstrated that Black women accurately estimate the level of thinness preferred by African American men. It was predicted by the researchers that Black women could correctly estimate the level of thinness found attractive by Black men, thereby providing support for the explanation that Black women are partially protected from experiencing similar level of body dissatisfaction as White women because they correctly estimate that Black men like larger women. Participants, 68 undergraduate women Black women and 34 Black men, were asked to fill out a questionnaire to record demographic information, age, race, country of origin, gender, birthplace, and education. They were then asked to assess body image using the Contour Drawing Rating Scale devised by Thompson and Gray (1995) in which both men and women were instructed to indicate the figure that approximates their current figure, what they aspire to look like, what figure they think would be most attractive to the opposite gender, and what opposite gender figure they find most attractive.

The results showed that Black women want to be thinner than they currently are, and they think that Black men would like them to be thinner than both, what they are and what they would ideally like to be. Black men do not want to be thinner than they are but think that women would like them to be thinner. Both Black men and women correctly estimate the level of thinness preferred by the opposite gender. This study provides support for the explanation that Black women experience less body dissatisfaction than do their White counterparts because they correctly estimate the



level of thinness found attractive by Black men who prefer larger women than White men do, thereby placing less pressure on Black women to be thinner. This research suggests that Black women are more in touch with their own body ideas, which would explain the low incidence of eating disorders, as compared to White women.

Clearly core cultural values are encoded in aesthetic ideals for body shape, especially in Western culture, where these ideas are constructed, homogenized, and reified in the media (Becker 1995). However, Becker, in *Body, Self, and Society: the view from Fiji* (1995), takes the body image dialogue out of the Western lens of culture. Here she examines how in Fijian society there appears to be a consensual ideal with respect to the aesthetics of bodily form, “with admiration of a particular shape corresponding to positive sentiments about what the shape encodes or suggests” (27). For example, Fijian women tend to prefer a curvier female shape, not like the “thin” western ideals. Thus, the Fijian “self” differs from the “Western self”, making body shape to the Fijian a marker of social connectedness rather than of personal identity. And what seems to differentiate the Fijian from the Westerner is the interest and investment in attaining the ideal by cultivating, nurturing, and disciplining the body. For example, Fijians specifically associate ideal body shape, such as strong, large calves, for a female, with physical characteristics suggesting strength, the ability to work hard and to care for her children. Also, the Fijian body reflects the achievements of its caretakers. “A body is the responsibility of the micro-community that feeds and cares for it; consequently, crafting its form is the province of the community rather than of the self” ( 57).

Becker (1995) also claims that given the historical flux of Western preference for body shape ideals, new cross-cultural variability in aesthetic ideals for body shape and weight might be reflected in Fijian body images. The ethnographic data she presents does suggest a tremendous variability in bodily aesthetics that include body shape. Thus, in order to compare perceptions of ideal body shapes among Fijians with those of other cultures, Becker surveyed Fijians in four villages about their attitudes towards body shape and work on the body. The results of her study suggest that Fijian women enjoy a positive self-image irrespective of their weight status. “Despite the clustering of opinion of what constitutes an aesthetically pleasing shape, Fijian women are relatively unmotivated to discipline their bodies and appetites in order to obtain a desired shape” (46). Thus further supporting the contention that body shape, to the Fijian women, is an indicator not only of relevant personal abilities such as nursing, housework, and care giving, but also of one’s connectedness to the social network of the community. Fijian women tend to be relatively unconcerned with their weight status, even when it diverges considerably from the ideal. Because social relationships are fundamentally mediated and affirmed through the exchange and distribution of food, Fijian women who are “not eating well” are seen as lazy or ill, and this is in stark contrast to Western women ideals in which a thinner body often means cessation of eating at all costs.

## Ideals of Body Image

Today, the majority of those suffering from body image problems in the United States invariably are young, middle to upper-class, heterosexual white women desperately trying to mold their figures to standards created by advertisers, media, clothing designers, and popular culture (Bordo 1993; Thompson 1994). These conceptions of body are not only misguided, but are built on skewed assumptions about race, class, and sexuality. Women of the 20<sup>th</sup> century also associate slenderness with self-management, experiencing new-found freedom and empowerment in the public arena (Bordo 1993). These American universals in ideals of body image that permeate culture and structure body image often times ignore women of color, working class women, and lesbians. To understand the influence that culturally constructed Western ideals of body image have on women, physical attractiveness and body size, as societal influences on body image will be discussed.

It is possible that in Western culture, where women are primarily defined by their appearance, cultural prescriptions about body size may take precedence in shaping young women's body image (Jones 1995). Physical attractiveness, body size estimation, societal influences, and sexual selection all contribute to distortions of body image in Western culture (Jones 1995). In the United States, body image is upheld by multiple institutions of power; a multi-million dollar weight reducing industry in which most consumers are women, medical professionals who maintain that fat is unhealthy and should be eliminated, the booming advertising industry that promotes demeaning images of women, a job market in which women who do not fit

this model of beauty face discrimination, and an insurance industry that upholds medically prescribed standards of what constitutes a healthy body size (Thompson 1994).

In biological anthropology, the topic of physical attractiveness and its possible evolutionary causes and consequences has been relatively neglected. Sexual selection and physical attractiveness is a human anomaly and, until recently, relatively few quantitative studies in physical anthropology have paid special attention to the study of physical attractiveness in the context of the theory of sexual selection (Jones 1995). Human beings seem to be an exception to the general rule among animals that male attractiveness matters more than female attractiveness. The importance attached to female, as opposed to male, physical attractiveness in our species, especially in Western society, stands in need of an explanation.

#### Physical attractiveness and body size

Body image is a construct widely used in the social sciences, largely due to the fact that distortions of body image are one of the many factors underlying eating disorders and issues of self-esteem (Gardner et al. 1999). Gardner et al. (1999) describe body image disturbance as consisting of two separate factors: perceptual disturbance, the inability to assess the size of one's own body; and body dissatisfaction, affective or attitudinal perceptions of one's body. To discuss this further, the understanding of developmental changes in body image in children, college women, and older women in Western culture is essential.

Body images are not fixed or static. For example, Gardner, Friedman, and Jackson (1999) measured children's body size estimations in a longitudinal study. The sample consisted of 216 male and female children ages six through thirteen. The children were, on average, accurate in estimating body size with no gender, age, or ethnic differences. When the children were asked what size they would like to be ideally, relative to their actual size, the researchers found that all age groups wanted to be thinner although this changed by gender with individuals aged nine and older. Male children wanted only modest decreases in their body size. In contrast, females showed an increasing desire to be thinner starting early at age seven and increasing through age thirteen. This study concluded that female children at this age wished to be thinner by a magnitude that would be clearly noticeable to them and others.

Physical attractiveness, body image satisfaction, weight concerns, and eating problems have become especially salient issues on many college campuses. Harris (1995) maintains that a central task of women's development involves maximizing ways to increase physical attractiveness and appeal to others, particularly men. She claims adolescence is a period during which females struggle with bodily concerns in an attempt to resolve issues of personal identity. In addition the pursuit of beauty and the enhancement of appearance are important to the feminine gender role orientation and central to the self-esteem of women. Harris concludes that body image attitudes among female college students played a role in establishing and clarifying purpose, wellness, intimacy, and academic autonomy.

Declines in health and functional abilities are normal in later life, whereby, today's cultural standard of physical beauty is that of a youthful, toned, thin and

healthy body. There is a “double standard” of aging where physical signs of advanced age are more harshly judged in women than in men (Clarke 2001). Despite the fact that attention to appearance and the pursuit of physical attractiveness are key aspects of the feminine gender role and identity, older women’s feelings about the body has been largely unexplored. Clarke (2001) conducted 96 hours of interviews with 22 women aged 61 to 92 to determine how women perceive their changing appearances and what impact these perceptions have on their sense of identity, and the nature of the relationship between an older woman’s sense of self and her body. Clarke claims the majority of women in her study contend there is a disparity between their bodies and their sense of identity. An emphasis seemed to be placed on being and feeling youthful despite chronological age, which highlights the devaluation of body image in later life. The older women differentiated themselves from their appearances, chronological ages and functional abilities of their bodies.

Studies such as these underscore the developmental changes in body image, which show consciousness of body image in the young and old and high levels of awareness among adolescents. This high level of awareness among adolescents concerning body image is the result of the exposure to cultural values represented in a myriad of societal factors from popular media, to peers, to family, and exposure to these sources ideals have a direct effect it has on body image and self-esteem, starting from an early age for females.

In the United States, women are exposed to and internalize the cultural value of slimness more than men and find cultural ideals of beauty more crucial in developing and maintaining self-esteem (Brewis 1999; Gardner et al. 1999; Harris

1995). These findings have been used to demonstrate two distinct propositions about the causes and context of body image distortion: evidence of the way in which popular media misinforms women about their bodies; and media images of ultra-slim women are internalized by women and result in distorted self-images and conceptions of others' judgments of their bodies (Brewis 1999; Gardner et al. 1999; Harris 1995). In recent years researchers have increasingly focused on the role of parental, peer, and media in the body image and dieting behavior of adolescence (McCabe and Ricciardelli 2003). Interestingly, it is not possible to identify a single major source of sociocultural influence that is likely to have the most impact. While media imagery and reinforcement of popular cultural idea must play a role in promoting and exaggerating women's misconceptions about male preference, this role may be a product or a co-result rather than a single necessary causal factor in the patterning of body physical attractiveness misjudgment in samples of Western women (Brewis 1999)

### Summary

In defining body image through a discussion of anthropological and medical literature, it is clear that body size and shape vary considerable between the sexes and cross-culturally. It has been shown that idealization of slim bodies and motivation to achieve them is associated with low self-esteem and distortions of one's own body image. In Western culture, where women are for the most part defined by their

appearance, cultural prescriptions about body size take precedence in shaping young women's ideas of the body.

While this research focuses on females influenced by Western culture, it does include females from non-Western cultures, and it is important to note that cross-cultural studies can be used to reveal the relationship between cultural values and the perception of body image. Most importantly, however, is the impact of situational social factors on body satisfaction, and this is well highlighted in the clear differences between Black females and White females, as well as between Fijian and Western ideals of body size, shape and overall identity.

While Western culture has homogenized the image of the body over the years, creating an ideal of thin and fit that young American females find hard to obtain. For the female athlete studies such as those presented here can be used to teach the importance of accurately judging body size, and thus creating an ideal body image that is fit and healthy. The following chapter discusses female biology, and includes expectations regarding menstruation, a normal menstrual cycle, female menstrual dysfunction, and adequate bone health, in order to more fully understand the effects of excessive activity and lack of eating on the long term health of elite athletes.



## CHAPTER II

### THE BIOLOGY OF WOMEN

#### Menstruation

##### Popular beliefs about menstruation

The discovery of the ovum in 1827 stimulated study into the physiology of reproduction, and in 1863 menstruation was finally linked to the ovaries and their function (Montgomery 1974). This discovery provoked much discussion within the scientific and medical community, yet it did little to alter popular attitudes toward menstruation. A woman's monthly reproductive cycle doesn't just effect fertility, it influences mood, muscle mass, body fat, energy metabolism, and aerobic capacity (Walsh 1996).

Menstruation is a topic that has attracted considerable interest among a range of scientists. Clinicians and psychiatrists have long speculated about the extent to which distress syndromes related to menstruation are psychological or organic, each having implications for therapeutic approaches (Ernster 1977). Family planners are focused on the meaning of menstruation and the significance of cycle changes induced by different contraceptives with regard to fertility (Ernster 1977). Feminists are concerned with the possibility that long-held views about menstruation are incapacitating and might affect societal roles for women, as well as self-image of the

individual female as she develops (Ernster 1977). Anthropologists, over the decades, have documented cross-cultural variation in overt menstrual behaviors, which indicates that much of what is being observed can be attributed to social expectation rather than to biology such as restriction on and avoidance of the menstruating woman, regulations regarding personal hygiene, and restrictions on sexual intercourse (Ernster 1977).

Throughout the ages, and across cultures, the meaning of menstruation, its related interpretations, and function in sexuality, can be directly tied to body image, both by females and males. This chapter focuses on the importance of the menstrual cycle, including the physiological effects, expectations, why it is important to have a normal menstrual cycle, and insight into how menstrual socialization might be linked to body image and sex role acquisition.

### A normal menstrual cycle

A basic understanding of the normal menstrual cycle is the foundation for the recognition and treatment of menstrual dysfunction. Kiningham (1996) and Small (1999), both present clear examinations of the function and importance of a normal menstrual cycle in the female body. A normal menstrual cycle averages 28 days, with day one marking menstruation and day 14 marking the time of ovulation, however, cycles can vary in length from 22 to 45 days. The function of the menstrual cycle is to regulate the maturation of the ovum and prepare the uterus for implantation. The pituitary gland releases follicle stimulating hormones to start the

development of the egg in the ovaries. The follicle that the egg grows in releases estrogen into the bloodstream to prepare the endometrium for potential pregnancy. As a result, the endometrium thickens and uterine secretions increase. At the same time, estrogen acts as a feedback mechanism to stop any more eggs from maturing, and to stimulate the release of luteinizing hormone (LH) from the pituitary. During ovulation, a sudden LH surge from the pituitary causes the release of the mature ovum. The follicle left behind develops into a structure called the corpus luteum and starts to thicken the endometrium further. The increasing levels of estrogen and progesterone inhibit the release of FHS and LH from the pituitary in another feedback mechanism. If conception does not take place after ovulation, all the ovarian hormones drop to their initial levels and menstruation begins.

Cyclic menstrual bleeding requires normally functioning ovaries, a uterus with a responsive endometrium, an unobstructed outflow tract, and an intact hypothalamic-pituitary-ovarian axis (Kiningham et al. 1996; Saladin 2001). Aside from pregnancy, the most common causes of amenorrhea involve disorders within the hypothalamic-pituitary-ovarian axis, in which hormonal signals, or an inappropriate response to these signals, lead to inadequate coordination of ovarian follicular development (Kiningham et al. 1996; Saladin 2001). Disruptions in menstrual function affect fertility and can result in a prolonged effect on bone mineral density, discussed at length in a further section.

### Why is the menstrual cycle important in women's health?

The occurrence of regular monthly periods in women of reproductive age is the most obvious manifestation of cyclical ovarian activity (Baird 1997). Walsh (1996) discusses two main phases of the menstrual cycle: the number of days from the first day of menses to ovulation is the follicular phase, during which estrogen and progesterone are low; and the days after ovulation, luteal phase, when both hormones are high. She suggests the luteal phase is when many metabolic changes occur that can alter both fertility and athletic performance, although, research into this topic has not yet produced conclusive results.

The basis for the female hormonal cycle is the endocrine coordination between the hypothalamus, the pituitary gland, and the ovaries (Baird 1997; Olson 1989; Saladin 2001; Walsh 1996). The coordination among these centers occurs through the circulatory system via hormones. Estrogen, progesterone and relaxin affect many tissues and systems other than the ovarian follicles (Walsh 1996). Estrogen affects soft tissue strength, muscle function, and the central nervous system, while progesterone can act as a central nervous system anesthetic and relaxin can drastically diminish collagen tension (Baird 1997; Olson 1989; Saladin 2001; Walsh 1996). These complex interactions of hormones may play a role in the susceptibility of women to serious injuries. For example, Wojtys et al. (1998) designed a study to investigate the variation in anterior cruciate ligament injury rates during the female monthly cycle and found that there is an increased incidence of ACL injury during the ovulatory phase of the menstrual cycle. Researchers found that when a surge in

estrogen production occurs, usually between days 10 and 14 of the menstrual cycle, the rate of ACL injury is statistically significant. Anterior cruciate ligament injuries are four to eight times higher in women than in men. This suggests that the epidemic of non-contact ACL tears in female athletes may be related to hormonal fluctuations. The menstrual cycle's effect on knee injuries, especially during the ovulatory phase of the cycle, suggests a widespread problem facing women, and the entire sport and medical community. This proposed association between ACL injury rate and menstrual cycle timing is crucial because female sex hormones have been shown to affect the structure and composition of specific tissues of the body. The effects of irregular menstruation on bone health will be discussed at length in a further section.

### Expectations regarding menstruation

Although increasing attention has been given to the biological components of the menstrual cycle it can be argued that expectations and relaying the importance of regular menstruation to premenarcheal and amenorrheic females should be more heavily stressed. Ernster (1977) conducted a study among 200 American premenarcheal females designed to elicit their expectations regarding menstruation. Group interviews were conducted among Girl Scout troops in a major U.S. city, with girls ranging in age from 9 to 14 years. A variety of questions were asked: What is a period; How long to menstrual periods last; how does a girl feel during her menstrual period; And do they think girls can do everything she normally does when menstruating? Seventy five percent of the girls included in the study were

premenarcheal, and the remainder were in the years immediately following the onset of menstruation. The study was designed to better understand the relevant influences, information, and attitudes in Western society regarding menses and to gain insight into how menstrual socialization might be linked to body image.

Results of Ernster's (1997) study showed that informal and formal hints about menstruation have permeated the consciousness of premenarcheal girls over the years and certain stereotypes have been internalized such as displeasure, discomfort, and a time of vulnerability. Most of the girls' remarks reflect ancient notions that restrictions should accompany menstruation and that it is a time of weakness, and this suggests that the girls harbor incomplete knowledge and fears such as the possibility that menstruation might involve pain or lead to pregnancy, during a time when they are beginning to assimilate body images which incorporate reproductive organs. This incomplete knowledge of menstrual beliefs and practices serve to validate societal images of the inferior constitution and abilities of the female. There are certain themes regarding menstruation revealed in this study which merit concern such as fear, anticipation, secrecy, anxiety about being normal, and confrontation with female role expectations.

The research presented here attempts to promote an open, de-mythicized, realistic approach to understanding menstruation by focusing on the consequences of athletic training and athletic amenorrhea. But first, female menstrual dysfunction, the female athletic triad, and athletic amenorrhea must be discussed must be discussed within the larger context of women's health.

## Female Menstrual Dysfunction

Dysfunctional menstrual uterine bleeding is defined as abnormal bleeding in the absence of intracavity or uterine pathology (Saladin 2001). Most commonly, menstrual dysfunction is associated with anovulatory menstrual cycles and systemic or medical conditions, but may coexist with intrauterine pathology (Saladin 2001). Currently, 9%-30% of reproductive age women have menstrual irregularities requiring medical evaluation (CDC 1995). The following section discusses disordered eating behaviors, amenorrhea, and the effect of menstrual dysfunction on bone health.

### Female athletic triad

Athletics provide an environment that places bodies and physical appearance at the forefront, even above performance, particularly for women. As much research suggests (Borcher and Heinberg 1996; Demarest and Allen 2000; Greenleaf 2002) the cultural ideals and norms of beauty and physicality are engrained at an early age. Furthermore, one of the challenges related to body image, unique to female athletes, is the pressure to meet cultural body ideals while also possessing qualities beneficial to successfully completing physically demanding tasks of their sport. The athletic environment provides a setting that allows women to demonstrate strength, power, and coordination but may be deemed inappropriate in the larger context of femininity due to the development of “masculine” features in women. While dissatisfaction with

one's body in Western culture has become the norm, it is not without consequence among elite athletes, and can develop into the female athletic triad.

The female athletic triad consists of disordered eating behaviors, amenorrhea, and osteopenia/osteoporosis, and is often overlooked as areas of concern for these women who otherwise consider themselves to be in superior physical condition (Thrash and Anderson 2000). Problems associated with this triad include development of an energy deficit, when the energy, or calories, they expend exceeds their energy intake. This deficit may be unintentional, resulting from inadequate replenishment of the caloric demands of training, or it may be intentional—a conscious attempt to lose weight or body fat in the interest of improved appearance or athletic performance (Dummer et al. 1987).

In a study of young elite swimmers Dummer et al. (1987) revealed that 60.5% of average-weight females and 17.9% of underweight females were trying to lose weight by decreasing their food intake, however, 12.7% were bulimic, 2.5% were using laxatives, and 1.5% were using diuretics. While this is only one example, disordered eating can be seen in athletes participating in all sports. However, one sport seems to counter this, diving.

Hausenblas and Mack (1997) examined self-presentational concerns related to the physique and eating disorder correlates among female divers. Specifically, divers, who compete in a judged event where appearance such as body weight and shape plays a central role in the athlete's outcome, were compared with an athletic control group where appearance does not directly influence performance (i.e. volleyball, soccer, and lacrosse), and a non-athletic control group. Female divers in this study



reported significantly less social physique anxiety than an athletic and non-athletic control group. Even though these competitive divers compete and train in revealing attire and are evaluated subjectively by judges, they did not report heightened social physique anxiety, present eating disorders, as well as body image issues. Given divers low social physique anxiety scores, it appears that they are comfortable with their physical self-presentation, and have minimal concerns regarding their bodies. This strongly suggests that involvement in activities that emphasize physical self-presentation do not necessarily place females at a higher risk for developing eating disorders. Although, this study may have had flaws regarding study groups which presented a bias in the methodology. For example, using only female divers, the researches de-emphasize the influence of cultural trends of social anxiety. Methodologically this is problematic because study groups such as gymnasts, skaters, and swimmers, who also compete in revealing clothing, should have been included and compared with the divers, emphasizing sports culture outside the academic arena. In addition, societal pressures of thinness were not included in the dialogue of self-presentational concerns of the divers.

In athletic performance the advantage of maintaining a healthy minimal level of body fat juxtaposed with the negative connotations of being fat in Western society creates strong pressures for thinness (Rust 2002). Some researchers (Katz 1986; Wiita et al. 1995) have speculated that society's emphasis on physical fitness and leanness may promote preoccupation with low or extremely low body weight and this may result in the develop of eating disorders. In addition, Katz (1986) has suggested

that extreme exercise, such as long-distance running, can trigger anorexia in persons who are at risk psychologically and biologically for developing an eating disorder. Whatever the motivation, when these pressures lead to eating disorders or energy intake deficits, a serious consequence can be menstrual dysfunction of female athletes, or amenorrhea.

### Amenorrhea

There are two types of menstrual dysfunction: primary and secondary amenorrhea. Primary amenorrhea is defined as the absence of menses by age sixteen and secondary amenorrhea is typically defined as the absence of at least three to six consecutive menstrual cycles in a female who has begun menstruating (Drinkwater et al. 1996; Skolnick 1993).

Skolnick's (1993) research reveals that the prevalence of secondary amenorrhea in adult athletes ranges from 3.4% to 66%, depending on the sport or criteria used to define amenorrhea, compared to 2% to 5% of women in the general population. While some athletic women experience altered menstrual cycles (discussed earlier), it is rarely a result of training activities alone. If the energy output by athletes is not supplemented with energy going in, such as adequate caloric intake, they are fueling an inadequate diet. Athletes who have inadequate diets for their activity level, such as runners, dancers, and gymnasts, are usually prone to "athletic amenorrhea," a form of hypothalamic amenorrhea, which in females under sixteen is seen as primary amenorrhea in females under sixteen (Carbon 1994). As Rust (2002)

discusses, hypothalamic amenorrhea is characterized by a reduction in the secretion of a hormone, called gonadotropin releasing hormone (GnRH), from the brain's hypothalamus. The function of GnRH is to stimulate the pituitary gland, which in turn sends signals to the ovaries. A reduction of GnRH and luteinizing hormone (LH) is found in amenorrhea. The lack of LH stimulation causes suppression of the ovary, which then fails to produce estrogen and progesterone. In turn, no ovulation occurs and there is no cyclic menstrual bleeding.

There are three inducers of hypothalamic amenorrhea: anorexia nervosa, excessive exercise, and extreme dietary restrictions, and often all three are interrelated. In women with anorexia nervosa, the gonadotropin deficiency is at least partially due to weight loss (Locke and Warren 2000). Luteinizing hormone (LH) secretion is also effected, in fact, some of the lowest LH levels seen in secondary amenorrhea have been observed in women with anorexia nervosa (Locke and Warren 2000). Patients with exercise-induced amenorrhea show patterns of GnRH depression, along with LH, and estradiol deficiencies (Locke and Warren 2000). It is a long follicular phase or the absence of a critical LH or estradiol surge at midcycle which accounts for the suppressed cycles experienced by athletes (Locke and Warren 2000). If LH levels are low, complete amenorrhea will ensue. Moreover, even in women of normal weight, amenorrhea may be primarily due to nutritional restriction (Locke and Warren 2000). There is evidence of subclinical eating disorders and severe restriction of dietary fat intake found in normal weight, non-athletic women with hypothalamic amenorrhea (Locke and Warren 2000).

Clearly disruptions in menstrual function represent only the extreme end of a graded continuum of ovarian response to nutritional and physical stresses (Ellison 2001). Between the extremes of a fully functioning ovarian cycle and the interruption of menstrual function are more subtle degrees of variation. The mildest form of ovarian suppression involves a lower profile of progesterone secretion in the luteal phase of the cycle, which is termed "luteal insufficiency" (Ellison 2001).

Suppression of follicular development in the first half of the cycle may also occur, and is often a precursor of luteal suppression in the same cycle (Ellison 2001).

Ovulatory failure, which can occur without noticeable changes in menstrual pattern, represents a more profound suppression of ovarian suppression, dropping the probability of conception for that month to zero (Ellison 2001). These various forms of ovarian suppression are not independent conditions, but occur along a gradient reflecting etiology. Continued suppression can lead to menstrual irregularity, oligomenorrhea, and, if suppression is profound and sustained, amenorrhea (Ellison 2001). When ovarian suppression occurs in association with environmental or behavioral stresses, the degree of suppression along this gradient ordinarily correlates with the intensity of stress (Ellison 2001). For example, as behavior or ecological stresses such as extreme thinness, heavy exercise, and nursing, increase, the ovarian response decreases from fully competent cycles to luteal phase suppression, ovulatory failure, oligomenorrhea, and amenorrhea, and, in turn, ovarian function decreases (Ellison 2001).

It should be noted that some cases of menstrual dysfunction in athletes result from pathological conditions that are unrelated to exercise. For example, according

to Shanghold et al. (1990), athletes are no less susceptible than the general population to pituitary tumors, thyroid dysfunction, polycystic ovary disease, and premature ovarian failure, in which the incidence is very low. Any of these disorders can cause menstrual dysfunction and hormonal abnormalities. Because of this, it is important to determine whether the cause of athletic amenorrhea is due to lack of energy intake or one of the previous pathological conditions.

Until recently, the medical community regarded amenorrhea in elite athletes as a relatively benign condition, a consequence of training (Skolnick 1993). However, amenorrhea is a symptom of something going wrong and could be a sign of a potentially serious clinical problem (Skolnick 1993). Over the past decade, the reduction and disturbance in menses in young athletes, or amenorrhea, is starting to be seen as a disorder with great consequence with side effects creating a loss in bone mineral density. Drinkwater, Bruemner, and Chestnut (1990) raise the question of whether extended periods of menstrual irregularity may result in a prolonged effect on bone mineral density. Specifically, their research was designed to examine more closely the relationship between present bone mineral density, menstrual history, and current menstrual status of active young women. Ninety seven female athletes, ages 18 to 38 years, participated in the study and were examined using single and double absorptiometry to determine mineralization for different parts of the skeleton and the resulting data was compared to menstrual patterns. Specifically, dual-portion absorptiometry was used to measure bone mass at five different sites: L2 through L4, femoral neck, femoral shaft, tibia, and fibula. Menstrual status was confirmed by drawing venous blood samples everyday for four weeks, and skin fold measurements

were taken to measure subcutaneous fat to determine fat ratios. Drinkwater et al. (1990) concluded that the loss of bone mass correlated with abnormal menstruation (diagnosed with oligomenorrhea or amenorrhea), with the women experiencing the greatest irregularity having the greatest reduction in bone mass. The researchers also stated that body weight had a beneficial effect, and heavier women experienced less mineral loss than the lighter subjects.

In 1992, Baer and Taper assessed the dietary intake and exercise training in amenorrheic and eumenorrheic athletes, female who have 10-13 menstrual cycles per year. They claim strenuous training combined with a low-energy diet are the main causes of amenorrhea in adolescent runners. In this study, six amenorrheic and six eumenorrheic runners, ages fourteen to eighteen were assessed for their dietary training status. Each girl completed a seven day diet record and was examined for body composition. A questionnaire was administered to assess personal health, exercise habits, menstrual history, and dietary practices. Body composition was determined by skinfold thickness to measure body fat, and blood samples were taken to measure estradiol levels. The purpose was to determine what aspects of the amenorrheic runners' training had caused them to stop menstruating. The results of this study showed that adolescent athletes who train vigorously and consume a low-energy diet exhibit secondary amenorrhea and reduced estradiol levels. It was found, typically, amenorrheic runners consumed less energy than eumenorrheic athletes, particularly energy from protein. Because of the potential health risks associated with athletic amenorrhea, such as a low energy diet and reduced bone mineral density, individuals who advise female athletes regarding training and dietary habits need to

emphasize the importance of consuming an appropriate energy intake to support performance as well as growth and development. The following section aims to discuss bone structure, adequate bone health, and the effects of exercise on the skeleton in the larger context of women's health.

### Bone Health

Osteoporosis is a condition in which loss of bone density leads to increased risk of fractures. In most cases, osteoporosis, which occurs at an earlier age and more frequently among women, is associated with age-related endocrine changes, especially the decline in estrogen production during menopause (Stini 1995). However, earlier occurrences resulting from factors such as inactivity, low bone peak density in young adulthood, low calcium intake, and a variety of lifestyle factors such as diet and exercise can lead to a high risk of fractures before menopause (Stini 1995). This is because bone is in a continual state of turnover, and the balance between bone formation and resorption can be upset by a number of factors (Stini 1995). The focus here is to understand the optimal bone health for women through examining bone structure and histology, risk factors for low bone density, and the effects of exercise on the skeletal structure.

### Bone structure and histology

Osteoporosis is defined as a systemic skeletal disease characterized by low bone mass and microarchitectural deterioration with increased bone fragility and fractures (Deblinger 2001). Osteoporosis results when the dynamic, constant process of bone remodeling becomes unbalanced, with more being resorbed than is being replaced, leading to a porous bone structure (Deblinger 2001). Calcium, mostly in the form of calcium hydroxyapatite, stored in the human skeleton represents 98% of the body's total calcium (Stini 1995). Newly formed hydroxyapatite crystals are different than older ones in that older crystals are larger, more regular, and contain less carbonate (Stini 1995). This difference in crystalline structure results in older crystals offering less surface area where resorption can occur, creating this imbalance (Stini 1995).

Bone is made up of both cortical and trabecular bone. Cortical bone constitutes 85% of the skeleton, yet trabecular is metabolically more active and prominent at sites where osteoporotic fractures most commonly occur such as in the end of the femur, the vertebrae, and the pelvis (Carbon 1994; Stini 1995; Watts 1991). Trabecular or cancellous bone is a "spongy" lighter form of bone that is abundant in the axial skeleton. It is usually found in protected areas such as the marrow cavities near the end of long bones, in the bodies of vertebrae, in the ribs, and in the bone of the pelvis (Carbon 1994; Stini 1995). Trabecular bone forms an open latticework in which 30-90% of the enclosed area is open space (Stini 1995). As long as the latticework remains intact and the stresses remain similar to those experienced



during growth, trabecular bone is well suited to withstand compressional stress associated with weight bearing activities (Rizzoli and Bonjour 1997; Stini 1995). Although, because of its greater accessibility for resorption, trabecular bone is usually the first element to experience loss of mass when aging, illness, or other risk factors which precipitate mobilization of calcium (Rizzoli and Bonjour 1997; Stini 1995). Cortical or compact bone, which is much denser than trabecular bone, forms the outer surface of bones that may have a high proportion of trabecular bone inside (Carbon 1994). Because of its greater density, it is more impact resistant than trabecular bone and, especially in the shaft of long bones, serves as a major weight bearing structure (Carbon 1994; Stini 1995; Watts 1991).

The characteristic structural unit of cortical bone is the osteon. With age and remodeling, the original primary osteons are resorbed wholly or in part and are replaced by secondary osteons (Carbon 1994; Stini 1995). Portions of older lamellae, concentric layers of bone surrounding the blood vessels, remain between osteons, and the system eventually takes on a less organized appearance (Carbon 1994; Stini 1995). The remodeling of cortical bone occurs at different rates in different parts of the skeleton; it may occur more rapidly in the femur, for instance, where cortical bone has a half-life of about 7.6 years, than in the tibia, where a half-life of 24.2 years is normal (Carbon 1994; Stini 1995). As a result of this there is considerable heterogeneity in the organization of cortical bone. This heterogeneity of bone quality from point to point on a specific bone's surface makes bone relatively more susceptible to fatigue damage than would be the case than if it was the same quality at all points (Carbon 1994; Stini 1995). About 90% of the strength of compact bone is

determined by its density and loss of bone mass means loss of bone strength, which in turn, means an increased risk of fracture, the current clinical definition of osteoporosis (Carbon 1994).

### Risk factors in maintaining adequate bone health

Some of the factors that contribute to the onset of osteoporosis have their antecedents early in life in the form of modifiable behaviors or lifestyles such as exercise and nutrition (Leslie and St. Pierre 1999). Bone acquisition by young adults seems to reflect habitual physical activity. Weight bearing activities contribute to the development and maintenance of bone, conversely, bone is negatively influence by disuse and weightlessness. For example, as a result of strenuous exercise for hours a day over many months, estrogen levels can be lowered, especially if significant weight loss accompanies such exercise programs (Leslie and St. Pierre 1999). The loss of estrogen during this period can negatively effect the opportunity to build peak bone mass (Leslie and St. Pierre 1999). In a study by Leslie and St. Pierre (1999) risk factors for osteoporosis were examined among 20 to 29-year-old females, in which engagement in strenuous exercise for hours a day over many months lowered estrogen levels. The research concluded that the loss of estrogen during this period negatively influenced the opportunity to build peak bone mass.

The susceptibility of bone to estrogen deprivation was recognized more than fifty years ago with a noticeable association between osteoporosis and menopause (Rizzoli and Bonjour 1997). Since then, the concept of a causal link between

estrogen deficiency and accelerated bone loss has been supported by observations in various states of premature estrogen deficiency, such as anorexia, secondary amenorrhea due to strenuous exercise, and the use of gonadotropin inhibitors (Rizzoli and Bonjour 1997). Rizzoli and Bonjour (1997) examined the importance of estrogen on the affect on metabolism and the structural integrity of bone. The researchers suggest that in disorders associated with low estrogen production or inadequate estrogen action hormones are a key factor in acquisition of bone mass. Some might object that in exercise related amenorrhea, eating disorders are a likely factor in the low bone mass, but Rizzoli and Bonjour observed that marathon runners' bone loss was essentially attributable to estrogen deficiency rather than alterations in calorie, calcium, or protein intake.

#### Effects of exercise on the skeleton

Some form of weight-bearing exercise is essential to maintain bone density, but the optimum amount of exercise differs among differing ages and individuals. Exercise affects the skeleton in several ways. The direct effects of stress loading can be to increase bone mineral density, now a strategy for preventing osteoporosis and include a variety of factors that increase bone density (Andreoli et al. 2000; Burrows et al. 2003; Wolman 1994). For example, weight bearing activities are associated with increase in bone density but are less pronounced if the exercise does not incorporate gravity stimulation (Andreoli et al. 2000; Burrows et al. 2003; Wolman 1994). Thus, swimming, being a weight-supported activity, produces only a limited

effect on the skeleton, compared with some weight bearing activities such as running. The skeletal response to exercise is greatest at the site of maximum stress (Andreoli et al. 2000; Burrows et al. 2003; Wolman 1994). This effect is seen in professional tennis players, whose playing arm can be up to 30% more dense than the non-playing arm, runners have increased density in the calcaneus, femoral shaft, and spine; and rowers, who perform intensive upper body exercise, display even more spinal bone density (Wolman 1994). Any exercise activity that produces repetitive stress loading to a part of the skeleton will tend to increase bone density at that site (Andreoli 2000; Burrows et al. 2003; Carbon 1994; Wolman 1994 ). The prescription of exercise programs such as running, tennis, rowing, or volleyball, can lead to appreciable increases in bone density after several months of training and for older people, exercise may reduce the risk of osteoporosis (Wolman 1994).

High impact exercise appears to have the greatest positive effect on optimal bone health, however, excessive exercise can decrease bone density, a decrease which has been associated with a reduction in circulating estrogens found in women with high activity levels (Stini 1995). The impact of excessive exercise is perhaps the greatest in young women who have not yet attained peak bone density and who therefore have less bone mineral reserve to draw on at menopause, an effect which can have great consequence later in life. The ability of the female athlete to push her body to the physiological limit has produced extensive knowledge about how various physiologic systems respond to exercise (Carbon 1994; Stini 1995). For female athletes, menstrual dysfunction may lead to decreased bone mineral density, a

concern for young athletes since the average woman gains 40% to 50% of her skeletal mass during adolescence (Lloyd et al. 2000).

Here the importance of a normal menstrual cycle and its affect on adequate bone health have been highlighted and used to understand the potential problems associated with athletic amenorrhea and the effects of exercise on the skeleton. The following chapter presents an empirical study of elite female college athletes at Western Michigan University and the prevalence and awareness of athletic amenorrhea is assessed and discussed.

### CHAPTER III

#### THE STUDY: ATHLETIC AMENORRHEA: PREVELANCE AND AWARENESS AMONG FEMALE ATHLETES AT WESTERN MICHIGAN UNIVERSITY

A normal menstrual cycle coupled with consistent exercise can create optimal bone health for women (Frederick and Hawkins 1992). As research has shown, exercise, especially types of exercise in which the muscles work against gravity (impact activities), are important for the development and maintenance of strong bones, and can reduce bone loss (Frederick and Hawkins 1992). Intensive aerobic exercise, however, can adversely affect bone density indirectly by its effect on the hypothalamic-pituitary-gonadal axis, which leads to a fall in blood estrogen concentrations; the effects of which cause amenorrhea (Borrows et al. 2003; Wolman 1994). But all too often, amenorrhea in elite athletes is regarded as a relatively benign condition, only a consequence of training and many in the medical community see it as a normal adaptation of female athletes (Banfield and McCabe 2002). Thus, the loss of menstrual periods during athletic training is not regarded as problematic, but amenorrhea *is* a symptom of something going wrong and could be a sign of a potentially serious clinical problem or of health issues to come later in life. There is research that strongly suggests that no irreversible reproductive dysfunctions should occur as a result of menstrual dysfunction in athletes, but various disorders including

luteal phase deficiency and hypoestrogonic amenorrhea are very common among athletes and can last a long time (Shanghold et al. 1990). There is also growing concern about the risk of early-onset osteoporosis in women athletes with amenorrhea and resulting low estrogen levels (Shanghold et al. 1990).

The research conducted for this thesis and presented here investigates female college athletes (18-24 years) from Western Michigan University, a Division I school, who are undergoing strenuous training. The goal of this study is to determine if Division I female athletes from Western Michigan University are showing signs of menstrual dysfunction and whether or not they understand the long term consequences of amenorrhea on their health and bone density. An additional focus is on the information given to these female athletes in training regarding the possibility of menstrual dysfunction as a result of the duress of weight reduction and stress of competition. Furthering this is an understanding of the information being offered to these women regarding the potential long term health effects of athletic stress on their bodies (particularly their skeletal structures), and reproductive system.

### The Project

This research presented here is an investigation of the incidence of menstrual dysfunction (athletic amenorrhea) in forty-three female athletes undergoing strenuous training. Beyond assessments of menstrual dysfunction, this study also aims to assess the level of awareness among these female athletes with regards to their

understanding of the cause and effects of athletic amenorrhea and its potentially long-term health consequences.

The first part of the study consists of forty-three females who are elite collegiate athletes between the ages of 18 and 24 who have been already engaged in exercise an average of eight hours per week for a minimum of four years. As a part of the study, subjects completed a questionnaire to assess training, health, diet, menstrual status, and awareness of athletic amenorrhea (appendix A). Specifically, such factors such as age, age at onset of training, years of training, time off from training, age at first menses, cycles per year, and the use of oral contraceptives were assessed.

The second part of the study was to determine the incidence of menstrual dysfunction among the athletes. All forty-three athletes were asked to recall the number of menstrual cycles per year they had. Subjects determined to be amenorrheic (0-3 menstrual cycles per year) constituted one group; subjects determined to be eumenorrheic (4-9 cycles per year) constituted another group, and subjects determined to be oligomenorrheic (10-13 cycles per year) were another study group. Although, a number of females ( $n=14$ ) were using oral contraceptives. These 14 athletes could not be considered for menstrual dysfunction and put into the eumenorrheic group (9-13 cycles per year). All work was conducted in accordance with the privacy standards of the Human Subjects Institutional Review Board (appendix B). The athletes included in the study participated in track, cross-country, and gymnastics teams.



### Subject selection

Recruitment of subjects involved contacting the gymnastics, track, and cross-country coaches and informing them of the proposed project and the specific involvement of their athletes. If the coach or any of the subjects felt their anonymity would not be protected, they were free not to participate in the study. If the coach of the respective sport agreed to participate, permission was requested to attend one practice to discuss this study with the athletes. Specifically, that the aim of this study is to find out the prevalence of amenorrheic athletes among Western Michigan University Division I athletes and whether or not they are informed on the subject matter.

The study was completely voluntary and anonymous and there was no pressure to participate. In addition, this researcher is not involved with Western Michigan University's athletic department in any way, and does not have a relationship with any of the coaches of the gymnastics, track, and cross-country teams.

Although all questionnaires were completed and accepted from the athletes, not all data was used for analysis. For example, if the subjects stated within the questionnaire they are on oral contraceptives they cannot be considered amenorrheic due to the effects of estrogen on bone production and regulated menstrual cycles, yet their information was still used to determine if they had heard of the cause and consequences of amenorrhea. To draw together a sample the following criteria was used: 1) female subjects were to be of an elite level. This does not mean they are professional athletes rather have been highly competitive for at least four years; 2)

participants had to be able to accurately assess menstrual status. This was assessed through questions five and six of the questionnaire and was based solely on recall.

The data collected is presented graphically showing the percentage of female athletes at Western Michigan University who are amenorrheic and the percentage of females who are aware of the terminology, among other pertinent data, in the following chapter. As this research is not linked to a particular sport, subjects are not identifiable by the combination of their answers with their sport.

Analysis of the data includes the assessment of completed questionnaire's (appendix A) to assess training, health, diet, menstrual status, and level of awareness. These data aided in the evaluation of the percentage of female athletes who are experiencing menstrual dysfunction and the level of knowledge subjects possess regarding its effects. Questionnaires in which the answer involved a "yes" or a "no" (questions seven through twelve) a yes is represented by the number one and a no is represented by a number two. All other answers are in accordance with the respective number. The prevalence of amenorrhea, specifically, the percentage of female athletes who are having 0-3 periods per year and the level of awareness, the number of athletes aware of what athletic amenorrhea is presented in statistical and graphical form and processed using the statistical program Minitab 14 (data appendix C).

## CHAPTER IV

### RESULTS

The following are the descriptive statistics, both in tabular and graphical form, assessed from the questionnaires of the forty-three participants (see appendix A; questionnaire). The complete spreadsheet of the questionnaire data in Minitab 14 can be found in Appendix C.

#### Descriptive Statistics Question 1:

The standards set for elite athletes, to be included in this study, was participation in competitive sport and training for a minimum of four years, all but two athletes fulfilled this requirement. 43 individuals were identified to participate in the study based on the answers to the Questionnaire (Appendix A). The average number of years female athletes included in this study have been competitive is 9.767 years, with a minimum of five and a maximum of sixteen (Table 1).

Variable	Mean	StDev	Minimum	Median	Maximum	Range
Q 1	9.767	2.861	5.000	9.000	16.000	11.000

**TABLE 1:** Descriptive statistics for number of years in which athletes in this study have been competitive.

### Descriptive Statistics Question 2:

The average number of months per year in which the athletes in this study are competitive is 8.070 months, with a minimum of three and a maximum of twelve months (Table 2). The average season for athletes at Western Michigan University lasts eight to nine months, which includes pre-season, in-season, and post-season work-outs.

Variable	Mean	StDev	Minimum	Median	Maximum	Range
Q 2	8.070	2.906	3.000	9.000	12.000	9.000

**TABLE 2:** Descriptive statistics for number of months per year athletes in this study are competitive.

### Descriptive Statistics Question 3:

The average number of hours per week in which the athletes in this study work out is 19.302, with a minimum of 12 hours and a maximum of 30 hours per week (Table 3). This includes weight training, endurance training, and sport training. This question was in regards to peak season training.

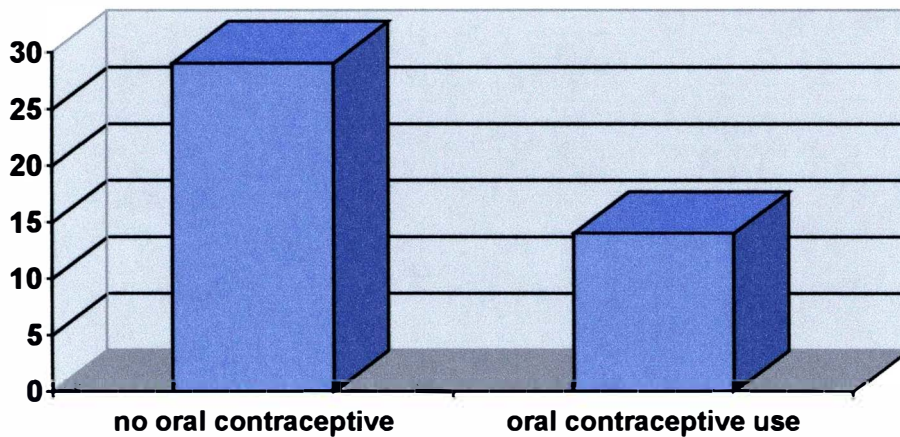
Variable	Mean	StDev	Minimum	Median	Maximum	Range
Q 3	19.302	3.694	12.000	20.000	30.000	18.000

**TABLE 3:** Descriptive statistics for the number of hours per week athletes in this study work-out.

#### Descriptive Statistics Question 4:

32% of the athletes in this study are using an oral contraceptive (Figure 1).

The national average in 1995 of women using an oral contraceptive was 17% (CDC 1995). As almost twice the national average, the number of female athletes who cannot be considered amenorrheic is considerable. Although, their knowledge of the cause and effects of amenorrhea is still significant.



**FIGURE 1:** Number of athletes in this study taking an oral contraceptive.

<u>Age</u>	<u>n</u>	<u>pill non-users</u>	<u>pill users</u>	<u># of years (avg)</u>
18	5	3	2	1.50 yrs
19	6	4	2	1.00 yr
20	5	3	2	3.50 yrs
21	7	4	3	1.33 yrs
22	1	0	1	5.00 yrs

**TABLE 4:** Oral contraceptive use among athletes in this study.

Note: as age is an identifier, some participants did not wish to state their age on the questionnaire. The following is information from those who provided this information.

#### Descriptive Statistics Question 5:

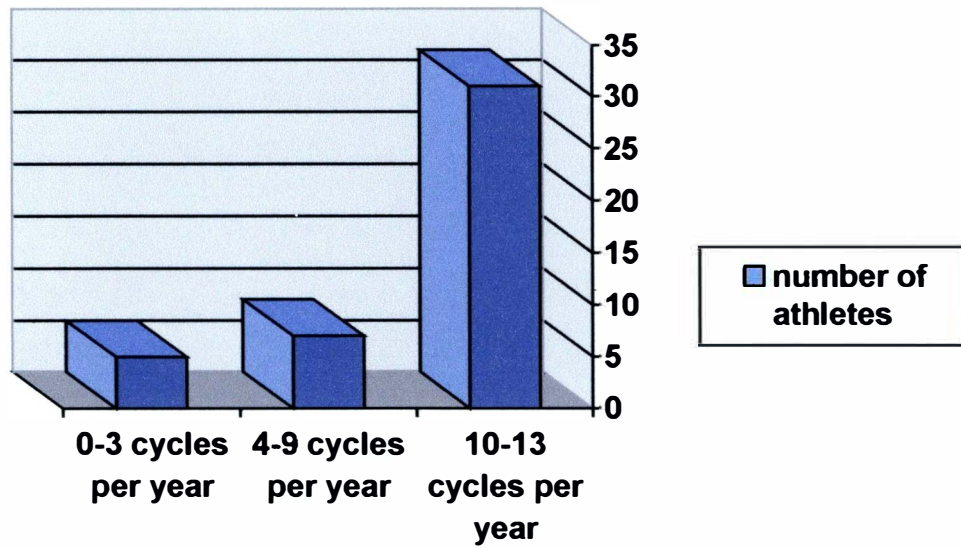
The average age in which females athletes in this study began menstruating is 13.279 years (Table 5). The average age at first menstruation for women 15-44 years old was 12.6 in 1995 (CDC 1995).

Variable	Mean	StDev	Minimum	Median	Maximum	Range
Q 5	13.512	1.549	10.000	14.000	16.000	6.000

**TABLE 5:** Age in which female athletes within this study began menstruating.

#### Descriptive Statistics Question 6:

The number of athletes at Western Michigan University that are amenorrheic is 11.62%. 16.27% of athletes were oligomenorrheic, and the remaining 72.09% were eumenorrheic (Figure 2).



**FIGURE 2:** Number of menstrual cycles per year.

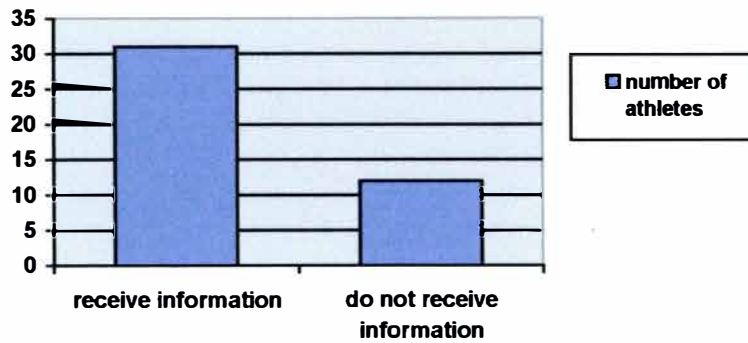
**Descriptive Statistics Question 7:**

A very small percentage of athletes in this study, only about 4.6 percent, have ever been diagnosed with an eating disorder, according to the questionnaire (Appendix A).

**Descriptive Statistics Question 8:**

93.02% of the athletes in this study claim to have a yearly physical.

## Descriptive Statistics Question 9:

**FIGURE 3:** Number of athletes in the study who receive nutritional information.

N	Answer
5	Speaker
8	Nutritionist
1	Doctor
6	Through respective athletic team
3	Classes
1	Church
3	Books/literature

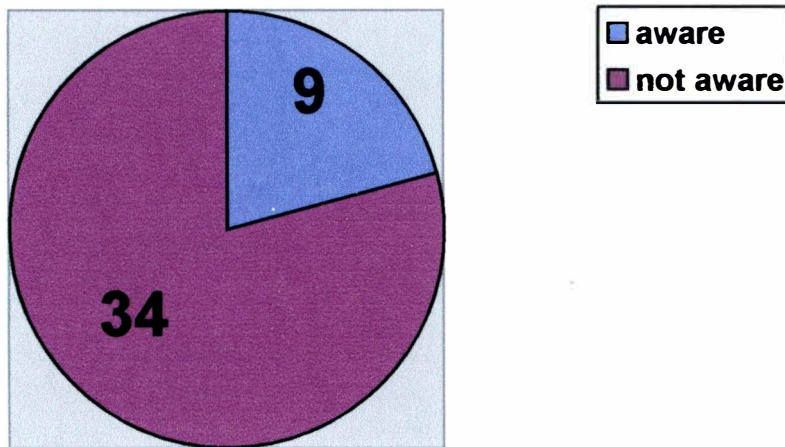
**TABLE 6:** How athletes in the study are receiving nutritional information.

## Descriptive Statistics Question 10:

20.93% of athletes in this study have heard the term “athletic amenorrhea”

(Figure 4).





**FIGURE 4:** Number of athletes in the study who were aware of the term “athletic amenorrhea”.

Descriptive Statistics Question 11:

Of the 9 athletes in this study (20.93%) who have heard of the term “athletic amenorrhea”, only 55% (n=5) of those were aware of the cause and its consequences.

Descriptive Statistics Question 12:

Although only 20.93% of the athletes have heard of the term, 34.88% of the athletes claimed they have received literature and/or education regarding the effects of missed menstruation.

## Summary of Results

The objectives of this study were to (1) determine the rate of menstrual dysfunction from a sample of female athletes at Western Michigan University and (2) whether or not these athletes are being educated as to the potential long-term consequences of their extreme body conditioning. This research examined forty-three elite athletes, 11.62% of which were amenorrheic, having fewer than four menstrual cycles per year and 16.27% were oligomenorrheic, having less than nine menstrual cycles per year. The remaining 72.09% were eumenorrheic, yet 38.70% of these athletes were taking an oral contraceptive. Although these numbers weren't beyond expectations, what was troubling was the level of knowledge among the athletes on the subject matter. 72.09% of the athletes claimed to have received nutritional education as athletes, yet only 20.93% of the athletes have ever heard of the term "athletic amenorrhea", and of the 20.93% who have heard of the term, only 55% of those were aware of the cause and its consequences. Although only 20.93% of the athletes have heard of the term, 34.88% of the athletes claimed they have received literature and/or education regarding the effects of missed menstruation. The most common source of nutritional information came from a visiting nutritionists (18.60%), their respective team (14.00%), and speakers (11.62%).

If 93.02% of the athletes are claiming to have had a yearly physical, why are so few aware of the cause and consequences of missed menstruation? This research and further study into athletic amenorrhea and its effect on bone density is extended to and beneficial for women's health. The notion of menstrual regularity and health

is part of an ideology in which the cultural construction of femininity can be viewed. The text and study above has demonstrated the ideals about menstrual regulation in athletes, which is pivotal in understanding women's health. While there is increasing recognition of women participating in sports at all levels, there is also growing awareness that biological differences between the sexes may require different training rules and practices for men and women, especially young female athletes. Should educating athletes be put at the forefront of their training? Yes, as it is clear that athletic departments should be obligated to inform athletes of the hazards of missed menstruation and also include an outlet for female athletes to discuss body image concerns. Bringing the awareness of the ill effects of menstrual irregularity to female elite athletes will hopefully contribute to the evaluation and management of menstrual dysfunction and the long-term effects of exercise related disorders.

## CHAPTER V

### CONCLUSIONS: DECONSTRUCTING FEMININITY

Since the 1970's, more women participate in sports, and this has increasingly challenged patriarchal notions of the feminine body (Castelnuovo and Guthrie 1998). By rejecting the construction of femininity as powerless, female athletes are stretching the boundaries of "woman" and thus appear to be engaged in a sort of "gender bending" (Castelnuovo and Guthrie 1998). This chapter examines the anthropology and development of modern sport, as well as the increased sporting opportunities for women and how changes in the last three decades have impacted gender equity in female athletes. Finally, this chapter will contextualize the female elite athlete by challenging Western constructions of femininity.

#### The Development of Modern Sport

The anthropology of sport is the application of the perspectives, theories and methodologies of the discipline to the study of sport. From an anthropological perspective, sport is viewed as a distinctive component of culture, not unlike marriage, religion, or music. It is treated as a separate institution but, like all cultural institutions, it is integrated with other institutions that characterize a culture

(Blanchard 2000). Sport is a complex phenomenon, which acts as an important agent of both social change and social control and defines female roles in society at large. Sport creates and reflects tensions surrounding definitions of gender roles and reveals how status and power are assigned on the basis of perceived biological differences (McCrone 1988). Sport is therefore an excellent monitor of how far women have traveled along the road to equality and the distance they still have to go as well as being crucial to an understanding of society and patterns of social relations (Blanchard 2000).

Competitive games are found in almost all societies and can be counted among the few cultural universals of mankind. Furthermore, involvement in competitive sport, recreational sport, school sport, and sport spectatorship has become one of the most important institutions of modern life, crucial to understanding patterns of social relations in which sport and women were embedded (McCrone 1988). But, only a minority of women were actively involved in sport between 1700 and 1850, and in the 19<sup>th</sup> century participation by both sexes declined as a result of urbanization, industrialization, and moral attitudes of the rising middle class (McCrone 1988). In addition, and possibly the causal agent of this decline is that women are being taught that muscular strength represents signs of having to work for a living and that this might damage both their social status as well as their organs and make them unattractive to men (McCrone 1988). It is not until the middle of the 19<sup>th</sup> century that even the most moderate advice about the advantages of exercise begins to be undertaken, particularly for women (McCrone 1988).

Though the 19<sup>th</sup> century sees a dramatic decline in female participation in sport, as a result of social ideals, it is interesting to note that only until recently, women's place in the sporting traditions continued to be peripheral and primarily passive, especially since sport continues to be seen as involving masculine activities requiring physical and psychological attitudes and behavior considered unnatural to females (McCrone 1988). But in the last twenty-five years, the role of women in sport has changed dramatically, due to the outcome of several key developments. First, the feminist movement presents an ongoing challenge to traditional gender roles and ideologies; secondly, legal and political initiatives that have yielded an increase in opportunities for women in sport; and thirdly, the recent health and fitness movement which has raised awareness of the importance of physical activity (Theberge 2000). These key changes have allowed for an increase in the number of women participating in a variety of sports, changing the picture of the elite athlete to include women as well as men. While changes have occurred, it has not been an easy battle, or one that is over.

### Gender Equity in Female Sport

During the 1960's, the women's movement had an impact on female athletes as they began reflecting on the unequal conditions of women in sport (Castelnuovo and Guthrie 1998). Two significant events came about to remedy this: the establishment of the Association for Intercollegiate Athletics for Women (AIAW) in 1971 and the passage of Title IX in 1972 (Castelnuovo and Guthrie 1998). The

AIAW was founded by female physical educators as the governing agency for women's intercollegiate athletics in which guidelines and rules were designed to strike a balance between the roles of student and athlete and to place the academic and social concerns of student-athletes above the interests of academic institutions, commercial media, fans, and alumni (Castelnuovo and Guthrie 1998). Title IX prohibited sex discrimination in any educational program or activity receiving federal financial assistance, which was the first time that the issue of female access to and participation in sport was elevated to the status of public policy (McCrone 1998). Without a doubt, the most successful result of implementing Title IX at all educational and competitive levels has been increased participation opportunities for women.

The impact of this shift was enormous as collegiate female sports adopted the same criteria for success as those guiding male sports such as the gaining of revenue, emphasis on victories, and the concern with media-driven income (McCrone 1988). A result of this was that women's programs began to be cited for the same violations as male programs, such as illegal recruiting tactics and scholarships to attract players, but this victory of increased female participation in sport has mirrored the male model of elite competitive sport, especially at the college level (Castelnuovo and Guthrie 1998). With these advances and the increase of women participating in sport, cultural construction of femininity is now being challenged.

## Challenging the Cultural Construction of Femininity

Role conflict for the female athlete would appear to have its basis in the disparity inherent in traditional conceptions of femininity and athleticism (Harris 1981). Serious commitment to sports involvement is the antithesis of what female is “supposed” to emulate in society (Harris 1981). Athletics are culturally masculine, and the incompatibility of athletics and femininity has been longstanding. Organized sport is a critical arena in the power struggle over the social conception of masculinity and femininity. The turn of the century, during the spread of industrial capitalism, resulted in fewer men controlling their own businesses and labor. The disappearing western frontier and domination of public education by women additionally contributed to men’s fear that American society was becoming feminized. These events resulted in men becoming increasingly concerned with physicality and toughness and sport becoming more significant as a critical set of experiences through which masculinity could be validated (Castelnuovo and Guthrie 1998). The success of the suffrage movement during this period focused on women’s biological differences as justifying rationale for inclusion, and, not surprisingly, men’s opposition to female athletes and the athletic female body began to emerge after voting rights had been achieved. This preexisting and ongoing association of sport with masculinity also provided the cultural context for the characterization of female athletes as lesbian. In later years, women’s greater involvement in the public realm of work and politics, which was propelled by World War II, challenged the breadwinner role of male domination, yet did not end the ideology of gender difference (McCrone



1988). Gender equity did not start to appear until the advent of Title IX, and the second wave of feminism, discussed earlier.

Today, females who participate in sport engage in behaviors traditionally associated with males and thus, are violating gender norms. Participation in athletics is still considered a masculine activity in American society (Sabo 1980). Athletics is an arena where males can cultivate characteristics associated with the male sex role (aggression, strength and competitiveness). In contrast, the traditional female sex roles include qualities such as being subordinate, weak, and passive (Miller and Heinrich 2001). These qualities seem to oppose the image of successful athletic participation. Being female in Western culture does not necessarily mean that one is perceived or accepted as feminine. In the United States sex roles and social norms seem to be particularly rigid. Women in sport do not fit the particular concept of femininity and those who persist in sport suffer for it. As a female becomes more proficient in sport, her level of personal investment increases and the long hours of practice and limited associations may isolate her socially. Personal conflict and stress increase as it becomes necessary for her to convince others of her femininity. This tension and conflict may increase more if a female chooses a sport that most regard as exclusively male (Sabo 1980).

Research has found that female athletes are considered less feminine and more masculine than female non-athletes (Miller and Heinrich 2001). For example, Miller and Heinrich, in the *Physical Educator* (2001) examined gender role conflict, physical appearance, athletic competence, and body image in 44 middle school aged and 34 college-aged female athletes and non-athletes. The participants completed a

five part questionnaire which assessed: demographic information; gender role conflict; masculine and feminine attributes; physical appearance, athletic competence, body image and; the importance of athletics to social status. The researchers have speculated that the incompatibility of the female sex role and sport participation may result in gender role conflict for the female athlete. Their research has found that female athletes possess more positive self-concepts about athletic participation (physical appearance, athletic competence, and body image) than non-athletes. They suggest female athletes ascribe greater importance to the role of athlete than to gender ideals.

Another area of interest in female athletics is the paradox of female bodybuilding. Participating in this sport blurs the lines between femininity and masculinity, enhances yet undermines self-esteem and a healthy body image, and requires that competitors simultaneously play the role of muscular athlete and feminine woman (Shea 2001). Shea (2001) in *Women and Language*, explores the paradox of female bodybuilding, that bodybuilding objectifies, exploits, and manipulates the female body verses empowering women by giving them choices to construct their body in a way they see fit. Shea (2001) suggests these differing views suggest an interesting paradox: female bodybuilding simultaneously empowers and disempowers women by challenging yet reinforcing traditional notions of femininity. Her research argues that female body building and the more “masculine” sports blur the lines between femininity and masculinity by rendering female muscle subversive yet sexy. Also, it enhances and undermines women’s self-esteem, and requires competitors to have masculine attributes such as being muscular, lean, and hard, yet

appear feminine, attractive, and soft. The duality suggests that female athletes must be both “athlete” and “woman”.

The differences in attitudes and acceptance towards males and females in sport originate in the differences in traits that society ascribes to each sex. Traditionally, the female athlete has resolved her own conflict between what she perceives herself to be as an athlete and what society expects her to be by withdrawing from sport involvement, or focus on feminine appropriate sports such as swimming, tennis, and gymnastics (Harris 1981). Fortunately, increasing numbers of females are discovering that they can cope with any dissonance perceived by adapting to the demands of the situation and can function confidently in both athletic and traditionally feminine roles (Harris 1981).

### Conclusions

The conflict of the female athlete and Western ideals of body image can attribute to health issues such as athletic amenorrhea. A major challenge related to body image unique to female athletes is the pressure to meet cultural body ideals while also possessing qualities beneficial to their sport. This pressure can lead to a preoccupation with low body weight or disordered eating, energy deficiency, and menstrual irregularity.

The effects of athletic menstrual dysfunction may not be long-lasting or irreversible, but, as this study has shown, it is prevalent among athletes. For elite athletes, amenorrhea is often regarded as a relatively benign condition and only a

consequence of training. Many in the medical community still think that amenorrhea is a normal adaptation of female athletes and it is normal for them not to have periods during athletic training, but amenorrhea is a symptom of something going wrong and could be a sign of a potentially serious clinical problem, or result in a future of ill health for the individual. In examining the serious effect of menstrual dysfunction on bone health, this research contributes to the contemporary understanding of women's long-term health. Furthermore, while exercise is viewed as widely beneficial to women of all ages, the pressure to succeed in sports by achieving or maintaining an unrealistically low body weight through food restriction and high intensity training may lead some women to develop eating disorders, amenorrhea, and osteoporosis. Thus, this research also benefits the quality of life for elite athletes by informing them of the effects of high intensity stress loading on their skeletons, while also making these concerns available to a wider audience to illuminate the potential difficulties college athletes may have after their athletic careers.

As this study was designed to determine the incidence of menstrual dysfunction among female athletes at Western Michigan University, it also offers a clearer understanding of the culturally bound ideas of body image in a Western society. More importantly, this research challenges the cultural construction of femininity through its design. By outlining the medical and anthropological literature on menstruation, menstrual dysfunction, bone health, and body image, a review of the data gathered within this study bears a heavy weight on the future of female athletes and women's long-term health. The question of whether female athletes at Western Michigan University are aware of the effects of missed menstruation is alarming.

With a variety of avenues (physicals, speakers, nutritionists, classes etc) available to the female athletes, why is athletic amenorrhea being overlooked? Assessing and treating body image issues and menstrual dysfunction should not only be an integral aspect of clinical management of eating disorders and weight management, it should also be a fundamental facet of educating elite athletes, especially in a college setting.

### Recommendations

As a result of the research presented here and the results of the empirical study undertaken, it is clear that there are a number of ways to educate young elite athletic women, as well as women not engaged in extreme sport, as to the consequences of unrealistic body image coupled with high rates of exercise and low rates of eating. These recommendations are tied to the role of nutritional and health education. In the case of elite athletes, this should be addressed at least two times per season in a classroom setting. The importance of health food choices, regular menstrual cycles, and bone health to optimize growth, fitness, and athletic performance should be discussed and examined, and never underestimated by both participants and professionals. Therefore, there is an immediate need for sports nutrition education applicable to females, especially female athletes. A yearly physical should be routine and required for all athletes at the start of each season, including an open forum for athletes to ask questions of professionals on the subject matter. Coaches, dieticians, and nutritionists, particularly those who specialize in sports nutrition and exercise

physiology, can assist these athletes in achieving peak performance level without compromising their health.

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Appendix A  
Questionnaire

Age:

1. How many years have you been a competitive athlete?
2. How many months a year are you a competitive athlete?
3. How many hours per week do you work out (average)?
4. Are you currently taking an oral contraceptive? If so, for how long?
5. Approximately what age did you start menstruating?
6. How many menstrual cycles per year do you have (please circle)?  
0-3                      4-9                      10-13
7. Have you ever been diagnosed with an eating disorder?
8. Do you have a yearly physical?
9. Do you receive nutritional education? If so, how?
10. Are you aware of the term **athletic amenorrhea**?
11. If so, are you aware of the cause and its consequences?
12. Have you ever received any literature or education regarding the effects of missed menstruation?

Appendix B  
Human Subjects Institutional Review Board consent form

Western Michigan University

Department of Anthropology

Principle Investigator: Dr. Pamela K. Stone

Student Investigator: Michele R. Chupurdia

Because you are a woman and a member of a Western Michigan University athletic team, you are invited to participate in a research project entitled "**Athletic Amenorrhea: prevalence and awareness among female athletes**" designed to determine the incidence of menstrual dysfunction and the level of awareness among female athletes. The study is being conducted by Dr. Pamela Stone (thesis chair) and Michele Chupurdia (MA student) from Western Michigan University, Department of Anthropology. This research is being conducted as part of the thesis requirements for Michele Chupurdia.

This survey is comprised of 12 short answer questions and will take approximately 10 minutes to complete. Your replies will be completely anonymous, so do not put your name anywhere on the form. You may choose not to answer any question and simply leave it blank. If you choose not to participate in this survey, you may either return the blank survey or you may discard it in the box provided. Returning the survey indicates your consent for use of the answers you supply. If you have any questions, you may contact Dr. Stone at 269-387-3973, Michele Chupurdia at 269-345-2267, the Human Subjects Institutional Review Board 269-387-8293, or the vice president for research 269-387-8298.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board as indicated by the stamped date and signature of the board chair in the upper right corner. You should not participate in this project if the stamped date is more than one year old.



Appendix C  
Questionnaire Data: statistical software Minitab 14

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
8	4	20	2	14	1	2	1	1	2	2	2
10	4	20	2	16	3	2	1	1	1	2	1
10	4	20	2	14	3	2	1	1	2	2	1
9	3	20	1	16	3	2	1	1	2	2	2
12	12	20	1	13	3	2	1	1	2	2	2
13	4	20	1	15	3	2	1	1	2	2	1
12	4	20	2	14	2	2	1	1	2	2	2
13	4	20	2	14	3	2	1	1	2	2	2
12	4	20	1	13	3	2	1	1	2	2	2
15	4	20	2	16	3	2	1	1	2	2	2
10	4	20	1	12	3	2	1	2	2	2	2
10	3	20	2	16	3	2	1	1	2	2	2
11	9	15	1	13	3	2	1	2	2	2	2
5	9	22	2	14	3	2	1	2	2	2	2
11	9	20	2	11	3	2	1	1	2	2	1
12	10	13	2	13	3	2	1	1	2	2	2
8	9	20	2	15	1	2	1	1	2	2	2
6	9	20	2	12	1	2	1	2	1	1	1
13	9	15	1	13	3	2	1	1	2	2	2
14	9	15	1	15	3	2	1	2	2	2	2
8	9	15	2	13	3	2	1	2	2	2	2
12	9	19	2	14	3	2	2	1	2	2	1
11	9	20	2	14	2	2	1	1	1	2	2
7	9	20	2	10	3	2	1	1	2	2	1
7	12	20	2	13	3	2	1	1	2	1	1
9	9	20	2	11	3	2	1	2	2	2	1
9	9	20	1	12	3	2	1	1	2	2	1
5	6	20	1	16	3	2	1	2	2	2	2
6	6	20	2	11	3	1	1	1	2	2	2
16	12	25	2	14	2	2	1	2	2	2	1
8	12	20	2	15	2	2	2	1	1	1	1
8	12	20	2	15	1	1	1	2	1	1	1
5	12	27	2	13	1	2	1	2	1	2	2
8	9	12	2	12	3	2	1	1	2	2	2
9	9	13	2	14	3	2	1	1	2	2	2
8	12	20	2	13	3	2	1	1	2	2	2
13	9	12	1	12	2	2	2	2	1	2	2
8	9	20	2	12	3	2	1	1	2	2	1
16	9	12	1	15	3	2	1	1	1	1	2
8	9	20	1	14	3	2	1	1	2	2	1
8	12	25	1	11	2	2	1	1	2	2	2
9	7	20	2	14	2	2	1	1	2	2	2
8	9	30	2	14	3	2	1	1	1	1	2



## Appendix D Human Subjects Institutional Review Board approval form

Date: October 7, 2003

To: Pamela Stone, Principal Investigator  
Michele Chupurdia, Student Investigator for thesis

From: Mary Lagerwey, Chair

A handwritten signature in cursive script, appearing to read "Mary Lagerwey".

Re: HSIRB Project Number 03-09-22

This letter will serve as confirmation that your research project entitled "Athletic Amenorrhea: Menstrual Dysfunction and its Effect on Bone Health" has been **approved** under the **exempt** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: October 7, 2004