THE RELATIONSHIPS OF SOCIAL PHYSIQUE ANXIETY, BODY IMAGE
AND BODY COMPOSITION ON THE RISK OF DEVELOPING EATING
DISORDERS IN YOUTH GYMNASTS

A Thesis Submitted to the College of
Graduate Studies and Research
In Partial Fulfillment of the Requirements
For the Degree of Master of Science
In the
College of Kinesiology
University of Saskatchewan
Saskatoon, Saskatchewan

By
Carla Nicole Hill

© Copyright Carla N. Hill, 2005. All rights reserved.
PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirement for a Postgraduate degree from the University of Saskatchewan, I agree that the Libraries of this University may make it freely available for inspection. I further agree that permission for copying of this thesis in any manner, in whole or in part, for scholarly purposes may be granted by the professor or professors who supervised this thesis work, or, in their absence, by the Head of the Department or the Dean of the College in which this thesis work was done. It is understood that any copying or publication or use of thesis or parts thereof for financial gain shall not be allowed without written permission. It is also understood that due recognition shall be given to me and to the University of Saskatchewan in any scholarly use that may be made of any material in this thesis.

Requests for permission to copy or to make other use of material in this thesis in whole or in part should be addressed to:

Dean of the College of Kinesiology
University of Saskatchewan
Saskatoon, Saskatchewan
S7N 5B2
ABSTRACT

In many aesthetic sports, such as gymnastics, athletic success is dependent to a great extent upon physical characteristics, specifically small body size and low body fat. Previous research also suggests that late developing children self-select into sports such as gymnastics because of the advantages of having this prepubescent physique. One of the concerns expressed with regard to the pressure that this exerts on a young athlete is that gymnasts are at risk for body image dissatisfaction and social physique anxiety, which could lead to disordered eating. Although a number of studies have looked at these two issues, one physical and one behavioral, in isolation, very few have looked at them together. The primary purpose of the present investigation was to examine the relationship of body dissatisfaction and social physique anxiety to the risk of developing an eating disorder in youth female and male gymnasts. The second purpose was to investigate the relationship of chronological age, maturity, and body composition to body image dissatisfaction and social physique anxiety in female and male gymnasts. The participants included male \( n = 42 \) and female \( n = 74 \) competitive gymnasts from four different gymnasts clubs within the Saskatoon area. Age, height, and weight were recorded. Individuals were classified into maturity groups using chronological age bands. An index of body fatness was obtained by summing either eight or nine skinfold measures. Body image was assessed by responses to a pictorial questionnaire. Social physique anxiety, a measure of the anxiety one experiences in response to others evaluating one's physique, was obtained through a modified Social Physique Anxiety Scale. Three subscales of the Eating Disorder Inventory, Body Dissatisfaction, Drive for Thinness, and Bulimia, were used to measure risk for developing an eating disorder. Data were analyzed using Person Product Moment Correlations, two-way factorial
ANOVA, and Chi-square analysis. Results showed that there was an association between body image dissatisfaction and the risk for an eating disorder ($\chi^2 = 16.290, p < 0.05$) in female gymnasts, but not males ($\chi^2 = 1.493, p > 0.05$). No associations were found between social physique anxiety and the risk of developing an eating disorder in either female or male gymnasts. When divided into maturity categories again no associations were found between body image dissatisfaction and maturity groups in either gender. In females, there was a positive significant correlation ($r = 0.50, p < 0.05$) between social physique anxiety and age. In males there was a negative significant correlation ($r = -0.51, p < 0.05$) between social physique anxiety and age. When the gymnasts were banded into three maturational categories, social physique anxiety was significantly different between maturity groups ($F(1,110) = 15.411, p < 0.05$) and genders also showed different patterns of social physique anxiety. In contrast to males, females with a greater sum of skinfolds experienced higher social physique anxiety scores. When grouped by sum of skinfolds, social physique anxiety was significantly different between groups ($F(2,110) = 192.301, p < 0.05$) and genders also showed different patterns of social physique anxiety. In contrast to females, in males there was an association between sum of skinfolds and body image dissatisfaction. In conclusion it was found that these gymnasts were not a risk for developing an eating disorder. There was also no association between age and body image dissatisfaction in either females or males; however, social physique anxiety increased with increasing age in females but decreased with increasing age in males.
ACKNOWLEDGMENTS

There are many people for me to thank for their generous assistance and guidance given to me throughout the time that I was a student in Graduate Studies.

First, I extend a thank you to my advisor, Dr. Adam Baxter-Jones, for his support and professional guidance on this thesis. I appreciate your encouragement and patience as I fine tuned my skills as a scientific writer. I would like to express my gratitude to the other members of my thesis committee; Dr. Karen Chad and Dr. Kent Kowalski for their knowledgeable advice given to me for completing this thesis. A special thank you to my external advisor, Dr. Tom Graham for his valuable input.

Thank to my parents for giving me the desire to learn, determination, and the courage to follow my dreams. Thank you for all your inspiration, I would not be were I am today without all your love and support.
TABLE OF CONTENTS

PERMISSION TO USE i

ABSTRACT ii

ACKNOWLEDGMENTS iv

TABLE OF CONTENTS v

LIST OF TABLES vii

LIST OF FIGURES viii

LIST OF APPENDICES ix

1. INTRODUCTION AND LITERATURE REVIEW 1
   1.1 Introduction 1
   1.2 Literature review 4
      1.2.1 Growth and development 4
      1.2.2 Gymnasts and growth and development 7
      1.2.3 Gymnast's body composition and performance 12
      1.2.4 Body image 14
      1.2.5 Body image and athletes 18
      1.2.6 Body image and gymnasts 19
      1.2.7 Social physique anxiety 22
      1.2.8 Social physique anxiety and athletes 24
      1.2.9 Social physique anxiety and gymnasts 27
      1.2.10 Eating disorders 29
      1.2.11 Disordered eating in young athletes 32
      1.2.12 Summary 35
   1.3 Purposes 36
   1.4 Hypotheses 36
   1.5 Assumptions 37
   1.6 Limitations 37
   1.7 Delimitations 38

2. METHODS AND PROCEDURES 39
   2.1 Research design 39
   2.2 Participants 39
   2.3 Data collection 40
      2.3.1 Anthropometric testing procedure 40
         2.3.1.1 Chronological age 40
         2.3.1.2 Maturation 40
         2.3.1.3 Standing height 41
         2.3.1.4 Body weight 41
         2.3.1.5 Body mass index 41
**LIST OF TABLES**

<table>
<thead>
<tr>
<th>TABLE</th>
<th>Title</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Physical characteristics ($\bar{X} \pm SD$) of youth female and male gymnasts</td>
<td>64</td>
</tr>
<tr>
<td>3.2</td>
<td>Frequency of chronological age of female and male gymnasts</td>
<td>65</td>
</tr>
<tr>
<td>3.3</td>
<td>Body image, SPA, and EDI responses ($\bar{X} \pm SD$) of female and male gymnasts</td>
<td>66</td>
</tr>
<tr>
<td>3.4</td>
<td>Correlation matrix of criterion and predictor variables for male gymnasts</td>
<td>68</td>
</tr>
<tr>
<td>3.5</td>
<td>Correlation matrix of criterion and predictor variables for female gymnasts</td>
<td>69</td>
</tr>
<tr>
<td>3.6</td>
<td>Physical characteristics ($\bar{X} \pm SD$) of youth female and male gymnasts</td>
<td>73</td>
</tr>
<tr>
<td>3.7</td>
<td>Body dissatisfaction, SPA, and EDI responses ($\bar{X} \pm SD$) of youth female and male gymnasts</td>
<td>74</td>
</tr>
<tr>
<td>3.8</td>
<td>Body dissatisfaction, SPA, and EDI responses ($\bar{X} \pm SD$) of youth female and male gymnasts by sum of skinfolds</td>
<td>76</td>
</tr>
<tr>
<td>3.9</td>
<td>Social physique anxiety and risk for disordered eating among female gymnasts</td>
<td>79</td>
</tr>
<tr>
<td>3.10</td>
<td>Social physique anxiety and risk for disordered eating among male gymnasts</td>
<td>80</td>
</tr>
<tr>
<td>3.11</td>
<td>Body image dissatisfaction and risk for disordered eating among female gymnasts</td>
<td>81</td>
</tr>
<tr>
<td>3.12</td>
<td>Body image dissatisfaction and risk for disordered eating among male gymnasts</td>
<td>82</td>
</tr>
<tr>
<td>3.13</td>
<td>Sum of skinfolds and body image dissatisfaction in female Gymnasts</td>
<td>83</td>
</tr>
<tr>
<td>3.14</td>
<td>Sum of skinfolds and body image dissatisfaction in male gymnasts</td>
<td>84</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>Description</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Female and male gymnasts heights compared against population percentiles (CDC) (10th, 25th, 50th, 75th, 90th)</td>
<td>60</td>
</tr>
<tr>
<td>3.2</td>
<td>Female and male gymnasts weights compared against population percentiles (CDC) (10th, 25th, 50th, 75th, 90th)</td>
<td>60</td>
</tr>
<tr>
<td>3.3</td>
<td>Female and male gymnasts body mass indexes compared against population percentiles (Cole, 1995) (9th, 25th, 50th, 75th, 91th)</td>
<td>62</td>
</tr>
</tbody>
</table>
# LIST OF APPENDICES

<table>
<thead>
<tr>
<th>APPENDIX</th>
<th>Description</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Body Image Questionnaires</td>
<td>121</td>
</tr>
<tr>
<td>B</td>
<td>Social Physique Anxiety Scales</td>
<td>124</td>
</tr>
<tr>
<td>C</td>
<td>Eating Disorder Inventory</td>
<td>127</td>
</tr>
</tbody>
</table>
1 INTRODUCTION AND REVIEW OF LITERATURE

1.1 Introduction

In many sports athletic success is dependent to a great extent upon physical characteristics, including anthropometric dimensions, and body composition (Claessens, Lefevre, Beunen, & Malina, 1999). The relevance of morphological characteristics is especially evident in "artistic" sports, such as gymnastics, figure skating, dancing, and diving. In these sports, the athlete’s body is the primary element in obtaining high performance scores. Scoring may be also influenced by judges’ perceptions (Malina, 1997). As a result, research has suggested that athletes such as gymnasts are likely at risk for body image dissatisfaction and anxiety associated with negative feelings towards their body (social physique anxiety), which could lead to disordered eating (Garner, Rosen, & Barry, 1998).

Aesthetic sports may attract girls with anorexic-like tendencies or attitudes. The realities of competition in aesthetic sports reveal that how you look is important to success, possibly leading to a heightened focus on weight and body shape (Davison, Earnest, & Birch, 2002). Concern about weight and shape may also be promoted by comments from parents and coaches and comparisons by peers and competitors (Davison et al., 2002). Extreme weight loss behaviors are even encouraged among high-performance athletes by coaches, parents, and even peers (Cash & Pruzinsky, 2002), which puts gymnasts at increased risk for body image dissatisfaction. Importantly, most work has been done in university students and adults, and little research in the area of school aged children and adolescents, the age when the majority of gymnasts compete.
It has been recognized that negative physique-related perceptions of one’s body increase the likelihood of developing an eating disorder (Garner & Olmstead, 1984; Thompson & Chad, 2002). Social physique anxiety (SPA), the anxiety experienced when an individual perceives that his or her body shape or figure is being negatively evaluated by others, is related to the concept of body image (Hart, Leary, & Rejeski, 1989). SPA may also play a crucial role in the development of a disturbed body image and affect eating patterns. In aesthetic sports the transmission of a positive impression of one’s physical appearance, as well as what one does with one’s body, plays an important role in the evaluation of the performance (McAuley & Burman, 1993). Therefore, this quest to self-present the appropriate image to judges, coaches, and other gymnasts could lead to higher levels of social physique anxiety in those individuals who find it difficult to do so or who question or doubt their own capabilities (McAuley & Burman, 1993). Moreover, it has been shown that age has been positively correlated with social physique anxiety and that older gymnasts might be expected to demonstrate high levels of social physique anxiety than their younger peers (McAuley & Burman, 1993).

Scores on social physique anxiety have also been related to scores on eating disordered behaviors and these in turn have been related to scores on eating disordered personality traits (Frederick & Morrison, 1998). As well, body image disturbances have emerged as one of the most potent risk factors for the development and maintenance of eating disorders such as anorexia nervosa and bulimia.

Success at national and international gymnastic competitions has been increasingly attained at relatively young ages, particularly in girls. Female gymnasts on average have become younger, both chronologically and developmentally (Claessens,
Veer, Stijnen, Lefevre, Maes, Steens, & Beunen, 1991). These female gymnasts tend to be smaller and lighter than other female athletes throughout childhood and adolescence (Malina, 1994), as do their parents, suggesting a genetic predisposition for short girls to excel in gymnastics (Nickols-Richardson, 1999). The smaller size of elite female gymnasts is evident long before any systematic training starts (Baxter-Jones & Maffulli, 2002). Thus, this could reflect a selection of smaller physiques into the sport of gymnastics. In addition, as gymnasts enter adolescence most are classified as average or late maturers, with few early maturing girls. In later adolescence, most gymnasts are classified as late maturers (Baxter-Jones, Maffulli, & Mirwald, 2003). Malina (1994) concluded that female gymnasts exhibit the growth and maturity characteristics of late maturing girls with short parents.

Therefore, research has suggested that gymnasts are likely at risk for body image dissatisfaction and social physique anxiety, which could lead to disordered eating (Garner, Rosen, & Barry, 1998). When looking at one of the important risk factors, body image, in the development and maintenance of eating disorders there is far less research on development of body image in adolescent males. Therefore, within the unique population of gymnasts research is extremely limited in the areas of body image, social physique anxiety, and disordered eating, especially in males. Thus, the primary purpose of the study was to examine the relationship of body image dissatisfaction and social physique anxiety to the risk of developing an eating disorder in female and male gymnasts. The second purpose was to investigate the relationship of chronological age, maturity status, and body composition to body image dissatisfaction and social physique anxiety in female and male gymnasts.
1.2 Literature review

1.2.1 Growth and development

Growth specifically refers to the increase in the size of the body as a whole, and of its parts (Baxter-Jones et al., 2003). As children grow, they become taller and heavier, they increase in lean and fat tissues, and their organs increase in size (Malina, Bouchard, & Bar-Or, 2004). Maturation is described as the process of becoming mature, or progress toward the mature state (Malina et al., 2004). Maturation refers to the timing and tempo of progress toward the mature biological state (Malina et al., 2004). Timing refers to when specific maturational events occur, for example the age at maximum growth during the adolescent growth spurt, known as age at peak height velocity (APHV) (Malina et al., 2004). Tempo refers to the rate at which maturation progresses, for example how quickly or slowly an individual passes from onset of secondary sex characteristics to the mature adult state. Growth and maturation are often used in combination with the term development. Although development refers to the acquisition of behavioral competence and is culture specific, it is often used interchangeably with maturation (Malina et al., 2004).

Growth, maturation, and development operate in a time framework. Infancy is the first year of life, up to but not including the first birthday. Childhood extends from the end of infancy (first birthday) to the start of adolescence, and is often broken down into early childhood, which includes the preschool years (1.0 to 4.99 years), and middle childhood, which includes the years in elementary schools (5 years to the beginning of adolescence) (Malina et al., 2004). Adolescence is defined biologically as the onset of pubertal development. Adolescence is more difficult to define in terms of actual age because of variation in the time of its onset and termination. The age ranges of eight to
19 years in girls and 10 to 22 years in boys are appropriate limits for normal variation in the onset and termination of adolescence (Malina et al., 2004). Adolescence begins with acceleration in the rate of growth in stature, which marks the onset of the adolescent growth spurt and terminates with the attainment of adult stature (Malina et al., 2004).

Stature and weight are the most commonly used measurements in growth studies. The pattern of age changes is generally similar in all children, but the size attained at a given age and timing of the adolescent spurt vary considerably from child to child. From birth to early adulthood (age 19), both stature and weight follow a four-phase growth pattern: rapid gain in infancy and early childhood, moderately steady gain during middle childhood, rapid gain during the adolescent growth spurt, and slow increase until growth ceases with the attainment of adult stature (Malina et al., 2004). Body weight, however, usually continues to increase into adult life.

During the adolescent spurt, the rates of growth in both stature and weight increase or accelerate. On average, the spurt occurs earlier in girls than in boys by about two years (Malina et al., 2004). The maximum rate of growth in stature during the spurt is called peak height velocity (PHV), and the age at maximum velocity growth is called age at PHV. Peak height velocity occurs, on the average, close to 12.0 years of age in girls and 14.0 years of age in boys with a standard deviation of about 1.0 year (Malina et al., 2004). Growth in stature stops about 16 years of age in girls and about 18 years of age in boys. Thus, girls and boys who attain PHV before 11.0 and 13.0 years of age, respectively, would be classified as early maturing, whereas, girls and boys who attain PHV after 13.0 and 15.0 years of age, respectively, would be classified as late maturing. Early-maturing children of both sexes have been shown to be taller and heavier than average or late maturing individuals from age six and onward, and also have more
weight-for-height at each age. As well, early maturing children, on average, have a higher body mass index (weight/stature$^2$) than average and late maturing children at each age during childhood and adolescence. Early and late maturing children also differ in relative body proportions during growth. Early maturing boys and girls tend to have relatively broad hips (wide hips relative to their shoulders) and, conversely, relatively narrow shoulders (relative to their hips) (Malina et al., 2004). In contrast, late-maturing children have relatively narrow hips and relatively broad shoulders. Early and late maturers also differ in relative leg length, where leg length accounts for a greater percentage of stature in late maturers.

During adolescence, there is also an increase of body composition which is made up of two types of tissues. Tissues that constitute body weight are divided into fat free mass (FFM) and fat mass (FM). Body composition partitions and quantifies body weight or mass into its basic components. FFM follows a growth pattern like that of stature and weight, and sex differences become clearly established during the adolescent growth spurt. Youth adult values of FFM are reached earlier in females, at about 15 to 16 years of age compared to 19 to 20 years of age in males. In late adolescence and young adulthood, males have, on the average, a FFM about 1.5 times larger than that of females. Sex differences in FFM per unit stature are small in childhood and early adolescence, but after age 14, males have more FFM for the same stature as females (Malina et al., 2004).

Estimated FM, or total body fat, increases during the first 2 or 3 years of life and then shows little change through five or six years of age. FM increase more rapidly in girls than in boys, and increases through adolescence in girls, but it appears to reach a plateau or to change only slightly near the time of the adolescent spurt in boys (about 13
to 15 years) (Malina et al., 2004). In contrast to FFM, females have, on average, about 1.5 times the FM of males in late adolescence and young adulthood.

Changes in total body fat are expressed as a percentage of body fat. Relative fatness increases rapidly in both sexes during infancy and then gradually declines during early childhood (Malina et al., 2004). Girls tend to average a slightly greater percentage of body fat than boys during infancy and early childhood, but from five to six years through adolescence, girls consistently have a greater percentage of body fat than boys. The relative fatness of females increases gradually through adolescence in the same manner as FM. Relative fatness also increases gradually in males until just before the adolescent growth spurt (About 11 to 12 years) and then gradually declines, and reaches its lowest point at about 16 to 17 years and then gradually rises into young adulthood (Malina et al., 2004). Thus, in contrast to estimates of FM, relative fatness declines during male adolescence, due to the rapid growth of FFM at this time.

1.2.2 Gymnasts and growth and development

Artistic gymnastics is one of the most popular sports today for young girls. Women's Artistic gymnastics is composed of four events: vault, uneven parallel bars, balance beam, and floor exercise. Men's gymnastics is composed of six events: floor exercise, parallel bars, high bar, pommel horse, rings, and vault (Cogan & Vidmar, 2000). Approximately two million children male and female, aged two to 18 years, engaged in gymnastics training (Nickols-Richardson, 1999).

In recent times the mature, full-figured women gymnasts of the 1950s and 60s have given way to the prepubescent teenage champions of today. Success at national and international gymnastic competitions has been increasingly attained at relatively
young ages, particularly in girls (Iverson, 1990). Female gymnasts on average have become younger, both chronologically and developmentally (Claessens et al., 1991). For example, the average chronological age of elite female gymnasts has decreased from 22.7 years in participants at the Tokyo Olympic Games in 1964 to 16.5 years in participants at the Rotterdam World Championships in 1987. The results also showed that the average age of elite male gymnasts decreased from 26.0 years to 21.9 years (Claessens, et al., 1991).

Claessens and colleagues (1991) looked at anthropometric data of male and female gymnasts competing at the 1987 World Gymnastic Championships and compared their values with both reference data and data reported in previous studies of gymnasts competing at international events. When the female gymnasts (mean chronological age of 16.5 ± 1.8 years, ranging from 13.2 to 23.8 years) were compared to Flemish reference data (for age closest to the mean chronological age of the female gymnasts), they were smaller in height and weight dimensions (Claessens et al., 1991). Over 80% of the gymnasts were smaller than the Belgian median of 163.4 cm. The mean weight of the female gymnasts (45.6 kg) was 9 kilograms less than the Belgian median (54.6 kg) (Claessens et al., 1991). When the male gymnasts (mean chronological age of 21.9 ± 2.4 years, ranging from 16.0 to 28.6 years) were compared to Flemish reference data (for age closest to the mean chronological age of the male gymnasts), the results showed that the male gymnasts had a mean stature 9.1 cm less than the mean of the reference data for Belgian males (Claessens et al., 1991). There was no difference between the means of the weight for the male gymnasts and reference data (Claessens et al., 1991).
The anthropometric characteristics of the male and female gymnasts competing at the 1987 World Championships were also compared to data reported from the Tokyo Olympic Game in 1964. The mean height and weight of the female gymnasts in 1987 was 154.3 cm and 45.6 kg compared to 157.0 cm and 52.0 cm in 1964. Since, elite female gymnasts are younger chronologically; their mean height and weight are significantly smaller and lighter than previous champions. Whereas, looking at the top male gymnasts over the years, the anthropometric dimensions have remained constant with the mean height of 162.0 cm and weight of 63.0 kg. There is little change in the male’s anthropometric dimensions due to the fact that their mean chronological age occurs after the cessation of growth and development.

Elite young gymnasts undertake training programs of progressive volume and intensity from an early age. Talented young female gymnasts often commence training at age five or six and train for more than 20 to 30 hours per week year-round throughout childhood and adolescence (Caine, Bass, & Daly, 2003). Training itself refers to systematic, specialized practice for gymnastics including learning and practicing the various elements and routines specific to gymnastics events and apparatus; warm-up and stretching, periodic dance and choreography, and occasional strength training (Caine, Bass, & Daly, 2003). Caine and colleagues (2003) view gymnastics training as just one of many factors in the gymnastics environment that either also or in combination with other factors, such as nutrition and stress, may negatively influence the growth and maturation of gymnasts. Caine and colleagues (2003) stated that elite level or heavily involved female gymnasts may experience attenuated growth during their years of training and competition due to hormonal alterations caused by dieting and training.
Although they acknowledge that the cause-effect relation between gymnastics training and inadequate growth has not been demonstrated, and that this is only their opinion.

However, numerous researchers, including Baxter-Jones and colleagues (2003) concluded that there is no definitive evidence to indicate that training affects growth and maturation in gymnasts. Instead, the smaller size of elite female gymnasts is evident long before any systematic training starts (Baxter-Jones & Maffulli, 2002). These female gymnasts tend to be smaller and lighter than other female athletes throughout childhood and adolescence (Malina, 1994). As well, parents of elite female gymnasts have been shown to be significantly shorter than parents of other athletes, suggesting a genetic predisposition for short girls to excel in gymnastics (Nickols-Richardson, 1999). Thus, this could reflect a selection of smaller physiques into the sport of gymnastics.

As gymnasts enter adolescence most are classified as average or late maturers, with few early maturing girls. In later adolescence, most gymnasts are classified as late maturers (Baxter-Jones et al., 2003). Malina (1994) concluded that female gymnasts exhibit the growth and maturity characteristics of late maturing girls with short parents. That is, their growth patterns are no different from those of a non-training normal healthy late maturing girl.

It has been reported that a “gymnastic-specific” body type is required to succeed within the sport of gymnastics (Claessens et al., 1991; Claessens et al., 1992). Gymnasts have always been the smallest of Olympic participants, being lighter, stronger by body mass, leaner, and more flexible than all others (Richards, Ackland, & Elliott, 1999). The appropriate size of an individual for optimal gymnastic performance may occur prior to the adolescent growth spurt and PHV (Richards et al., 1999). This female “gymnastic-specific” body type is characterized by short stature, light body mass, narrow hips with
relatively broad shoulders, a low percentage of body fat with a high fat-free mass, and later maturation when compared to reference females of the same age (Malina, 1997). Male gymnasts also have a low percentage of body fat, but also need an incredible amount of upper body strength in order to be competitive on their events (Cogan & Vidmar, 2000). Thus the emphasis is more on muscular strength as opposed to thinness.

Gymnasts strive to reduce body fat and increase muscle mass, which in young female gymnasts, the goal of having very low body fat is contradictory to normal patterns of growth (Bernardot & Czerwinski, 1991). By reducing food intake, young female gymnasts may be at risk for restricted growth and delayed maturation (Bernardot & Czerwinski, 1991), due to the fact that they are not getting the proper nutrition and nutrients needed for optimal growth and development.

A study by Bernardot and Czerwinski (1991) looked at selected body composition measures of female junior elite gymnasts (N = 146) attending the US Association of Independent Gymnastics Club’s biannual training camp. The age of the gymnasts ranged from seven to 14 years of age (mean = 9.82 years). The gymnasts were small but well proportioned with an average height of 52.9 inches and weight of 64.0 lbs. This placed them in the 26th percentile for both weight:age and height:age and in the 50th percentile for weight:height ratio (Bernardot & Czerwinski, 1991). The mean body mass index for the entire group was 16.53 (SD = 1.42), and became higher as age increased. Body fat percentages were low for the entire group, ranging from 5.07% to 16.73% (mean = 8.81 [plus-or-minus] 1.99%) (Bernardot & Czerwinski, 1991). Therefore, as the gymnasts grew older, they became progressively smaller in weight and height for age but were highly muscled for size (Bernardot & Czerwinski, 1991).
A study by Gurd and Klentrou (2003) investigated the effect of intense training on physical growth and pubertal development in young male gymnasts. Twenty-one elite male gymnasts (13.3 ± 0.3 yr) were recruited from competitive gymnastics clubs in Southern Ontario. The gymnasts had to be training a minimum of 15 hours per week. Twenty-four age-matched boys (13.5 ± 0.3 yr) were recruited from recreational martial arts classes. The results showed that the gymnast’s height and weight were 155.5 cm ± 2.3 and 48.3 kg ± 2.7 and the control’s height and weight were 162.5 cm ± 1.9 and 54.4 kg ± 1.4), but these differences did not reach significance ($P \approx 0.05$) (Gurd & Klentrou, 2003). The gymnasts did, however, have significantly ($P \leq 0.05$) lower relative body fat (8.6% ± 0.1) when compared to the control group (13.7% ± 0.7) (Gurd & Klentrou, 2003).

1.2.3 Gymnast's body composition and performance

Biomechanical principles appear to underlie the trend of small gymnasts who are light, strong by body mass, lean and flexible in both physique and movement style (Richards et al., 1999). The smaller gymnasts, with high strength to mass ratios, seem better able to handle their own mass during complex rotational skills (Richards et al., 1999). A study by Richards and colleagues (1999) looked at the relative influences of body size, strength, and training volume on current performance levels. A total of 37 female gymnasts between the ages of 10 and 13.5 years of age were selected into two subgroups; high volume training (group 1) were gymnasts who trained more than 15 hours per week (average = 30 hours) and the moderated training (group 2) consisted of gymnasts who trained less than 20 hours per week (average = 15 hours per week). The high training volume gymnasts were significantly smaller but markedly stronger than
those gymnasts in group 2 despite the size disadvantage. Group 1 gymnasts were able to produce higher velocities for front and backward rotations (Richards et al., 1999).

The results from the study by Richards and colleagues (1999) support the claim that various aspects gymnastic performance may be differentially affected by growth. While some activities are hindered by an increase in whole body inertia, other may be less affected as the related improvement in strength provides a balancing influence to counter the increase inertia (Richards et al., 1999). In the sport of gymnastics a lower value of body mass is more advantageous to produce success, where the body is propelled against gravity and excess non-power producing tissue is inefficient (Bale et al., 1996). The gymnast may be hindered by an increase in whole body inertia; it requires the ability to rapidly rotate the body as a whole or segmentally may be maximized when the gymnast possesses a small body and has a high ratio of strength to mass (Richards et al., 1999).

Not only is a lean body composition beneficial to the performance of artistic gymnastics maneuvers and but it is viewed as aesthetically appealing, particularly during performances, by some coaches, peers, and judges. A study by Claessens et al. (1999) found that performance scores were associated primarily with the degree of fatness or endomorphy (relative fatness of the body) of the athlete. It was shown that gymnasts who were more endomorphic or fatter tended to have lower performance scores.

Thus, concerns about weight and shape may be triggered by comments from judges, coaches, and parents and also by comparisons by peers and competitors (Davison et al., 2002). As a result, gymnastics may be associated with body image dissatisfaction, which is the dissatisfaction one has with the weight, shape, size, or fat level of their body.
Body image is a multidimensional phenomenon and has been defined by Cash as feelings, thoughts, and behaviors about one’s body weight (Cash & Pruzinsky, 2002). Fisher (1990) defined body image as “the psychological experience of one’s own body.” McCrea, Summerfield, and Rosen (1982) regard body image as “the subjective evaluation of one’s own body and the associated feelings and attitudes.” Various factors such as culture, gender, peers, mass media, parents, and maturational stage have shown to contribute to the development of body image (Zalilah et al., 2003).

Early research on body image stems from cognitive and/or behavioral paradigms in psychology (Cash & Pruzinsky, 2002). The basic elements of a cognitive-behavioral model are historical influences and proximal or concurrent factors. Historical factors are past events, attributes, and experiences that predispose or influence how people come to think, feel, and act in relation to their body (Cash, 2002). These include cultural socialization, interpersonal experiences, physical characteristics, and personality attributes that are occurring during childhood and adolescence. Cultural socialization includes normative notions about attractiveness and unattractiveness but also express gender-based expectations (Cash & Pruzinsky, 2002). Interpersonal experiences are expectations, opinions, and verbal and nonverbal communications conveyed in interactions with family members, friends, other peers, and even strangers (Cash & Pruzinsky, 2002). Physical characteristics also affect one’s own body image through how well one’s appearance matches social standards of physical attractiveness. As well, changes in physical competence and appearance are dramatic during youth, and as a result, pubertal maturation during adolescent can affect body image development (Cash
Pubertal maturation in females tends to have a negative affect on body image, whereas in males it tends to be a more positive affect (Cash & Pruzinsky, 2002). Finally, self-esteem can also influence the formation of body image. If an individual has a positive self-esteem, this positive evaluation of one’s body may serve as a buffer against events and people that might threaten one’s body image. A negative self-esteem may heighten one’s body image vulnerability (Cash & Pruzinsky, 2002).

When looking at body image development in children, measures focused on weight and shape (overall or specific body parts), and worries about being or getting fat, which lead to body dissatisfaction or weight and shape concerns (Smolak, 2002). It has been shown that global measures of body esteem show little change until around the age of 10 or 11 years, with girls and boys both exhibiting somewhat the same levels of body esteem throughout most of childhood (Smolak, 2002). However during adolescence, growth and puberty is more positively viewed by boys, due to society’s ideals of the tall muscular man (Cash & Pruzinsky, 2002).

In children (age 5 to 10 years of age) body image is influenced by factors such as parents, peers, and media or toys (Smolak, 2002). Parents are influential because they are selecting and commenting on children’s clothing and appearance or requiring the child to look a certain way (Smolak, 2002). They are also influential in their children’s eating patterns and behaviors. Children tend to mimic parental behavior and because of this may eat or avoid certain foods, which could lead to developing a positive or negative body image (Cash & Pruzinsky, 2002). Peers play a role in the development of body image because social comparison is present in early elementary (Smolak, 2002). If a child is constantly comparing themselves or being compared to other peers, they may feel intimidated and have low self-worth, and as a result, their body image may be more
negative. Finally media or toys show skewed gender roles on television, presentations of the “ideal” or typical women as slender, models, and Barbie dolls (Smolak, 2002). Children who compare themselves and idolize unrealistic role models, may experience more anxiety and have a more negative body image.

There is a shift in body image development during adolescence. Normal biological process moves girls away from the societal ideal body shape, and as boys mature their bodies have a greater chance of developing toward the broad-shouldered, tall, and muscular ideal (Levine & Smolak, 2002). Girls’ development through the stages of puberty in early adolescence is associated with increased body mass, a more negative body image, and higher levels of drive for thinness and dieting (Levine & Smolak, 2002). There is far less research on the development of body image in adolescent boys; overall it appears that the timing of puberty does not have a strong or lasting effect on boys’ body image (Levine & Smolak, 2002).

Body image development is greatly influenced by the media. Societal standards for women represent a level of thinness, which is unrealistic and impossible for most women to achieve by healthy measures (Tiggemann, 2002). As well, magazines, film, television (including cartoons), and toys present the ideal female body as young, tall, long-legged, and extremely thin, whereas the males ideal body is increasing in muscul arity, with some males exceeding the upper limits of muscul arity attainable without the use of anabolic steroids (mesomorphic, broad shouldered, well-developed upper body, flat stomach, and narrow hips) (Tiggemann, 2002). For example, GI Joe from the 1960s was significantly less muscular than the 1990s figure (Cash & Pruzinsky, 2002). GI Joe and other action figures have grown larger but leaner, conveying the value of extreme leanness and muscul arity.
Between genders, the nature of body weight dissatisfaction is slightly different. Females are more likely to judge themselves overweight when compared to national reference standards, whereas males are more likely to perceive themselves as underweight (Furnham & Calnan, 1998). Body image dissatisfaction and body distortion (seeing the body shape different than what it actually is) seems to increase with age, peaking during early adolescence, particularly in females (Littleton & Ollendick, 2003). It has also been found that females have a higher level of dissatisfaction with their bodies than males. As well, body dissatisfaction is more prevalent among females (Rierdan, Koff, & Stubbs, 1988), and they are three times more likely to report trying to lose weight than males (Serdula, Collins, Williamson, Anda, Pamuk, & Byers, 1993).

Puberty and adolescence is a major period of transition both physically and mentally in body image (Fabian & Thompson, 1989; Faust, 1987; Pearl, 1993). As children approach and go through puberty, girls tend to be concerned with physical beauty and maintaining the ideal thin shape that society emphasizes, whereas boys are more concerned with size, strength, and power (Pearl, 1993). Many females are faced with the societal pressure idealizing a body image that is not particularly healthy or attainable. As a result, most females fall short of the ideal, and this likely has a negative influence on self-esteem, psychological well being, and physical health (Pearl, 1993).

In boys and adolescent males less attention has been paid to the ways in which the increasingly muscular male body ideal may be contributing to body dissatisfaction (Labre, 2002). Sociocultural standards of beauty for males emphasize strength and muscularity, and men who meet this ideal are considered more attractive and receive more social benefits (Labre, 2002). As a result, many men suffer from the "Adonis
Complex”; Adonis was the Greek half-man, half-god who represented the ideal masculine body image—the V-shaped, muscular body (Cash & Pruzinsky, 2002). Many men are in pursuit of losing body fat while maintaining lean muscle mass. Muscle symbolizes health, dominance, power, strength, sexual virility, and threat; and because muscular men are perceived to embody these traditionally masculine traits, they may feel or aspire to feel more respected, admired, attractive, and confident (Labre, 2002).

Another form of body image dissatisfaction some men suffer from is Muscle Dysmorphia; the preoccupation that one is too small and not sufficiently lean or muscular, even though one may be extremely muscular (Cash & Pruzinsky, 2002). Behaviors include long hours of lifting weights, excessive mirror checking, and excessive attention to diet (Cash & Pruzinsky, 2002). This preoccupation causes clinically significant distress or impairment in social, occupational, and other important areas of daily functioning (Labre, 2002). They also avoid situations where the body is exposed to others, for example, not taking their shirts off at the beach (feeling that they look too small), wearing layers of clothing to appear more muscular, and some men may become housebound for days because they feel so out of shape (Labre, 2002).

1.2.5 Body image and athletes

When looking at athletes and body image, the relationship between body image perceptions and athleticism is influenced and moderated by a number of factors, such as the type of activity, the gender of participants, their degree of commitment, and a host of psychological characteristics (Davis, 1992). Many competitive athletes recognize the important relationship between optimal performance and low body weight due to the
fact that excess weight limits agility, speed, and contributes to increased fatigue (Davis, 1992).

Body image among athletes is also influenced by gender, even among athletes. Males consistently report lower levels of body dissatisfaction than females (Cash & Pruzinsky, 2002), which are consistent with gender differences found in the general population. However, degree of dissatisfaction in the male athletes (as well as females) is moderated by the type of sport in which they participate (Davis, 1992). For example, body dissatisfaction is higher among football and body-building, which are sports characterized by a muscular body build, than those males participating in cross-country and distance running, in which upper body strength is a disadvantage. As well Davis (1992) noted that male athletes, in general, have greater body dissatisfaction than age-matched nonathletes.

1.2.6 Body image and gymnasts

A longitudinal study by Davison and colleagues (2002) looked at the relationship between participation in aesthetic, or appearance oriented, sports and weight concerns in young girls. The participants included 197 girls (5 to 7 year olds) and their mothers. At each age, girls’ weight concerns and sport participation were assessed and girls were classified as participating in aesthetic sports (dance, gymnastics, cheerleading, baton twirling, swimming, aerobics, and figure skating), non-aesthetic sports (volleyball, soccer, basketball, softball, hockey, tennis, martial arts, and track), or no sports. The results showed that girls in the aesthetic sport group reported higher weight concerns than girls in the non-aesthetic and no sport groups at ages 5 and 7 years (Davison et al., 2002). In addition, girls participating in aesthetic sports at ages 5 and 7 years reported
the highest weight concerns at age 7. Findings from this study are of concern because
the girls were only 5 and 7 years of age and because weight concerns have been linked
to unhealthy behaviors and subclinical eating disorders (Davison et al., 2002).

Davison and colleagues (2002) defined some potential explanations for the
relationship between sport participation and body image concerns. In addition to the
possibility that aesthetic sports may attract girls with anorexic-like tendencies or
attitudes, the realities of competition in aesthetic sports reveal that how you look is
important to success, possibly leading to a heightened focus on weight and body shape
(Davison et al., 2002). Concern about weight and shape may also be promoted by
comments from parents and coaches and comparisons by peers and competitors. The
results from this study show that the relationship between sport participation and weight
concerns is present as early as age 5, and that research should focus on girls before
adolescence. Previously, extreme body image dissatisfaction was believed to begin with
the onset of pubertal development and adolescence. Recent evidence, however, suggests
that many young children are already unhappy with their body size.

Within the sport of gymnastics, body image concerns are very prevalent.
Gymnasts are required to train and compete in “leotards”, which intensifies the focus on
their body. This creates a particularly strong aversion to fatness and strong incentives to
reduce body fat to very low levels (Cogan & Vidmar, 2000). Over recent years, training
regimes and performance expectations have become progressively demanding,
increasing the potency of weight and shape concerns for many female athletes (Cogan &
Vidmar, 2000). Researches have even found that extreme weight loss behaviors are
encouraged among high-performance athletes by coaches, parents, and even peers (Cash
& Pruzinsky, 2002), which puts the gymnasts at increased risk for body image dissatisfaction.

Harris and Greco (1990) examined weight control and weight concern in competitive female gymnasts aged 17 to 23 years. The results showed that their current weight was significantly less than their highest weight and significantly more than they would like to weigh, or what their coach would like them to weigh. Most of the gymnasts (56%) felt pressure from their coach to lose weight, although only 17% felt pressure from fellow gymnasts to lose. Most of the females (61%) were currently trying to lose weight; no one was trying to gain. When the gymnasts were asked about their weight concerns within the sport and about changes in their own feelings about weight in the last few years, every gymnast indicated her belief that gymnasts were more concerned about their weight than most other females her age (Harris & Greco, 1990). Their reasons included pressure from others (mentioned by 32%), especially from coaches (29%), the need to look good in a leotard (32%), a belief that being thin helps one's performance (25%), an emphasis on appearance (18%), and the fact that one is constantly watched (7%) and judged (18%). Most respondents (76%) reported that they had become more concerned with their weight in the last few years. Several commented that the pressure for gymnasts to be little and to have a prepubescent figure makes it increasingly difficult to maintain the ideal shape for the sport as one matures (Harris & Greco, 1990).

In conclusion, Harris and Greco (1990) found that these competitive female gymnasts were extremely concerned about their weight, despite having a low body mass and percent body fat compared to national reference standards. They considered themselves too fat and felt that others (coaches, family, other gymnasts, and friends)
agreed with them. Not only were they dissatisfied with their bodies, but they also felt that even a small weight gain would have a deleterious effect on their performance.

In female gymnasts, there is an association between late puberty and successful athletic performance (Iversen, 1990). Many young gymnasts are thought to restrict their food and nutrient intake in efforts to maintain a prepubescent body shape and lower levels of body fat (Filaire & Lac, 2002). When intense training is combined with low nutrient intake gymnasts may be at risk of restricted growth and delayed maturation (Daly, Bass, Caine, & Howe, 2002). In combination with comments, encouragement of weight loss behavior from parents and coaches, and comparisons by peers and competitors, a gymnast may develop an eating disorder in order to deal with pressures and remain competitive in gymnastics (Daly et al., 2002; Harris & Greco, 1990).

Previous research shows that research has been conducted in the area of body image dissatisfaction and female gymnasts at varying ages. To date, there are no studies or previous research available looking at male gymnasts and body image.

1.2.7 Social physique anxiety

Most people are concerned with how their body appears to others (McAuley & Burman, 1993). Hart and colleagues (1989) suggested that social physique anxiety (SPA) is related to the concept of body image. SPA relates to the anxiety experienced when an individual perceives that his or her body shape or figure is being negatively evaluated by others (Hart et al., 1989). Hart et al. (1989) suggested that the reason some individuals experience high SPA may be because they hold unrealistic negative perceptions of their physique. Females consistently score significantly higher on the social physique anxiety scale, exhibit more social physique anxiety, and experience
more negative thoughts about their body’s appearance than males (Hart, et al., 1989; Haase, Prapavessis, & Owens, 2002; McAuley, Bane, & Mihalko, 1995). An individual with a high level of social physique anxiety might internalize the negative feelings and anxiety towards their body and readjust their body image. In addition, they often become distressed about their physical appearance and attempt to improve their body shape and size by dieting, fasting, binging, purging, or other negative behaviors (Hart et al., 1989). Therefore, social physique anxiety along with body image may play a crucial role in the development of a disturbed and effect eating patterns (McAuley et al., 1995).

Individuals who are concerned about negative physical evaluations are more likely to wear oversized clothing to hide their physiques and to exercise alone in private rather than in a group situation where evaluation potential is increased (McAuley & Burman, 1993). Whereas, those individuals that have positive physical evaluation of themselves maximize other people’s perceptions of their physique by wearing clothing that accentuates attractive features of the body and elect to exercise in environments where such features will be evaluated favorably (McAuley & Burman, 1993). This process of controlling and monitoring how one is perceived by other is referred to as self-presentation (Schlenker, 1980).

In an effort to better understand the social physique anxiety-behavior linkage researchers have begun to explore possible moderator variables such as age, gender, physiological status, and depression (Smith, 2004), especially in children and adolescents. Adolescence is a time of rapid biological change; changes in height and body composition that accompany adolescence can enhance the salience of the physique to adolescents (Smith, 2004). This is evident in the association between onset of physical maturation and physical self-perceptions. Early physical maturation is related
to relatively lower physical self-worth for girls and relatively higher self-worth for boys (Smith, 2004). This association is likely exacerbated by sociocultural messages that emphasize the value of thin bodies for women and lean, muscular bodies for men (Cash & Pruzinsky, 2002).

Second, peers are of particular psychosocial relevance during adolescence (Smith, 2004); this is also evident in the physical domain in both sport and general physical activity settings. For example, research examining sources of information youth use to judge their sport capabilities reveals a shift from dominant use of adult information sources during childhood to primary emphasis on peer comparison and evaluation during later childhood and adolescence (Smith, 2004). Smith (1999) found that perceptions of peer relationships associate with physical self-worth, positive responses to physical activity, motivation for challenging physical activities, and self-reported physical activity behavior in young adolescents.

Lastly, health behaviors such as physical activity appear to track from adolescence into adulthood (Malina, 1996). These findings suggest that the prospect of being evaluated in the physical domain is salient to adolescents, perhaps in different ways for body and girls, and that pursuing research on social physique anxiety in adolescence may improve understanding of youth psychosocial adjustment as well as the formation and maintenance of lifelong health attitudes and behaviors (Smith, 2004).

1.2.8 Social physique anxiety and athletes

Researchers have examined the construct of social physique anxiety in physical activity environments because it may have important implications in understanding exercise and sport behavior (Motl & Conroy, 2000). Exercise and physical activity
settings provide ample opportunities to be evaluated by other people (McAuley & Burman, 1993). In today’s society, we are concerned with others perceiving us as physically fit, healthy, beautiful, strong, attractive, and so forth rather than overweight, unhealthy, unattractive, and lazy (Hart et al., 1989). Therefore, we do what we can to convey a positive impression to other individuals. In aesthetic sports such as gymnastics, figure skating, diving, and dance, this transmission of a positive impression of one’s physical appearance, as well as what one does with one’s body, plays an important role in the evaluation of the performance (McAuley & Burman, 1993).

Self-presentation appears to be significant in sport environments (Leary, 1992). In this setting, women may perceive that others are evaluating their physique and skill level, which in turn, compels self-presentational concerns. In respect to physical activity with self-presentational concerns, it has been suggested that certain athletes (e.g., gymnasts, divers, figure skaters, aerobic competitors) train and compete in an environment where the physique is constantly under scrutiny (Borgen & Corbin, 1987).

For example, athletes participating in physique-oriented sports wear revealing attire that places the physique on display, and success is determined, in part, by the athlete’s ability to convey physical impressions of beauty and grace in the eyes of the judges, who subjectivity evaluate their performance (Haase & Prapavessis, 2001). As a result of evaluative pressures, social physique anxiety may occur (Leary, 1992). It seems reasonable to suggest that physique-salient sport athletes may experience greater social physique anxiety than other sport athletes (e.g., soccer, volleyball, netball) due to the heightened focus on physical appearance.

In contrast, Leary and Kowalski (1990) and Leary (1992) have suggested that people are likely to participate in activities that convey impressions that are consistent
with their roles, social norms, and/or other’s values. Extending this notion to social physique anxiety, it seems reasonable to suggest that people will select and participate in sports that emphasize the physique (e.g., diving, gymnastics, aerobics), because they are not worried about their physique.

Crocker, Snyder, Kowalski, and Hoar (2000) examined the social physique anxiety levels in high performance Canadian adolescent female athletes. The sports represented were basketball, tennis, volleyball, softball, gymnastics, diving, synchronized swimming, speed-swimming, and soccer. They found that there were no significant differences in social physique anxiety scores between athletes in aesthetic type sports and athletes in other sports. It was also found that perceptions of body fat were strongly related to athletes’ social physique anxiety. Previous research with adolescent athletes found that weight and body concerns were moderately related to social physique anxiety (Hart et al., 1989; Martin et al., 1997; McAuley & Burman, 1993). There is also evidence that actual body fat composition is related to social physique anxiety (Bane & McAuley, 1998; Hart et al., 1989) although Martin et al. (1997) failed to find such a relationship in adolescent female athletes.

Perhaps, because female athletes (and non-athletes) are susceptible to cultural pressures to maintain an ideal body shape, it is not the type of sport per se that impacts concern about body size and the likelihood of unhealthy eating. Rather, female athletes who feel that their body is being evaluated by others may be at greater risk (Krane, Stiles-Shipley, Waldron, & Michalenok, 2001). A female athlete’s uniform may increase the perception of her body being evaluated; the more body shape that is discernible in one’s uniform, the increase ability for her body to be judged by coaches, other athletes, and even spectators (Krane et al., 2001). Thus, there is a greater
likelihood of high SPA and low body dissatisfaction. Athletes who wear revealing uniforms in sports typically classified as lean (e.g., gymnasts, figure skaters) and non-lean (swimmers) generally report high levels of body dissatisfaction and disordered eating (O'Connor, Lewis, & Kirchner, 1995; Petrie, 1993). If an athlete perceives her body as less than ideal, this may increase the likelihood of body dissatisfaction and unhealthy eating behaviors (Krane et al., 2001).

1.2.9 Social physique anxiety and gymnasts

In the population of competitive gymnasts, the evaluation of one's physique plays a prominent role in both material and social outcomes (McAuley & Burman, 1993). Small agile physiques are ideally suited to competitive gymnastics because they optimize appearance and performance (Falls & Humphrey, 1979). Integral to scoring well in gymnastics is the gymnast's ability to present themselves in a manner that demonstrates grace, amplitude, power, speed, and strength to those judging performance (McAuley & Burman, 1993). In addition, the maintenance of a compact, attractive physique while remaining strong and powerful is a crucial component of gymnastics (Falls & Humphrey, 1979). Therefore, it is logical to expect that this quest to self-present the appropriate image to judges, coaches, and other gymnasts will lead to higher levels of social physique anxiety in those individuals who find it difficult to do so or who question or doubt their own capabilities (McAuley & Burman, 1993). Thus, a low sense of self-efficacy (an individual's estimate or personal judgment of his or her own ability to succeed in reaching a specific goal) with respect to physical capabilities would theoretically be expected to lead to increased elevations in social physique anxiety levels (McAuley & Burman, 1993). Moreover, as most highly competitive gymnasts are going
through the various hormonal and physical changes associated with adolescence when they are at the peak of their careers. Therefore, it appears reasonable to propose that age should be positively correlated with social physique anxiety and that older gymnasts competing at lower levels might be expected to demonstrate higher levels of social physique anxiety than their younger peers (McAuley & Burman, 1993).

A study by McAuley and Burman (1993) used the social physique anxiety scale in adolescent competitive female gymnasts ranging in age from 12-18 years. They confirmed that older gymnasts in the lower competitive levels were more physique anxious than their counterparts at the upper level. This could be a result of the older gymnasts not fitting into the ideal small gymnast physique. Also, the inability to present the appropriate body image to judges, coaches, and other peers will lead to higher levels of social physique anxiety. As well, more socially anxious participants in the lower levels also evidenced lower physical self-presentational confidence than those individuals competing at higher levels. The results indicated perhaps the consequences of trying to compete against younger participants while one's body is going through developmental stages that make optimal self-presentation difficult and increasing social physique anxiety. Therefore, the level of competitive participation differentially influenced the relationship between social physique anxiety and age and physical self-presentation (McAuley & Burman, 1993), and social physique anxiety was inversely correlated with perceived ability and self-presentation. The relationship between social physique anxiety and constructs such as perceived physical ability and physical self-presentation confidence also provide further evidence for the construct validity of social physique anxiety in physical activity settings (McAuley & Burman, 1993).
Competitive gymnasts may be at risk for both self-presentational concerns regarding the physique and eating disorders are competitive gymnast (Hausenblas & Mack, 1999). In regards to self-presentational concerns, gymnasts are training and competing in revealing attire that places the physique on evaluative display and often magnifies bodily flaws (Reel & Gill, 1996). Second, gymnastics is a sport where success is determined through subjective evaluation by judges (Hausenblas & Mack, 1999). Therefore, besides obvious physical skill, gymnasts’ ability to convey impressions of grace, strength, agility, and attractiveness can affect their evaluation by the judges (Hausenblas & Mack, 1999). Third, the individual (versus team) nature of the sport activity, in which accountability for performance is readily discernable, may result in heightened emphasis of the physique (Reel & Gill, 1996). Thus, due to the heightened focus on appearance, gymnasts may experience social physique anxiety in an attempt to convey positive impressions (Hausenblas & Mack, 1999).

Previous research shows that there is limited research in the area of social physique anxiety and female gymnasts. The research conducted has been with female gymnasts older than 12 years of age, and during adolescence. No research has looked at school aged children, the age when the majority of gymnasts compete. In addition, research has yet to be conducted in the area of social physique anxiety and male gymnasts at any age.

1.2.10 Eating disorders

The psychological construct of anxiety has been applied to the relationship between disordered eating behaviors and personality traits by many researchers (Frederick & Morrison, 1998). In fact, anxiety has been significantly correlated with
eating disorders for both adolescent and adult women (Martz, Handley, & Eisler, 1995). A study by Frederick and Morrison (1998) showed support for a mediational model in which scores on social physique anxiety are related to scores on eating disordered behaviors and these in turn are related to scores on eating disordered personality traits. They were able to show a relationship for rated eating disordered behaviors and scores on personality traits and social physique anxiety.

As well, body image disturbances have emerged as one of the most potent risk factors for the development and maintenance of eating disorders such as anorexia nervosa and bulimia. The construct of body image disturbances includes: internalization of society's body image ideal (thin-ideal internalization), negative subjective evaluations of one's physical appearance (body dissatisfaction), and distorted perceptions of body image (body image distortions).

Body image disturbance is the most common clinical feature to anorexia nervosa, whereas body image dissatisfaction is the most immediate or proximal antecedent to the development (Gardner, 2002). The main feature of anorexia nervosa is a preoccupation with thinness (Garner & Olmsted, 1984), which is linked to the attempt to establish control over the body and its functions. Diagnostic criteria for anorexia nervosa includes: 1) intense fear of becoming obese, which does not diminish as weight loss progresses, 2) disturbances of body image, 3) weight loss of at least 25% of original body weight or, 15-20% if an individual was relatively thin or still growing, 4) refusal to maintain body weight over a minimal normal weight for age and height, 5) at least two of the following manifestations: amenorrhea (absence of menses), lanugo (growth of a downy layer of hair all over the body), bradycardia (abnormally slow heartbeat), periods of overactivity, episodes of bulimia, and/or vomiting (Garner & Olmsted, 1984).
In anorexia nervosa the strong concern about physical appearance predates the onset of the disorder and even after weight restoration, the majority of anorexia nervosa patients continue to worry excessively about body weight and shape (Gardner, 2002). Cash and Pruzinsky (2002) stated that body image is the major predictor of relapse in anorexia nervosa patients.

Bulimia as defined by Garner and Olmsted (1984) is an abnormal increase in the desire to eat with recurrent episodes of rapid ingestion of large quantities of food (bingeing), followed by self-induced vomiting and purgation. The patient feels a sense of lack of control over eating during binge-eating episodes. A regular cycle of self-induced vomiting, use of laxatives, diuretics, or enemas (purging type), or dieting or exercise (non purging type) is also present.

Body image disturbances also increase risk for bulimia nervosa. There are two hypothesized mechanisms through which this occurs (Cash & Pruzinsky, 2002). The first is the most widely accepted; body image dissatisfaction and distortion result in elevated dieting because of the common belief that this is an effective weight control technique. Dieting in turn, increases risk for onset and maintenance of bulimic pathology because individuals may binge eat to directly counteract the effects of caloric deprivation. Dieting might also promote binge eating because violating strict dietary rules can result in overeating. Moreover, dieting requires a shift from relying on physiological cues to enforcing a cognitive-driven control over eating behaviors; this shift leaves individuals vulnerable to overeating when these cognitive processes are disrupted, possibly due to intense emotions (Cash & Pruzinsky, 2002; Stice, 2002). The second mechanism is that body image dissatisfaction distortions are thought to contribute to negative affect because appearance is a central evaluative dimension for...
females in Western culture. Elevated negative affect, in turn, is thought to increase the risk of binge eating for those individuals who binge in an effort to provide comfort and distraction from adverse emotions. Individuals might also use radical compensatory behaviors, such as vomiting, to reduce anxiety about weight gain consequent to overeating or because they believe that purging serves as an emotion catharsis (Cash & Pruzinsky, 2002; Stice, 2002).

An examination of the risk factors associated with the development of disordered eating in males has revealed more similarities than differences to those of adolescent females (Ricciardelli & McCabe, 2004), although, adolescent boys do not appear to be at the same level of risk for developing eating disorders as adolescent girls. As well, researchers have stated that it is much more difficult to diagnose eating disorders in males (Cash & Pruzinsky, 2002; Ricciardelli & McCabe, 2004; Stice, 2002). There is a reluctance to admitting having a “women’s problem”, as well the diagnostic criteria for eating disorders are biased toward family-related characteristics (e.g., the menstruation criterion) and do not mention body shape (which is more of a concern for males than actual body weight) (Stice, 2002). Many mistake male bingeing behavior for a hearty appetite (supposedly typical “guy behavior) or they dismiss thinness as a health nut (Stice, 2002).

1.2.11 Disordered eating in young athletes

When examining eating disorders within athletes, prevalence studies indicate that female athletes are at greater risk for developing eating disorders than are nonathletes of similar age (Beals & Manore, 1994; Johnson, 1994; Petri, 1993; Stoutjesdyk & Jevne, 1993; Sundgot-Borgen, 1994; Wiggins & Wiggins, 1997). Multiple factors contribute to
the increase in disordered eating behaviors among female athletes. Females involved in 
sports have particular personal attributes that make them excellent competitors yet 
accentuate the risk for disordered eating (Wiggins & Wiggins, 1997). In addition to 
societal norms for thinness and familial factors, female athletes also bear the pressure of 
the sports’ environment, contributing to the onset of eating disorders (Krane, Stiles­ 

The prevalence of eating disorders in female athletes is approximately 16 to 
72%, and has been found to be more of a problem for athletes than the general 
sports participation and disordered eating behaviors of middle school girls. Another 
study conducted by Burckes-Miller and Black (1988) looked at 695 male and female 
athletes and reported both bulimic attitudes and behaviours. One-third were preoccupied 
with food, 24% reported having recurring binge eating episodes at least once every 1-8 
days, 15% had distorted body image, 11.9% reported a loss or fear of losing control 
when eating and 5.3% ate until they were physically ill. Athletes also indicated that they 
were using severe weight control methods, 5.6% engaged in self-induced vomiting, 
3.7% abused laxatives, 11.9% fasted for at least twenty-four hours and 1.4% used 
enemas They found that 4.2% of female athletes met criteria for anorexia nervosa and 
39.3% for bulimia nervosa.

A survey by the NCAA sports-science division reveals that eating disorders 
quietly have become a significant health problem among college student-athletes (Dick, 
1990). Sixty-four percent of NCAA member institutions responding to the voluntary 
survey reported that at least one student-athlete had experienced an eating disorder 
during the past two years. The vast majority of the reports (93%) were in women's 

33
sports. Women's gymnastics was the sport with the largest percentage of sponsoring schools reporting an eating disorder (52 reports out of 108 sponsoring schools - 48%). The next highest percentages were in women's cross country (23%); women's swimming, not including diving (21%); and women's track and field events (21%). Wrestling was the men's sport with both the most reports (7%), and cross country was second (Dick, 1990).

Rosen, McKeag, Hough, and Curley (1986) looked at 182 college athletes in 9 sports found that 32% used at least one pathogenic or ED weight loss technique (self-induce vomiting-14%; laxatives-16%; diet pills 25%; and diuretics-5%. Another study by Rosen and Hough (1988) looked at 42 female college gymnasts and found that 62% were using at least one pathogenic form of weight control (self-induced vomiting-25%; diet pills-24%; fasting-24%; diuretics-12%; laxatives-7%).

Specific personalities of athletes can put an individual at increased risk for an eating disorder (Wiggins & Wiggins, 1997), such as obsessionality, perfectionism, rigidity, and harm avoidance, as well as variations in neuronal systems (neurotransmitter and hormone imbalances) that influence cognitive style and information processing (Thompson & Sherman, 1993). As well, sport-specific training regimes or behaviors that athletes engage in may be triggering factors for eating disorders like anorexia nervosa or bulimia, for example, prolonged periods of dieting, an unusual preoccupation with nutrition and body weight, frequent weight fluctuations, and sudden increases in training intensity (Weimann, Witzel, Schwidergall, & Bohles, 2000).

Gymnasts particularly are susceptible to pathogenic weight loss methods. Bale, Doust, and Dawson (1996) emphasizes the similarities of runners, gymnasts and dieters in which all three groups have similar attitudes and behaviors. These include an
emphasis upon food restriction to maintain a low body mass, intensive exercise, and a concern for a slim physique. The obsessive dieting and demanding training schedules of some athletes can cause changes in physique, body composition, and menstrual abnormalities indicating common factors between them and anorexics (Bale et al., 1996). As a result many researchers suggest that athletes such as gymnasts are at greater risk for developing an eating disorder similar to that of anorexics, linking athleticism and anorexia (Bale et al., 1996).

In addition, the environment that the gymnast is exposed to may also increase the risk for disordered eating. This includes coaching style, parental pressures, intensive practices and demanding competitions, social isolation and lack of opportunities for social development, public displays of skills and evaluation by others, and in some cases living and training away from home and family (Caine et al., 2003).

1.2.12 Summary

Research has suggested that the small prepubescent gymnast may be at risk for body image dissatisfaction and anxiety associated with negative feelings towards their body (social physique anxiety), which could lead to disordered eating (Garner, Rosen, & Barry, 1998). Although, when looking at one of the important risk factors, body image, in the development and maintenance of eating disorders there is far less research on development of body image in adolescent males. Therefore, within the unique population of gymnasts research is extremely limited in the areas of body image, social physique anxiety, and disordered eating.

Previous research shows that some research has been conducted in the area of body image dissatisfaction and female gymnasts at varying ages. To date, there are no
studies or previous research available looking at male gymnasts and body image. As well, previous research shows that there is limited research in the area of social physique anxiety and female gymnasts. The research conducted has been with female gymnasts older than 12 years of age, and during adolescence. No research has looked at school aged children, the age when the majority of gymnasts compete. In addition, research has yet to be conducted in the area of social physique anxiety and male gymnasts at any age. A study has yet to be done looking at growth, maturation, body composition, and its relationship to these body image concerns. The present study is likely one of the first studies to look at body composition, body image, social physique anxiety, and the risk of developing an eating disorder among both male and female gymnasts.

1.3 Purposes

The primary purpose was to examine the relationship of body image dissatisfaction and social physique anxiety to the risk of developing an eating disorder in female and male gymnasts.

The second purpose was to investigate the relationship of chronological age, maturity status, and body composition to body image dissatisfaction and social physique anxiety in female and male gymnasts.

1.4 Hypotheses

The two main hypotheses of this study were that body image dissatisfaction increases the risk for an eating disorder and that a higher social physique score increases the risk for an eating disorder with a higher prevalence in females.
The sub hypotheses within the two main were: (1) as age increases, body image dissatisfaction would become more prevalent in females and decrease with age in males, (2) as age increases, the social physique anxiety scale scores would be higher in females but lower in males, (3) as sum of skinfolds increases, the scores from the social physique anxiety scale would increase, (4) as sum of skinfolds increases, the frequency of body image dissatisfaction would increase.

1.5 Assumptions

1.5.1 The skinfold measurements taken give an indication of body fatness across all participants.

1.5.2 Skinfold measurements were performed in a similar manner on all participants.

1.5.3 The Body Image Questionnaire, Social Physique Anxiety Scale and Eating Disorder Inventory are valid instruments to assess body image, social physique anxiety and risk for developing an eating disorder.

1.5.4 The Body Image Questionnaire, Social Physique Anxiety Scale and Eating Disorder Inventory are administered in a uniform manner to all participants.

1.6 Limitations

1.6.1 The subjects in this study were predominantly Caucasian. This lack of racial representation may have resulted in a sample population who may have a greater concern for physiques and attractiveness than would a completely random sample.

1.6.2 The sample was self-selected in that participants were all competitive gymnasts within the Saskatoon area.
1.6.3 The methods and questionnaires were previously determined for this study.

1.6.4 Participants were examined using self-report measures of disordered eating behaviors, social physique anxiety, and body image dissatisfaction.

1.6.5 The data was previously collected by researchers.

1.6.6 A crude measure of maturation was used. This could have resulted in participants being classified in the incorrect maturational group.

1.7 Delimitations

1.7.1 The results from this research study can only be projected to competitive youth male and female gymnasts (ages 6-19).

1.7.2 The administrator read questions and answers to participants who were 7 years and under. It is possible, then, that these individuals may have been inadvertently promoted to answer the questionnaires in a particular way thus, affecting the results of the present study.
2 METHODS AND PROCEDURES

2.1 Research design

The research design was a cross-sectional study. The individuals were measured at only one time point and are represented only once in the sample.

Prior to the study commencing, informed consent was obtained from both the guardians and the gymnasts. Approval for this study was obtained from the Human Experimentation Ethical Review Committee of the University of Saskatchewan.

2.2 Participants

The participants were all competitive gymnasts in either the Saskatchewan provincial stream or the national/high performance stream. In the provincial stream gymnasts begin preparing for competitions within their province, outside their province, and possibly at the Western Canadian Championships. The national/high performance stream is the highest level of gymnastics in Canada. The gymnasts compete at events across Canada including the Canadian Championships and may also represent Canada at International meets. Therefore, dependent upon each child’s age and skill level, these gymnasts trained a minimum of ten hours up to thirty plus hours per week in preparation for local, provincial and national level competitions. Therefore, the exclusion criteria was the gymnast’s level of training; the gymnasts had to be in the competitive stream.
The participants for this study included male (n=42) and female (n=74) gymnasts from four different gymnastic clubs. The four gymnastic clubs were located in Saskatchewan, in the surrounding Saskatoon area. Ages of the gymnasts ranged from 6 to 19 years of age and were measured during 1990 and 1991.

2.3 Data collection

2.3.1 Anthropometric testing procedure

In efforts to address the research question and investigate the physical and behavioral domains together, differences in physical characteristics among female and male gymnasts and controls were examined. All anthropometric measurements (standing height, weight, and skinfold measurements) were taken by a trained anthropometrist, following techniques outlined by Ross and Marfell-Jones (1990). The gymnasts were all barefoot and wearing only their gymnastics leotard for all measures.

2.3.1.1 Chronological age

Chronological age was determined precisely to the decimal value. Decimal age was calculated from the self-reported date of birth and from the testing date (years + (days/365.25)).

2.3.1.2 Maturation

Gymnasts were grouped into three maturational categories (prepubescent, pubescent, and post pubescent) according to mean ages associated with reference
standards for puberty. Females were grouped into the following categories: 6.0 to 9.9 years (prepubescent), 10.0-13.9 years (pubescent), and 14.0 and above (post pubescent), whereas males were grouped as 6.0 to 9.9 years (prepubescent), 10.0-14.9 years (pubescent), and 15 and older (post pubescent).

2.3.1.3 Standing height

Height was measured using a calibrated Harpenden wall-mount stadiometer. The participants stood barefoot with their back against the wall in a standard erect posture, arms by the side, looking straight ahead, and with heels against the wall. The participant was instructed to take a deep breath while the anthropomist made sure the head was in the Frankfort plane (when the line from the orbitale to the tragion is horizontal). The stadiometer square was brought down to touch the top of the participant’s head. Participants then were told to step out from the wall and the measurement was recorded to the nearest 0.1 cm.

2.3.1.4 Body weight

Body weight was measured using a calibrated scale. The participants stood barefoot on the scale, and weight was recorded to the nearest 0.1 kg.

2.3.1.5 Body mass index
Body mass index, the relationship between weight and stature was calculated by the equation: Body mass index = weight / stature^2. Weight is in kilograms and stature is in meters squared, and is expressed as kg/m^2.

### 2.3.1.6 Skinfold measurements

An indication of body fatness in each participant was estimated by skinfold thickness, which is a measurement of the subcutaneous fat layer. A calibrated Harpenden skinfold caliper was used to measure the skinfold thickness on the right side of the body.

The measurements were taken with the participant in a relaxed standing position with arms at their side, or with their right hand placed on their left shoulder. The skinfold was picked up, so that a double fold of skin plus the underlying subcutaneous adipose tissue was held between the thumb and index finder of the left hand. A grasp was maintained on the skinfold throughout the measurement and the measurement was taken two centimeters beyond the fold of skin. The reading taken two seconds after full pressure from the caliper was applied. The skinfold measurements were performed twice, but if the two measurements were not within 0.4 milimeters (mm) a third measurement was obtained. The measurements were recorded to the nearest 0.1 milimeter (mm), and an average of the two scores, or median of the three scores was recorded.

The following sites were recorded:

**Subscapular Skinfold:** The skinfold measurement was taken on a fold running downward one centimeter below the bottom, inferior angle of the scapula.
**Supraspinale Skinfold:** The skinfold measurement was taken at the intersection of the border of the ilium on a line from the spinale to the anterior axillary border. The fold runs medially downward at about a 45 degree angle as determined by the natural fold of the skin.

**Iliac Crest Skinfold:** The skinfold measurement was taken at the fold superior to the iliac crest at the mid-axillary line.

**Abdominal Skinfold:** The skinfold measurement was taken on a vertical fold 5.0 cm lateral to, and at the level of the omphalion. Since the gymnasts were dressed in a gymnastic leotard, the skinfold thickness measurements in the abdominal area included the leotard thickness, with the value being corrected for the thickness of the leotard alone (Thompson, 1994).

**Biceps Skinfold:** The skinfold measurement was taken on a vertical fold at the marked mid-acromiale-radiale line on the anterior surface of the arm.

**Triceps Skinfold:** The skinfold measurement was taken on a vertical fold at the marked mid-acromiale-radiale line on the posterior surface of the arm.

**Front Thigh Skinfold:** The participants placed their right foot on a box so that the knee was bent at a 90 degree angle. Participants were asked to hold the underside of their leg by clasping both hands underneath and lifting upwards. The skinfold measurement was taken on a vertical fold on the anterior long axis of the femur, halfway between the inguinal crease and the anterior patella.

**Medial Calf Skinfold:** The participant again, had their leg place upon a box with the knee bent at a 90 degree angle. The skinfold measurement was taken on the medial midline at the level of maximum calf girth, parallel to the long axis of the leg.
**Sum of Skinfolds:** The eight sum equation was used in this study to determine body fat. The following equation was used to calculate the total sum of skinfolds: Total Sum of SF (mm) = subscapular SF (mm) + supraspinale SF (mm) + iliac crest SF (mm) + abdominal SF (mm) + biceps SF (mm) + triceps SF (mm) + front thigh SF (mm) + calf SF (mm).

2.3.2 Questionnaires

Participants were given three questionnaires following the completion of the anthropometric measurements. Standard written and verbal instructions were explained before the participant started the questionnaires. To account for questionnaire bias, one-third of the participants were given the Body Image Questionnaire, one-third given the Social Physique Anxiety Scale, and one-third given the Eating Disorder Inventory. The following two questionnaires were given out randomly following the above procedure. To assist those children who were seven years of age and under, an administrator read the questionnaires and response to the children to help their understanding.

2.3.2.1 Body image questionnaire (BIQ)

The pictorial body image questionnaire was a modified questionnaire developed by Dwyer et al. (1969) and Carroll et al. (1986). The questionnaire consisted of 6 silhouettes varying in levels of body fatness ranging from very thin (#1) to obese (#6) (Dwyer et al., 1969; Carroll et al., 1986).
The silhouettes used were front-view outlines of somatotype photographs which were chosen to represent different body types and were adjusted so that they were all of a constant stature (Dwyer et al., 1969; Carroll et al., 1986). The silhouettes in the original questionnaire were adapted from adult females to represent young female physiques (Thompson, 1994). Due to the large age range and physical development of the females, two different sets of silhouettes were used. One represented a pre-pubescent female and the other represented a post-pubescent female. Females ten years of age or younger completed the pre-pubescent silhouettes, whereas children eleven years and older completed the post-pubescent female silhouettes. The changes made to the questionnaires were done using the outlines from two similar somatotypes of different ages (7 year 2 months; 12 year 6 months) from Petersen's Atlas for Somatotyping Children (1967). This outline was used for the #3 silhouette (pre-pubescent = figure #281; post-pubescent = # 77), changes were then made to alter the level of fatness to give a series of six silhouettes ranging from emaciated to obese (Thompson, 1994). The males used only one set of silhouettes regardless of age.

The children were asked to select the silhouette which they perceived best resembled their own physique and then the silhouette that they would prefer to have. The subjects whose perceived and preferred silhouettes were the same were considered to be “satisfied” with their body physiques. If the participants desired a smaller
preferred silhouette than their actual perceived were “dissatisfied” with their physique. This dichotomous outcome would show whether the participants were “satisfied” or dissatisfied” with their body shape. If the participant desired a larger silhouette than their actual perceived, this is not seen as putting the individual at risk for disordered eating (Thompson, 1994).

Silhouette matching test have been commonly used in studies to assess an individual’s body-image perceptions (Hallinan & Schuler, 1993; Hallinan, Pierce, Evans, & DeGrenier, 1991; Nies, Cook, & Hepworth, 1999; Powers & Erikson, 1986). Stunkard and colleagues were pioneers in this methodology and have continued to find silhouette matching test scales valid measures of body image (Stunkard, 2000; Stunkard, Sorenson, & Schlusinger, 1983).

A study by Thompson and Altabe (1991) looked at the psychometric qualities of body silhouettes within a sample of male and female college students. The two-week test-retest correlation coefficients showed that the reliabilities were quite high, with the ideal silhouette (female, $r = 0.71$, male; $r = 0.82$) and current silhouette (female, $r = 0.89$; male, $r = 0.92$) (Thompson & Altabe, 1991).

When investigating body image dissatisfaction and the risk for an eating disorder, Thompson and Altabe (1991) found that correlations between figure ratings and measures of body dissatisfaction, eating disturbance, and self-esteem were moderate and in the expected directions. For the females the relationships were larger than the males; the figure rating to the Bulimia subscale of the EDI (female, $r = 0.35$; male, $r = 0.20$), the figure rating to the Drive for Thinness subscale (female, $r = 0.45$; male, $r = 0.30$), the figure rating to the Body Dissatisfaction subscale (female, $r = 0.62$; male, $r = 0.22$), and the figure rating to self-esteem (female, $r = -0.20$; male, $r = 0.08$) (Thompson
& Altabe, 1992). These higher values for females are consistent with the literature documenting a greater incidence of body image dissatisfaction and eating disturbance in females than in males (Cash & Pruzinsky, 1990). Therefore, body silhouettes have good test-retest reliability and adequate validity in males and females (Thompson & Altabe, 1992).

Tehard, Van Liere, Nougue, and Clavel-Chapelon (2002) looked at the validity of self-reported measurements of anthropometric characteristics and body silhouettes (a simple measure that can be used as a surrogate for measured BMI). Correlation coefficients between body silhouettes and BMI varied from 0.77 for self-measurements to 0.87 for technicians' measurements; both differed significantly from zero (Tehard, Van Liere, Nougue, & Clavel-Chapelon, 2002). These correlations showed a positive and linear trend between BMI and body silhouette. Another study by Must, Willett, and Dietz (1993) found similar results. They found high correlations between body silhouettes and measured body mass index (BMI) for females (0.65 at 10 years of age, 0.75 at 15 years, 0.66 at 20 years, and 0.75 at adulthood) (Must, Willett, & Dietz, 1993).

Some difficulties do exist with using silhouettes as a body image dissatisfaction measure. The first difficulty with existing silhouette matching tests is that some have silhouettes that differ in height (Stunkard, Sorenson, & Schlusinger, 1983). Because height is an important characteristic in judging relative weight, it is essential that this problem be remedied if accurate assessments are to be attained. The silhouettes used the present study of similar height, eliminating this problem.

Second, in applied research, most constructs of interest are continuous while the actual number of options available on response scales is often discrete. In the assessment of body image by silhouette drawing, body size is a continuous variable
measured by asking an individual to select one of a finite number of drawings (Gardner, Friedman, & Jackson, 1998). It has been acknowledged that some information may be lost when a “course” response scale is used to represent a near continuous or “fine” variable.

Thirdly, the method of presentation of the silhouette can also influence an individual’s selection of physique (Gardner, Friedman, & Jackson, 1998). Typically, all silhouettes are presented on a single sheet of paper, with figures arranged in ascending size from left to right. Individuals are typically instructed to mark the silhouette they think represents their actual size and then circle the size they would like to be ideally. Such techniques likely produce spuriously high test-retest reliability since individuals have little difficulty remembering which silhouettes they previously marked. Within the present study, participants completed the silhouette matching test only once.

2.3.2.2 Social physique anxiety scale (SPAS)

The Social Physique Anxiety Scale (SPAS) was used to measure one’s level of social physique anxiety; anxiety that individuals experience in response to other’s evaluation of their physique. Developed by Hart et al. (1989), it consisted of a 12-item scale. The participants answered to what degree each statement was true of them on a 5-point Likert-type scale with anchors of (1) “not at all”, (2) “slightly”, (3) “moderately”, (4) “very”, and (5) “extremely”. The scores ranged from 12 to 60; a larger value indicating a higher level or experience of social physique anxiety.

Due to recent research supporting that the 12-item SPAS is a multidimensional rather than unidimensional measure (Martin, Rejeski, Leary, McAuley, & Bane, 1997), the SPAS was reduced to a 9-item unidimensional scale by removing statements 1, 2,
and 5. These 9-items are more closely related to the concept of body image. Removing these statements does not comprise the reliability or validity of the scale (Martin et al., 1997).

The social physique anxiety scale scores have been found to correlate with a number of psychosocial variables associated with evaluative concerns among young women—including measures of global self-esteem and body esteem, fear of negative evaluation, weight dissatisfaction, body dissatisfaction, and body cathexis (Crawford & Eklund, 1994; Eklund & Crawford, 1994; Hart et al., 1989). Hart, et al. (1989) reported that Cronbach’s alpha coefficient was .90, indicating high interitem reliability and test-retest reliability was .82 after two weeks for scores from a sample of undergraduate women.

In order for children to comprehend, the SPAS was modified from the original version used in adults (Thompson, 1994; Thompson & Chad, 2002). Thompson and Chad (2002) pilot tested the modified SPAS on female gymnasts ranging from 6 to 15 years old. The results showed that the participants had a high level of comprehension, interitem correlation (α = 0.91) and 2-week, test-retest reliability (r = 0.88), indicating that the modified scale was appropriate to use in young gymnasts.

Smith (2004) reported that the 9-item social physique anxiety scale was strongly correlated with 12-item scale (female 9-item r = 0.99, male 9-item r = 0.98) in 9th- and 10th-grade high school students. The internal consistency reliability values were high for the 9-item scale (female α = 0.87, male α = 0.85). The 9-item model exhibited a good fit to the data and was gender invariant (Smith, 2004). Other studies have shown similar findings, with the internal consistency of the 9-item version of the social physique anxiety scores ranging between α = 0.88 and α = 0.90 in female gymnasts ranging from
12 to 18 years of age (Hart et al., 1989; McAuley & Burman, 1993; Motl & Conroy, 2000).

The convergent validity of the social physique anxiety scale scores has been supported by positive correlations with measures of social physique (i.e., interaction anxiousness and fear of negative evaluation), public self-consciousness, weight and body shape satisfaction, and percent body fat (Crawford & Eklund, 1994; Eklund & Crawford, 1994; Hart et al., 1989; Motl & Conroy, 2000). Negative correlations with measures of body cathexis and multidimensional body-esteem (i.e., physical attractiveness, upper-body strength, weight concern) also have supported the convergent validity of the social physique anxiety scale (Hart et al., 1989; Motl & Conroy, 2000).

Social physique anxiety scores have also differentiated between individuals reporting high and low levels of discomfort, negative thoughts, and stress during physique evaluation (Hart et al., 1989), which provides evidence of its discriminant validity (Motl & Conroy, 2000).

Motl and Conroy (2000) used confirmatory factor analysis on the 9-item social physique anxiety scale in male and female college students. Confirmatory factor analysis differs from exploratory (ordinary) factor analysis in that you specify the structure of three matrices a priori (in advance) of data analysis (Motl & Conroy, 2000). The chief advantage of confirmatory factor analysis is that it allows you to test hypotheses about specific factor structures. Thus, the null hypothesis is the solution you specify. If the dataset you analyze departs significantly from the null hypothesis, you reject the null hypothesis and conclude that the factor structure you propose does not fit the obtained data (McAuley & Burman, 1993). The results of the confirmatory factor analysis on the 9-item model indicated that it represented an acceptable fit to the social
physique anxiety scale responses of women and men ($x^2 = 96$, $df = 27$, $x^2/df = 3.56$, SRMR = 0.04, and GFI = 0.94). The internal consistency of the nine-item models to the social physique anxiety scale was 0.67 when using coefficient alpha.

McAuley and Burman, (1993) cross-validated the psychometric properties of the social physique anxiety scale in adolescent competitive female gymnasts (12-18 years). The chi-squared goodness-of-fit test, goodness-of-fit index (GFI), and root mean square residual (RMSR) were calculated. The chi-square test was highly significant ($x^2(54) = 224.27$, $P<0.0001$, the GFI = 0.87, and the RMSR = 0.057). The GFI is a measure of the discrepancy between predicted and observed covariances, and since the GFI value is > 0.85 it shows that the model is a good fit (McAuley & Burman, 1993). The RMSR measures how well the sample covariance structure hits the proposed models covariance structure, and since the RMSR value is < 0.08 it is acceptable (McAuley & Burman, 1993). Cronbach’s alpha coefficients were calculated as a measure of internal consistency of the model was highly reliable (12-item model, $\alpha = 0.90$; 11-item model, $\alpha = 0.92$). To examine the construct validity, they examined the proposition that individuals who evidence lower levels of perceived physical ability and self-presentation confidence would exhibit greater social physique anxiety. This was the case with the social physique anxiety being inversely correlated with perceived ability ($r = -0.49$, $P<0.0001$) and self-presentational confidence ($r = -0.56$, $P<0.0001$). The social physique anxiety scale appears to possess factorial validity and appears related to theoretically relevant constructs, suggesting support for general construct validity.

Frederick and Morrison (1998) completed a mediational path model; scores on the eating disordered behavior variable were regressed onto those for social physique anxiety. The model was significant with scores on social physique anxiety significantly
predictive of scores for eating disordered behaviors (F\textsubscript{1,77}=36.12, p<.01). The model by Frederick & Morrison (1998) was as followed: Social physique anxiety $\rightarrow \beta=.57$ $\rightarrow$ eating disordered behaviors $\rightarrow \beta =.53 \rightarrow$ eating disordered traits.

### 2.3.2.3 Eating disorder inventory

Garner and Olmsted (1984) designed the Eating Disorder Inventory, a 64-item, multiscale, self-report questionnaire to assess the psychology and behavioral characteristics of eating disorders. The EDI consists of 8 subscale scores: drive for thinness, bulimia, body dissatisfaction, ineffectiveness, perfectionism, interpersonal distrust, interoceptive awareness, and maturity fears.

A modified version was used, that assessed 3 of the 8 subscale scores; drive for thinness, bulimia, and body dissatisfaction. The drive for thinness subscale includes an excessive concern with dieting, preoccupation with weight, and an extreme pursuit of thinness (Garner, Olmsted, & Polivy, 1983). It also reflects both an infatuated wish to lose weight as well as a fear of weight gain. The bulimia subscale indicates the tendency towards episodes of uncontrollable overeating (bingeing) and may be followed by the impulse to engage in self-induced vomiting. The presence or absence of bulimia differentiates subtypes of anorexia nervosa and has been described in women with no prior history of anorexia nervosa (Garner, Olmsted, & Polivy, 1983). Finally, body dissatisfaction reflects the belief that specific parts of the body associated with shape change or increased “fatness” at puberty are too large (e.g. hips, thighs, buttocks) (Garner, Olmsted, & Polivy, 1983). These subscales were used because they measure behavioral and symptomatic patterns of anorexia nervosa or bulimia (Eberly & Eberly, 1985), which relate to body image concerns. The standardized subscales evaluate the
behaviors and attitudes about eating and weight as well as more general constructs and traits relevant to eating disorders.

The participants answered the statements as “always”, “often”, “sometimes”, “rarely”, or “never”. “The most extreme or anorectic response (“always” or “never”), depending on the keyed direction, earned a score of “3”, the immediately adjacent response “2”, the next response “1”, and the final three responses choices received no score (Garner & Olmstead, 1984). Scores from the modified Eating Disorder Inventory had a possible range from 0 to 69; a greater score indicates a greater risk of disordered eating. A cutoff score of ≥15 on a subscale puts an individual at risk for an eating disorder (Garner & Olmstead, 1984).

The EDI has been used extensively in research and clinical settings. Internal consistency (Cronbach’s alpha) of the EDI was .80 and the average item-total correlation was .63 indicating substantial within-scale common variance among items (Garner & Olmstead, 1984), showing high internal consistency. Criterion-related validity was established by comparing the self-report EDI patient profiles with the clinical judgments of experienced clinicians who were already familiar with the patient’s psychological presentation (Garner & Olmstead, 1984). Test-retest reliability and discriminant validity have also been demonstrated (Garner, Olmsted, & Polivy, 1983).

Shore and Porter (1990) examined a subscale performance of a normative sample of 619 boys and girls ages 11 to 18 year of age from Ontario, Canada. With the exception of the Bulimia scale, the EDI scales demonstrated high internal consistency using Cronbach’s alpha coefficients for the male (Drive for Thinness $\alpha = 0.73$; Body Dissatisfaction $\alpha = 0.86$; Bulimia $\alpha = 0.63$) and female sample (Drive for Thinness $\alpha = 0.81$; Body Dissatisfaction $\alpha = 0.91$; Bulimia $\alpha = 0.69$) (Shore & Porter, 1990).
Therefore, the analyses of the internal consistency of the EDI subscale Bulimia failed to demonstrate adequate reliability for either boys or girls. These results are consistent with the epidemiological finding of girls' higher vulnerability to eating disorders and also indicate the necessity of using separate norms for boys and girls (Shore & Porter, 1990). As well, due to the significant age-group effects among the females on the Body Dissatisfaction scale separate norms should be used for females aged 11-13 and females aged 14-18 years of age (Shore & Porter, 1990).

The lower reliability of the Bulimia scale is consistent with the limited relevance of this scale for this age group (Shore & Porter, 1990). Bulimia does not usually appear until the late teens or early twenties (Garner & Olmstead, 1984). The higher Drive for Thinness scores for girls than for boys, even prior to puberty, tends to corroborate the powerful impact of the sociocultural pressures on women to be thin (Garner & Olmstead, 1984).

Raciti and Norcross (1987) identified women at high risk for a clinically significant disorder using two different instruments, the Eating disorder Inventory and the Eating Attitudes Test. Cross-classification analyses indicated 90% agreement between the total EAT scores and the EDI Drive for Thinness subscale. Both instruments demonstrated acceptable levels of internal consistency and intercorrelations. Cronbach’s alpha coefficients for the scales ranged from \( \alpha = 0.79 \) to \( \alpha = 0.93 \), reflecting adequate internal consistency.

### 2.4 Analyses

Descriptive Statistics were calculated for all measures. Pearson product-moment correlations were calculated to determine the relationships between variables. The
assumptions for correlations are as follows: interval level data, linearity (plot the relationship between the variables with a scattergram or fit the functional curve formed by the relationship to be sure of linearity), bivariate normality, homoscedasticity or equal variances: truncated variances can attenuate the relationship, independence of observations, and representative sampling (Vincent, 1999).

Z-scores were calculated for all anthropometric measures in order to standardize raw height, weight, and body mass index scores of each participant by comparing them to reference standards. In order to convert the body mass index scores to z-scores, the equation created by Cole, Freeman, and Preece (1995) was used. The charts were derived using Cole's LMS method. The LMS method summarizes the distribution of body mass index at each age by its median (M) and coefficients of variation (S), as well as by a measure of skewness based on the Box-Cox power (L) required to transform the data to normality (Cole, Freeman, & Preece, 1995). The LMS method adjusts the body mass index for skewness and allow body mass index in individual subjects to be expressed as an exact centile or z-score (Cole, Freeman, & Preece, 1995).

Independent t-tests were used to determine if there were significant differences between female and male gymnast's physical characteristics (age, height, weight, body mass index, and sum of skinfolds). Comparisons between female and male gymnast's social physique anxiety scores and subscales of the Eating Disorder Inventory were examined. The assumptions of t-tests are as follows: population is normally distributed, sample(s) is randomly selected, sample variances must be equal – homogeneity of variance (2 times too big), and interval or ratio data (Vincent, 1999).

Factorial ANOVA was used to examine differences between males and females and age categories for all anthropometric characteristics, social physique anxiety, and
subscales of the Eating Disorder Inventory. Maturity groups and gender were entered as the two main effects and maturity groups*gender as the interaction effect. A second factorial ANOVA was run with sum of skinfolds and gender as the two main effects and sum of skinfolds*gender as the interaction effect. The assumptions for Factorial ANOVA are the same as for simple ANOVA; the dependent variable is measured on interval or ratio scale, population is normally distributed (however, little effect if violated), variability in samples equal (little effect if violated), scores in all groups independent (Vincent, 1999). Violations of these assumptions are more critical if the sample size is small, or not equal. Assumptions for factorial ANOVA are also the same as for repeated measures ANOVA; homogeneity of variance – variance among the repeated measures is the same, and homogeneity of covariance – correlation among all the combinations of the repeated measures are the same (Vincent, 1999). A violation of the sphericity assumption results in an increase in Type I error probability.

A Chi-square analysis (two-way contingency table analysis using crosstabs) was used to determine the association between social physique anxiety and the risk for an eating disorder, and body image and the risk for an eating disorder. It was also used to determine the associated between age and body image dissatisfaction between genders and sum of skinfolds and body image dissatisfaction among genders. The subscales of the Eating disorder inventory were summed and divided into terciles (bottom 25th, 25th-75th, and top 25th). Sum of skinfolds and social physique anxiety were also divided into terciles (bottom 25th, 25th-75th, and top 25th), so the extremes could be examined. The Chi-square analysis follows the assumptions that the observations for a two-way contingency table are independent of each other and the two-way contingency table
analysis yield a test statistic that is approximately distributed as a chi-square when the sample size is relatively large (Vincent, 1999).

The alpha level of significance for all statistical tests was set at the 95% confidence level ($p=0.05$). SPSS (version 11.5) statistical package was used to analyze the data.
3 RESULTS

3.1 Growth characteristics

Height and weight of individuals are shown in figure 3.1 and 3.2. The graphs show individual data points plotted on growth reference centiles (10th, 25th, 50th, 75th, and 90th) (CDC 2000). These graphical comparisons indicate that of the 71 female gymnasts, 46 (64.8%) were below the 50th percentile for height and 25 (35.2%) were above the 50th percentile, of the 42 male gymnasts, 26 (61.9%) were below the 50th percentile for height and 16 (38.1%) were above the 50th percentile. Of the 72 female gymnasts, 51 (70.8%) were below the 50th percentile for weight and 21 (29.2%) were above the 50th percentile, and of the 42 male gymnasts, 23 (54.8%) were below the 50th percentile for weight and 19 (45.2%) were above the 50th percentile. The average age specific z-score for height in females was \(-0.20 \pm 0.51\) and was significantly different from 0 (p < 0.05), indicating as a group they were smaller than average for their age. The average z-score for height in males was \(-0.13 \pm 0.50\) and was not significantly different from 0 (p > 0.05), indicating as a group they were no different than the average for their age. The average z-score for weight in females was \(-0.26 \pm 0.53\) and was significantly different from 0 (p < 0.05), indicating as a group they were lighter than average for their age. The average z-score for height in males was \(-0.11 \pm 0.48\) and was not significantly different from 0 (p > 0.05), indicating as a group they were no different than the average for their age.
Figure 3.1 Female and male gymnasts heights compared against population percentiles (CDC) (10th, 25th, 50th, 75th, 90th).

Figure 3.2 Female and male gymnasts weights compared against population percentiles (CDC) (10th, 25th, 50th, 75th, 90th).
Figure 3.3 describes the development of body mass index within individuals using Cole (1995) reference standards (9th, 25th, 50th, 75th, and 91st). The graphical comparisons indicate that of the 71 female gymnasts, 43 (60.6%) were below the 50th percentile for body mass index and 28 (39.4%) above the 50th percentile, and of the 42 male gymnasts, 16 (38.1%) were below the 50th percentile for height and 26 (61.9%) were above the 50th percentile. The average age specific z-score for body mass index in females was -0.26 ± 0.73 and in males was 0.28 ± 0.84 and both were significantly different from 0 (p < 0.05), indicating as a group females had a lower body mass index than average for their age and males on average had higher body mass index for their age.
Figure 3.3 Female and male gymnasts body mass indexes compared against population percentiles (Cole, 1995) (9th, 25th, 50th, 75th, 91st).
3.2 Descriptive statistics

Table 3.1 shows the descriptive statistics for physical characteristics of female and male gymnasts. Comparisons between the groups using independent t-tests indicated that there were significant differences between female and male gymnast’s chronological age, height, weight, and body mass index ($p < 0.05$), but there was no significant difference between sum of skinfolds between female and male gymnasts ($p > 0.05$).

The age group distributions are shown in table 3.2 and indicate the frequency of chronological age among genders. It indicates although there was a large age range, the majority were between 7 and 12 years of age.

Table 3.3 shows the average body dissatisfaction, social physique anxiety scores, and eating disorder inventory results between female and male gymnasts. Comparisons between the groups indicated that there was a significant difference between female and male gymnast’s drive for thinness ($p < 0.05$), but there were no significant differences between social physique anxiety, bulimia, and body dissatisfaction between female and male gymnasts ($p > 0.05$).
Table 3.1 Physical characteristics (X ± SD) of youth female and male gymnasts

<table>
<thead>
<tr>
<th>Physical Characteristics:</th>
<th>Female (n = 74)</th>
<th>Male (n = 42)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>10.4 ± 2.3*</td>
<td>11.7 ± 3.1</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>138.3 ± 14.3*</td>
<td>145.3 ± 16.5</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>32.6 ± 9.4*</td>
<td>38.9 ± 13.5</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>16.6 ± 1.8*</td>
<td>17.9 ± 2.5</td>
</tr>
<tr>
<td>S of S (mm)¹</td>
<td>70.9 ± 22.4</td>
<td>67.5 ± 21.2</td>
</tr>
</tbody>
</table>

1. S of S = sum of skinfolds
   Males - 9 skinfolds (sum of triceps, subscapular, pectoral, biceps, iliac crest, supraspinale, abdominal, front thigh, and medial calf)
   Females – 8 skinfolds (same as males except Pectoral skinfold)

* p < 0.05
Table 3.2 Frequency of chronological age of female and male gymnasts

<table>
<thead>
<tr>
<th>Age (n)</th>
<th>Female (n=74)</th>
<th>Male (n=42)</th>
<th>Total (n=116)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>7.0</td>
<td>9</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>8.0</td>
<td>14</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>9.0</td>
<td>10</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>10.0</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>11.0</td>
<td>13</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>12.0</td>
<td>10</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>13.0</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>14.0</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>15.0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>16.0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>17.0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>18.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>19.0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 3.3 Body image, SPA, and EDI responses (X ± SD) of female and male gymnasts

<table>
<thead>
<tr>
<th>Questionnaire Responses:</th>
<th>Female (n = 74)</th>
<th>Male (n = 42)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIQ¹</td>
<td>45.9%</td>
<td>35.7%</td>
</tr>
<tr>
<td>SPA²</td>
<td>19.8 ± 5.8</td>
<td>17.9 ± 5.4</td>
</tr>
<tr>
<td>Dissatisfaction³</td>
<td>2.4 ± 3.2</td>
<td>1.9 ± 2.9</td>
</tr>
<tr>
<td>Thinness⁴</td>
<td>4.3 ± 3.3*</td>
<td>2.9 ± 2.6</td>
</tr>
<tr>
<td>Bulimia⁵</td>
<td>0.7 ± 1.3</td>
<td>1.1 ± 3.4</td>
</tr>
</tbody>
</table>

1. BIQ = gymnasts who were dissatisfied with their body shape (%)
2. SPA = social physique anxiety (scores range from 9 to 45)
3. Dissatisfaction = Body Dissatisfaction - Eating disorder inventory subscale (score of ≥15 = at risk)
4. Thinness = Drive for Thinness - Eating disorder inventory subscale (score of ≥15 = at risk)
5. Bulimia = Bulimia - Eating disorder inventory subscale (score of ≥15 = at risk)

* p < 0.05
3.3 Correlations

Table 3.4 and 3.5 show correlations matrix. These tables indicate that in females there were significant weak positive correlations (p < 0.05) between age and social physique anxiety (r = .50), age and body dissatisfaction (r = .55), age and body mass index (r = .58), social physique anxiety and body dissatisfaction (r = .60), and sum of skinfolds and body mass index (r = .60). In males there were significant correlations (p < 0.05) between age and social physique anxiety (r = -.51), age and body mass index (r = .66), and sum of skinfolds and body mass index (r = .62). These results show that there is a relationship between these variables in female and male gymnasts and that results are similar between genders apart from social physique anxiety, whereas girl’s social physique anxiety increases with increasing age, boy’s social physique anxiety decreases.
Table 3.5 Correlation matrix of criterion and predictor variables for male gymnasts

<table>
<thead>
<tr>
<th>Male</th>
<th>Age</th>
<th>SPA</th>
<th>DIS</th>
<th>THIN</th>
<th>BUL</th>
<th>S of S</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPA</td>
<td>-0.508*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIS</td>
<td>-0.293</td>
<td>0.269</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>THIN</td>
<td>-0.361*</td>
<td>0.288</td>
<td>0.243</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUL</td>
<td>-0.117</td>
<td>0.059</td>
<td>0.147</td>
<td>-0.038</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S of S</td>
<td>0.207</td>
<td>0.033</td>
<td>-0.058</td>
<td>0.102</td>
<td>-0.015</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>0.664*</td>
<td>-0.329*</td>
<td>-0.180</td>
<td>0.035</td>
<td>-0.242</td>
<td>0.620*</td>
<td>1.00</td>
</tr>
</tbody>
</table>

1. SPA = social physique anxiety
2. DIS = Body Dissatisfaction
3. THIN = Drive for Thinness
4. BUL = Bulimia
5. S of S = Sum of Skinfolds (sum of triceps, subscapular, pectoral, biceps, iliac crest, supraspinale, abdominal, front thigh, and medial calf)
6. BMI = Body mass index

* p < 0.05
Table 3.4 Correlation matrix of criterion and predictor variables for female gymnasts

<table>
<thead>
<tr>
<th>Female</th>
<th>Age</th>
<th>SPA</th>
<th>DIS</th>
<th>THIN</th>
<th>BUL</th>
<th>S of S</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPA</td>
<td>0.500*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIS</td>
<td>0.551*</td>
<td>0.597*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>THIN</td>
<td>0.188</td>
<td>0.383*</td>
<td>0.393*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUL</td>
<td>-0.77</td>
<td>-0.023</td>
<td>0.209</td>
<td>0.138</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S of S</td>
<td>0.365*</td>
<td>0.428*</td>
<td>0.446*</td>
<td>0.422*</td>
<td>-0.052</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>0.578*</td>
<td>0.485*</td>
<td>0.447*</td>
<td>0.316*</td>
<td>-0.105</td>
<td>0.604*</td>
<td>1.00</td>
</tr>
</tbody>
</table>

1. SPA = social physique anxiety
2. DIS = Body Dissatisfaction – Eating disorder inventory subscale
3. THIN = Drive for Thinness – Eating disorder inventory subscale
4. BUL = Bulimia – Eating disorder inventory subscale
5. S of S = Sum of Skinfolds (sum of triceps, subscapular, biceps, iliac crest, supraspinale, abdominal, front thigh, and medial calf)
6. BMI = Body mass index

* p < 0.05
3.4 Maturity status

Due to the large age range and age groups distribution, a secondary analysis was carried out (see method section 2.3.1.2) by dividing the groups into three age related maturity groups (prepubescent, pubescent, and post pubescent). Table 3.6 shows the means for physical characteristics of female and male gymnasts by maturity groups.

Two-way ANOVA found no significant interaction for height between sex and maturity groups $F(1,109)=2.081, p>0.05$. When the main effects were examined no significant gender difference was found $F(2,109)=120.193, p>0.05$, but there was a significant difference among the maturity groups $F(2,109)=.967, p<0.05$. Post hoc analysis revealed that height increased with increasing maturity ($p<0.05$).

There was no significant interaction for weight between sex and maturity groups $F(1,110)=6.952, p>0.05$. The main effects were examined; when gender difference is ignored there was a significant difference among maturity groups $F(2,110)=124.237, p<0.05$. When maturity group is ignored, a significant difference among genders $F(2,110)=1.571, p<0.05$ is observed. Post hoc analysis revealed that all three maturity groups were significantly different ($p<0.05$), showing that female and male gymnasts are exhibiting gender differences for body weight.

There was no significant interaction for body mass index between sex and maturity and groups $F(1,109)=4.973, p>0.05$. When the main effects were examined no significant gender difference was found $F(2,109)=30.141, p<0.05$. And a significant difference among the maturity groups $F(2,109)=.628, p<0.05$ was found. Post hoc analysis revealed that all three maturity groups were significantly different ($p<0.05$).
There was no significant interaction for sum of skinfolds between sex and maturity groups $F(1,110)=2.014, p>0.05$. When the main effects were examined no significant difference was found for genders $F(2,110)=4.737, p>0.05$, but there was a significant difference among maturity groups $F(2,110)=.87, p<0.05$. This indicates that there was no significant difference between sum of skinfolds between female and male gymnasts.

Table 3.7 shows the average body dissatisfaction, social physique anxiety and eating disorder inventory results of female and male gymnasts by maturity group.

It was found that there was a significant interaction between sex and maturity groups $F(1,110)=15.411, p<0.05$ for social physique anxiety (table 3.7). This indicates that social physique anxiety is significantly different between maturity groups, and that genders show different patterns of social physique anxiety with maturity.

There was also a significant interaction between sex and maturity groups $F(1,110)=3.797, p<0.05$ for drive for thinness (table 3.7). This indicates that drive for thinness is significantly different between maturity groups, and that genders show different patterns of drive for thinness with maturity status.

There was no significant interaction between sex and maturity groups $F(1,110)=.654, p>0.05$ for bulimia (table 3.7). The main effects were examined; there was no significant difference among genders $F(2,110)=.748, p>0.05$, and no significant difference among maturity groups $F(2,110)=.139, p>0.05$. This indicates that there is no different for bulimia between maturity groups or genders.

There was a significant interaction between sex and maturity groups $F(1,110)=10.564, p<0.05$ for body dissatisfaction (table 3.7). This indicates that body
dissatisfaction is significantly different between maturity groups, and that genders show
different patterns for body dissatisfaction with maturity.
Table 3.6 Physical characteristics (X ± SD) of youth female and male gymnasts

<table>
<thead>
<tr>
<th>Group – Female</th>
<th>6-9 yr</th>
<th>10-13 yr</th>
<th>14 plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>8.4 ± 0.8</td>
<td>11.8 ± 0.9</td>
<td>14.9 ± 0.8</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>126.6 ± 7.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>146.9 ± 7.4&lt;sup&gt;a&lt;/sup&gt;</td>
<td>163.6 ± 5.9&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>26.0 ± 4.4&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>36.7 ± 6.0&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>52.6 ± 4.8&lt;sup&gt;a,b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Body mass index (kg/m&lt;sup&gt;2&lt;/sup&gt;)</td>
<td>15.9 ± 1.5&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>16.9 ± 1.7&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>19.6 ± 1.1&lt;sup&gt;a,b&lt;/sup&gt;</td>
</tr>
<tr>
<td>S of S (mm)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>65.2 ± 15.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>75.0 ± 28.8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>85.6 ± 11.9&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group – Male</th>
<th>6-9 yr</th>
<th>10-14 yr</th>
<th>15 plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>8.5 ± 0.9</td>
<td>11.8 ± 1.1</td>
<td>16.8 ± 1.2</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>130.2 ± 9.6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>146.4 ± 10.6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>168.8 ± 5.7&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>27.9 ± 4.3&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>38.0 ± 9.2&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>60.3 ± 6.7&lt;sup&gt;a,b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Body mass index (kg/m&lt;sup&gt;2&lt;/sup&gt;)</td>
<td>16.4 ± 1.5&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>17.5 ± 2.4&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>21.1 ± 1.8&lt;sup&gt;a,b&lt;/sup&gt;</td>
</tr>
<tr>
<td>S of S (mm)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>59.1 ± 17.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>70.3 ± 21.3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>75.4 ± 25.0&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

1. S of S = sum of skinfolds
   - Males - 9 skinfolds (sum of triceps, subscapular, pectoral, biceps, iliac crest, supraspinale, abdominal, front thigh, and medial calf)
   - Females – 8 skinfolds (same as males except Pectoral skinfold)

<sup>a</sup>. The sex difference is significant at the 0.05 level.
<sup>b</sup>. The age difference is significant at the 0.05 level.
Table 3.7 Body dissatisfaction, SPA, and EDI responses (X ± SD) of youth female and male gymnasts

<table>
<thead>
<tr>
<th>Group – Female</th>
<th>6-9 yr (n = 35)</th>
<th>10-13 yr (n = 31)</th>
<th>14 plus (n = 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire Responses:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIQ(^1)</td>
<td>40.5%</td>
<td>45.2%</td>
<td>66.7%</td>
</tr>
<tr>
<td>SPA(^2)</td>
<td>24.1 ± 6.4</td>
<td>28.8 ± 7.2</td>
<td>36.5 ± 5.7</td>
</tr>
<tr>
<td>Dissatisfaction(^3)</td>
<td>1.3 ± 1.7</td>
<td>2.9 ± 3.4</td>
<td>7.3 ± 4.4</td>
</tr>
<tr>
<td>Thinness(^4)</td>
<td>4.0 ± 3.1</td>
<td>4.2 ± 3.2</td>
<td>6.7 ± 1.8</td>
</tr>
<tr>
<td>Bulimia(^5)</td>
<td>1.0 ± 1.5</td>
<td>0.3 ± 0.6</td>
<td>0.8 ± 1.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group – Male</th>
<th>6-9 yr (n = 14)</th>
<th>10-14 yr (n = 20)</th>
<th>15 plus (n = 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire Responses:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIQ(^1)</td>
<td>42.9%</td>
<td>40.0%</td>
<td>12.5%</td>
</tr>
<tr>
<td>SPA(^2)</td>
<td>31.3 ± 5.7</td>
<td>24.4 ± 6.5</td>
<td>20.1 ± 4.9</td>
</tr>
<tr>
<td>Dissatisfaction(^3)</td>
<td>2.9 ± 3.6</td>
<td>1.6 ± 2.6</td>
<td>1.0 ± 1.6</td>
</tr>
<tr>
<td>Thinness(^4)</td>
<td>4.4 ± 2.7</td>
<td>2.2 ± 1.7</td>
<td>2.1 ± 3.3</td>
</tr>
<tr>
<td>Bulimia(^5)</td>
<td>0.9 ± 2.4</td>
<td>1.8 ± 4.4</td>
<td>0.1 ± 0.4</td>
</tr>
</tbody>
</table>

1. BIQ = gymnasts who were dissatisfied with their body shape (%)
2. SPA = social physique anxiety (scores range from 9 to 45)
3. Dissatisfaction = Body Dissatisfaction - Eating disorder inventory subscale (score of ≥15 = at risk)
4. Thinness = Drive for Thinness - Eating disorder inventory subscale (score of ≥15 = at risk)
5. Bulimia = Bulimia - Eating disorder inventory subscale (score of ≥15 = at risk)
3.5 **Body composition**

Table 3.8 shows the average body dissatisfaction, social physique anxiety, and eating disorder inventory results of female and male gymnasts by sum of skinfolds (bottom 25th percent, 25th to 75th percent, and top 25th percent). It was found that there was a significant interaction between sex and sum of skinfolds $F(2,110)=192.301, p<0.05$ for social physique anxiety. This indicates that social physique anxiety is different between sum of skinfolds, and that genders show different patterns of social physique anxiety with sum of skinfolds.
Table 3.8 Body dissatisfaction, SPA, and EDI responses (X ± SD) of youth female and male gymnasts by sum of skinfolds

<table>
<thead>
<tr>
<th>Group – Female</th>
<th>Low¹</th>
<th>Average²</th>
<th>High³</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 16)</td>
<td>(n = 39)</td>
<td>(n = 18)</td>
</tr>
<tr>
<td>Questionnaire Responses:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIQ⁴</td>
<td>9.5%</td>
<td>21.6%</td>
<td>13.5%</td>
</tr>
<tr>
<td>SPA⁵</td>
<td>16.94 ± 4.6</td>
<td>20.0 ± 5.5</td>
<td>22.0 ± 6.8</td>
</tr>
<tr>
<td>Dissatisfaction⁶</td>
<td>1.00 ± 1.2</td>
<td>2.5 ± 3.6</td>
<td>3.6 ± 3.1</td>
</tr>
<tr>
<td>Thinness⁷</td>
<td>3.81 ± 2.1</td>
<td>3.7 ± 2.9</td>
<td>5.9 ± 4.4</td>
</tr>
<tr>
<td>Bulimia⁸</td>
<td>1.5 ± 1.8</td>
<td>0.4 ± 1.0</td>
<td>0.5 ± 0.7</td>
</tr>
<tr>
<td>Group – Male</td>
<td>Low¹</td>
<td>Average²</td>
<td>High³</td>
</tr>
<tr>
<td></td>
<td>(n = 13)</td>
<td>(n = 19)</td>
<td>(n = 10)</td>
</tr>
<tr>
<td>Questionnaire Responses:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIQ⁴</td>
<td>14.3%</td>
<td>7.1%</td>
<td>14.3%</td>
</tr>
<tr>
<td>SPA⁵</td>
<td>19.5 ± 5.3</td>
<td>16.4 ± 4.4</td>
<td>18.6 ± 6.9</td>
</tr>
<tr>
<td>Dissatisfaction⁶</td>
<td>1.0 ± 1.4</td>
<td>2.8 ± 3.8</td>
<td>1.3 ± 1.7</td>
</tr>
<tr>
<td>Thinness⁷</td>
<td>2.9 ± 2.7</td>
<td>2.7 ± 2.6</td>
<td>3.3 ± 2.6</td>
</tr>
<tr>
<td>Bulimia⁸</td>
<td>0.9 ± 2.4</td>
<td>1.7 ± 4.5</td>
<td>0.4 ± 1.3</td>
</tr>
</tbody>
</table>

1. Sum of skinfolds – bottom 25th percent
2. Sum of skinfolds – 25th to 75th percent
3. Sum of skinfolds – top 25th percent
4. BIQ = gymnasts who were dissatisfied with their body shape (%)
5. SPA = social physique anxiety (scores range from 9 to 45)
6. Dissatisfaction = Body Dissatisfaction - Eating disorder inventory subscale (score of ≥15 = at risk)
7. Thinness = Drive for Thinness - Eating disorder inventory subscale (score of ≥15 = at risk)
8. Bulimia = Bulimia - Eating disorder inventory subscale (score of ≥15 = at risk)
3.6 **Chi² analyses**

Chi² analysis was used to examine if there was an association between body image dissatisfaction (BIQ) and maturity groups (prepubescent, pubescent, and post pubescent) between genders. The Pearson Chi-square ($\chi^2 = 1.433; \chi^2 = 2.349$) was not significant ($p > 0.05$). This indicates that there was no association between body image dissatisfaction and maturity groups among genders.

Tables 3.9 and 3.10 show the percentage of individuals with a social physique anxiety in the bottom 25th percentile and top 25th percentile and a risk for developing an eating disorder in the bottom 25th percentile and top 25th percentile for each gender. Among both female and male gymnasts, the Pearson Chi-square ($\chi^2 = 7.123$) was not significant ($p > 0.05$). This indicates that there was no association between social physique anxiety and risk of developing an eating disorder in either female or male gymnasts.

Table 3.11 and 3.12 show the percentage of individuals with body image dissatisfaction and a risk for an eating disorder in the bottom 25th percentile and top 25th percentile for each outcome by gender. Among the female gymnasts, the Pearson Chi-square ($\chi^2 = 16.290$) was significant ($p < 0.05$), which indicates that there was an association between body image dissatisfaction and risk of developing an eating disorder among female gymnasts. Whereas, among male gymnasts, the Pearson Chi-square ($\chi^2 = 1.493$) was not significant ($p > 0.05$), indicating that there was no association between body image dissatisfaction and risk of developing an eating disorder among males.

Table 3.13 and 3.14 show the percentage of individuals with a sum of skinfolds in the bottom 25th percentile and top 25th percentile and body image dissatisfaction for each
gender. Among the female gymnasts, the Pearson Chi-square ($\chi^2 = .702$) was not significant ($p > 0.05$), indicating that there was no association between sum of skinfolds and body image dissatisfaction in female gymnasts. Whereas, in male gymnasts, the Pearson Chi-square ($\chi^2 = 6.471$) was significant ($p < 0.05$), indicating that there was an association between sum of skinfolds and body image dissatisfaction among male gymnasts.
Table 3.9 Social physique anxiety and risk for disordered eating among female gymnasts.

<table>
<thead>
<tr>
<th>EDI</th>
<th>Social Physique Anxiety</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Top 25(^{th}) percent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top 25th percent</td>
<td>18.9%</td>
<td>2.7%</td>
<td></td>
</tr>
<tr>
<td>Bottom 25th percent</td>
<td>5.4%</td>
<td>4.1%</td>
<td></td>
</tr>
</tbody>
</table>
Table 3.10 Social physique anxiety and risk for disordered eating among male gymnasts.

<table>
<thead>
<tr>
<th>EDI</th>
<th>Social Physique Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Top 25\text{th} percent</td>
</tr>
<tr>
<td>Top 25\text{th} percent</td>
<td>7.10%</td>
</tr>
<tr>
<td>Bottom 25\text{th} percent</td>
<td>0%</td>
</tr>
</tbody>
</table>
Table 3.11 Body image dissatisfaction and risk for disordered eating among female gymnasts.

<table>
<thead>
<tr>
<th>EDI</th>
<th>Body Dissatisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dissatisfied</td>
</tr>
<tr>
<td>Top 25th percent</td>
<td>24.3%</td>
</tr>
<tr>
<td>Bottom 25th percent</td>
<td>1.4%</td>
</tr>
</tbody>
</table>
Table 3.12 Body image dissatisfaction and risk for disordered eating among male gymnasts.

<table>
<thead>
<tr>
<th>EDI</th>
<th>Body Dissatisfaction</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dissatisfied</td>
<td>Satisfied</td>
</tr>
<tr>
<td>Top 25th percent</td>
<td>11.9%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Bottom 25th percent</td>
<td>7.1%</td>
<td>21.4%</td>
</tr>
</tbody>
</table>
Table 3.13 Sum of skinfolds and body image dissatisfaction in female gymnasts

<table>
<thead>
<tr>
<th>Sum of Skinfolds</th>
<th>Body Dissatisfaction</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dissatisfied</td>
<td>Satisfied</td>
</tr>
<tr>
<td>Top 25th percent</td>
<td>13.50%</td>
<td>12.20%</td>
</tr>
<tr>
<td>Bottom 25th percent</td>
<td>9.50%</td>
<td>12.20%</td>
</tr>
</tbody>
</table>
Table 3.14 Sum of skinfolds and body image dissatisfaction in male gymnasts.

<table>
<thead>
<tr>
<th>Sum of Skinfolds</th>
<th>Body Dissatisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dissatisfied</td>
</tr>
<tr>
<td>Top 25th percent</td>
<td>14.3%</td>
</tr>
<tr>
<td>Bottom 25th percent</td>
<td>14.3%</td>
</tr>
</tbody>
</table>
4 DISCUSSION

4.1 Discussion

The primary purpose of the present investigation was to examine the relationship of body dissatisfaction and social physique anxiety to the risk of developing an eating disorder in youth female and male gymnasts as they grow and develop. It was found that there was an association between body image dissatisfaction and the risk for an eating disorder in females but not in males. No association was found between social physique anxiety and the risk for an eating disorder in either females or males. The second purpose was to investigate the relationship of age and body composition to body image dissatisfaction and social physique anxiety. When genders were banded into maturity groups, the results from the present study showed that there was no association between age and body image dissatisfaction in either females or males. It was found however that social physique anxiety increased with increasing age in females but decreased with increasing age in males. When genders were subdivided into sum of skinfold groups in females it was found that those in the top 25th percentile had experienced higher social physique anxiety scores. In contrast, males in the 25th percentile for sum of skinfolds did not differ in term of social physique anxiety scores. Finally, in females there was no association between sum of skinfolds and body image dissatisfaction, but in males there was an association.
Before discussing the main issues talked about above we need to first discuss the physical characteristics of the gymnasts in the present study, since their differences become apparent during the transition from childhood to adolescence. On average female gymnasts tend to be smaller and lighter than other females throughout childhood and adolescence (Malina, 1994), suggesting a genetic predisposition for short girls to excel in gymnastics (Nickols-Richardson, 1999). The smaller size of elite female gymnasts is evident long before any systematic training starts (Baxter-Jones & Maffulli, 2002), reflecting a selection of girls with smaller than average physiques into the sport of gymnastics.

Female gymnasts are characterized by short stature, light body mass, narrow hips with relatively broad shoulders, a low percentage of body fat with a high fat-free mass, and later maturation when compared to reference females of the same age (Malina, 1997). Male gymnasts also have a low percentage of body fat, but also need an incredible amount of upper body strength in order to be competitive on their events (Cogan & Vidmar, 2000). Thus with male gymnasts the emphasis is more on muscular strength as opposed to thinness, observed in females.

The results of the present study are in accord with those of Malina (1997). I found that the female gymnasts were smaller and lighter than average for their age. When compared to reference standards I found 64.8 % below the 50th percentile for height and 70.8 % below the 50th percentile for weight. In contrast no differences were found between male gymnasts and age matched reference standards. These findings were consistent with previous findings (Baxter-Jones & Maffulli, 2002; Baxter-Jones et al., 2003; Claessens et al., 1991; Bernardot & Czerwinski, 1991; Claessens et al., 1992; Gurd
& Klentrou, 2003; Malina, 1997), which state that female gymnasts are smaller in height and weight dimensions when compared to references standards for their age, and that male gymnasts show no difference between the means of height and weight when compared to reference data.

The average age-specific z-scores for body mass index in females and males indicated that as a group, females had a lower body mass index than average for their age (60.6% were below the 50th percentile) and males on average had a higher body mass index for age (38.1% were below the 50th percentile). The present findings contradict the findings by Bernardot and Czerwinski (1991) for body mass index in female gymnasts. Bernardot and Czerwinski (1991) found that female junior elite gymnasts (7 to 14 years of age) were small but well proportioned; their average height and weight placed them in the 26th percentile when compared to reference standards for their age, and that they had body mass index in the 50th percentile. Although reference standards detected differences in absolute values for body mass index, their results showed a mean body mass index for the female gymnasts was 16.53 (SD = 1.42), which was similar to the mean body mass index 16.6 (SD = 1.8) for the female gymnasts in the present study. Bernardot and Czerwinski (1991) demonstrated that as the gymnasts grew older, they became progressively smaller in weight and height for age but were highly muscled for size.

Though body mass index was an anthropometric measure taken for the present study, associations between the body mass index and components of body composition in several samples of children and adolescents indicate a wide range of variability (Malina et al., 2004). Individuals with the same body mass index will likely differ considerably in percent body fat and total-body fat, which limits the use of body mass index as an
indicator of fatness in individuals. Body mass index is more of an indicator of heaviness and indirectly of body fat (Malina et al., 2004). Therefore, the gymnasts in the present study with a higher high body mass index are most likely not fat, because their increased muscle mass and other nonfat tissues may contribute to the increase in weight relative to stature. The adolescent growth spurt also affects the relationship between stature and weight. The growth spurt occurs, on the average, first in stature and then in weight, so the relationship between the measurements is altered. Short stature, low relative fatness, and high muscle mass characterize gymnasts of both sexes. This short stature and increased relative weight would produce a high body mass index, resulting in a false indication of body fatness.

In summary, the present study found that the female gymnasts were smaller and lighter than average, whereas no differences were found between male gymnasts and references. These finding are consistent with previous findings (Baxter-Jones & Maffulli, 2002; Baxter-Jones et al., 2003; Bernardot & Czerwinski, 1991; Claessens et al., 1991; Claessens et al., 1992; Gurd & Klentrou, 2003; Malina, 1997). The findings of the present study showed that female gymnasts had a lower body mass index than average and males on average higher body mass index for age. Bernardot and Czerwinski (1991) contradicted the present results, finding no differences between female gymnasts and reference standards.

4.2 Tests of hypothesis

4.2.1 Main hypothesis 1: Body image dissatisfaction and the risk for an eating disorder
It was hypothesized that body image dissatisfaction increases the risk for an eating disorder and that it would be more prevalent in females. The results from this investigation supported the hypothesis for females, but not for males.

An Eating Disorder Inventory total score of ≥ 45 (≥15 on each of the three subscales) puts an individual at risk for an eating disorder (Garner & Olmstead, 1984). It is important to note that none of the gymnasts in the present study, female or male, had a score greater or even near the cutoff of 45. As a result, only the extremes (bottom 25th and top 25th) of the eating disorder scores were examined.

The conclusions drawn for the present sample of female gymnasts agree with the findings of Cash and Pruzinksy (2002) who stated that body image dissatisfaction emerged as one of the most potent risk factors for the development and maintenance of eating disorders. Cash and Pruzinsky (2002) described the constructs of body image disturbances as the internalization of society’s body image ideal (thin-ideal internalization), negative subjective evaluations of one’s physical appearance (body dissatisfaction), and distorted perceptions of body image (body image distortions). Body image dissatisfaction is the most immediate or proximal antecedent to the development of disordered eating and is also the major predictor of relapse in eating disorder patients (Cash & Pruzinksy, 2002).

The present results for male gymnasts contradict previous findings stating that body dissatisfaction was related to disordered eating in males and binge eating in adolescent males (Keel, Fulkerson, & Leon, 1997; Leon, Fulkerson, Perry, & Early-Zald, 1995). In addition, Riccardelli and McCabe (2004) found similar risk factors associated with the development of disordered eating in adolescent males and females. The present
study contradicts this statement, showing that females and males differ in regards to body image dissatisfaction and the risk for an eating disorder.

Although, several explanations exist which could possibly explain why body image dissatisfaction was not associated with the risk for an eating disorder in male gymnasts. The first factor is that males at all ages, do not appear to be at the same level of risk for developing eating disorders as females at all ages (Riccardelli & McCabe, 2004). Although, prevalence studies indicate that athletes are at greater risk for developing eating disorders than are nonathletes of similar ages (Wiggins & Wiggins, 1997; Beals & Manore, 1994; Johnson, 1994; Sundgot-Borgen, 1994; Stoutjesdyk & Jevne, 1993), it is much more difficult to diagnose eating disorder or risk like behavior in males (Cash & Pruzinsky, 2002; Ricciardelli & McCabe, 2004; Stice, 2002). This is because there is a reluctance to admitting to having a “women’s problem”, as well as the diagnostic criteria for eating disorders are biased toward family-related characteristics (e.g., the menstruation criterion) and do not mention body shape (which is more of a concern for males than actual body weight) (Stice, 2002). Another possible explanation is many mistake male bingeing behavior for a hearty male appetite (supposedly typical “guy behavior”) or they dismiss a strict diet or thinness as a health nut (Stice, 2002).

4.2.2 Main hypothesis 2: Social physique anxiety and the risk for an eating disorder

It was hypothesized that a higher social physique anxiety score increases the risk for an eating disorder with a higher prevalence in females. The results did not support
this hypothesis. There was no association found between social physique anxiety and the risk of developing an eating disorder in either female or male gymnasts.

The results of the present study for male gymnasts are supported by the findings of a study by Haase and colleagues (2002) who found that social physique anxiety made no contribution to the prediction of disturbed eating attitudes. They speculated that males might address their social physique anxiety through other means (e.g. aggression or social withdrawal) than body weight regulation through food management practice. Or perhaps, these other mechanisms (aggression or social withdrawal) may allow male athletes to handle the anxiety experience when attempting to present the ‘perfect’ ideal physique image (Haase et al., 2002).

The findings of the present study for females are in opposition to most previous results. Haase and colleagues (2002) showed for female athletes that social physique anxiety made a unique and combined contribution to the prediction of disturbed eating attitudes. Specifically, females with higher social physique anxiety scores are more likely to exhibit disturbed eating attitudes. Haase and colleagues (2002) discussed two possible mechanisms to explain their findings. The first was that females with higher social physique anxiety may resort to disordered eating to cope with their inability to self-present their ‘perfect’ ideal physique image, since disordered eating tends to be a frequent coping mechanism for females. On the other hand, female athletes may engage in unhealthy pathological eating patterns in order to compensate for their inability to achieve the desired ‘perfect’ physique, yet suffer anxiety when unable to accomplish this (Haase et al., 2002).
In addition, Haase and colleagues (2002) stated that athletes represent a high-risk population for eating disordered behavior because it is assumed they are exposed to body shape and weight pressures unique to sport. There is an emphasis on obtaining an optimal weight for athletic performance, which represents a subculture that augments society's pressures to be thin (Haase et al., 2002). Therefore, social physique anxiety may be an additional individual difference factor in the development of disordered eating to consider in athletic populations.

The findings from Hausenblas and Mack (1999) and Reel and Gill (1996) also oppose the results from the present study. They showed positive relations between social physique anxiety and disordered eating among female divers and cheerleaders when compared to nonathletic populations. These discrepancies could result from various factors. Although divers and cheerleaders possess low levels of body fat, these athletes typically still have higher levels of body fat indices than competitive gymnasts. Second, Hausenblas and Mack (1999) and Reel and Gill (1996) examined female athletes and nonathletes during late adolescence, whereas, the present study examined youth gymnasts.

The results of the present study also contradict previous work that showed support for a mediational model in which scores on social physique anxiety are related to scores on eating disordered behaviors and these in turn are related to scores of eating disordered personality traits (Frederick & Morrison, 1998). Frederick and Morrison (1998) were able to show a relationship between eating disordered behaviors and scores on the social physique anxiety scale. In addition, social physique anxiety has been found to be the strongest predictor of body weight and shape concerns that place females at risk for
developing an eating disorder (Thompson & Chad, 2000, 2002). Krane and colleagues (2001) also indicated that subscales of the eating disorder inventory are related to the social physique anxiety in athletes.

Previous studies have demonstrated that the psychological construct of anxiety has been applied to the relationship between eating disorder behaviors and personality traits (Frederick & Morrison, 1998). As well, anxiety has been significantly correlated with eating disorders for both adolescent and adult women (Martz, Handley, & Eisler, 1995). Although these studies have demonstrated that anxiety is related to disordered eating, this general anxiety may affect eating disordered behavior differently than social physique anxiety. Therefore, this differentiation between anxiety and social physique anxiety could possibly explain why there was no association between social physique anxiety and the risk of developing an eating disorder in either female or male gymnasts. This finding opens the door to the exploration of different types anxiety and anxiety associated with social physique anxiety and their influence on disordered eating behaviors.

Since the gymnasts in the present study ranged from 6 to 19 years, age may have affected the outcome and explain the discrepancies. Since individuals are more vulnerable to eating disorders until the late teen or early twenties, this could explain why these gymnasts were not classified as at risk for an eating disorder.

Because the participants in the present study were examined using self-report measures of disordered eating behaviors, social physique anxiety, and body image dissatisfaction, researchers should be concerned with social desirability effects. It is well documented that individuals with disordered eating patterns carefully guard this secret
(Brownell, Rodin, & Wilmore, 1992; Wells, 1991). Even on an anonymous questionnaire, individuals may not reveal such behavior (Sundgot-Borgen, 1994) in fear that coaches, parents, or even peers may find out the results.

McNulty, Adams, Anderson, and Affenito (2001) stated some possible difficulties in determining whether athletes were at risk for developing an eating disorder. Diagnosis of eating pathology in the athlete is difficult due to their physical characteristics and strict training regimens. Certain attitudes and characteristic behaviors are accepted by many athletes and coaches and are not seen as problematic (i.e., dietary restraint and excessive exercise) (McNulty et al., 2001). It remains difficult to discriminate between those athletes who are training intensely from those who are restricting diet to improve performance by decreasing body weight (McNulty et al., 2001). Performance thinness is a term that refers to the belief that performance is enhanced through very low body fat percentage and low body weight (Johnson, Powers, & Dick, 1999). However, female athletes may be preoccupied with weight, but this preoccupation does not necessarily mean that they have an eating disorder (Garner, Rosen, & Barry, 1999). Future research in this area is not likely to advance the understanding of disordered eating and body image concerns unless qualitative research is used to gain a more insight into the complex issues of body satisfaction and eating behaviors in athletes.

4.2.3 Subhypothesis 1: Age and body image dissatisfaction

It was hypothesized that as age increases, body image dissatisfaction would become more prevalent in females and decrease with age in males. The results did not
support this hypothesis. To try and address this from a different angle age groups were condensed into maturity groups to take into account the various stages of maturation.

The results from the present study showed there was no association between body image dissatisfaction, age, and maturity among genders. The findings from the present study contradict most findings that body image dissatisfaction in children tends to increase with age and maturity (Davies & Furnham, 1986; Paxton, 1993; Roland, Farnill, & Griffiths, 1997; Smolak, 2002; Thompson & Chad, 2000, 2002). Tiggeman and Wilson-Barrett (1998) concluded that preoccupation for a thin body was as prevalent in 7 to 8 year olds as in older girls, aged 11 to 12 years, although preoccupation increased as girls became older. In addition, Davison and colleagues (2002) concluded that body image dissatisfaction in young girls participating in aesthetic sports is present as early as 5 to 7 years of age. In addition, they found that the girls aged 7 reported the highest body image dissatisfaction. Davison and colleagues (2002) support the conclusion that body image dissatisfaction becomes more prevalent with age, which disagrees with the finding in the present study.

One possible explanation for this finding is that gymnasts, through repeated exposure of their bodies in training and competition may become desensitized to body image concerns (Eklund & Crawford, 1994). Another possible explanation for this finding may be that those individuals dissatisfied with their body image may have selectively retired from competitive gymnastics because they lack the ideal physique (Hausenblas & Mack, 1999). Individuals who perceive that their physique represents a disadvantage to successful performance may retire from the sport before aspiring to elite levels of competition (Hausenblas & Mack, 1999). Those gymnasts who are satisfied
with their physiques perhaps have bodies that are genetically predisposed to be closer to ideal for gymnasts.

Previous work done looking the development of body image in children, adolescents, and puberty also disagrees with the results of the present study. Measures of body image concerns and dissatisfaction in children show little change until around the age of 10 or 11 years, with girls and boys exhibiting somewhat the same levels of body satisfaction and dissatisfaction (Fabian & Thompson, 1989). During adolescence, there is a shift of body image development. Puberty and adolescence is a major period of transition both physically and mentally in body image (Fabian & Thompson, 1989; Faust, 1987; Pearl, 1993). These normal biological process moves girls away from the dominant ideal body shape. Girls' development through the stages of puberty in early adolescence is associated with a more negative body image (Levine & Smolak, 2002).

Several factors could potentially explain the discrepancy in body image dissatisfaction and maturity groups in both genders. Since a crude measure of maturation was used, this could have the following consequences. Since, most gymnasts entering adolescence are classified as average or late maturers, with few early maturing girls, many of the participants may have been classified as pubescent or post-pubescent when actually not. Thus, these gymnasts may have a younger maturational age than average chronologically age-matched individuals.

There are a few studies that have examined body dissatisfaction among adolescent boys. The results suggest that boys are primarily satisfied with their bodies, with a substantial minority wanting a thinner body, and only a small proportion of them indicating that they wanted to be larger (McCabe & Ricciardelli, 2004). Whereas boys as
they mature, their bodies have a greater changes of developing toward the broadshouldered, tall, and muscular ideal. It has been found that during adolescence, males are more focused increasing muscle size and becoming bigger (McCabe & Ricciardelli, 2004). The findings from the present study contribute to the literature, showing that no association was found between body image dissatisfaction and maturity groups in either females or males.

4.2.4 Subhypothesis 2: Age and social physique anxiety

It was hypothesized that as age increases, the social physique anxiety scores would be higher in females but lower in males. When age was a continuous variable, the results supported the hypothesis. In females there was a positive significant correlation between social physique anxiety and age, indicating that social physique anxiety increases with age. In males there was a negative significant correlation between social physique anxiety and age, indicating that social physique anxiety decreases with age.

As mentioned earlier, due to the large age range the gymnasts could not be grouped together, and were grouped into three maturational categories (prepubescent, pubescent, and post pubescent) according to mean ages associated with reference standard for puberty. When age was a categorical variable, the results supported the hypothesis. Significant social physique anxiety differences were identified within female and male gymnasts across maturity groups. This indicates that social physique anxiety is significantly different between maturity groups, and that genders show different patterns of social physique anxiety.
The present findings confirm previous work that females consistently score significantly higher on the social physique anxiety scale, exhibit more social physique anxiety, and experience more negative thoughts about their body's appearance than males (Hart et al., 1989; McAuley et al., 1995; Haase et al., 2002; Thompson & Chad, 2000, 2002). Female athletes might pursue and struggle with bodily perfection issues to a greater extent than their male counterparts, and in turn experience more anxiety about their physique if they fail to meet their high and unrealistic standards (Haase et al., 2002).

McAuley and Burman (1993) examined social physique anxiety in adolescent (12 to 18 years) competitive female gymnasts, and demonstrated that older gymnasts had higher social physique anxiety than the younger gymnasts. McAuley and Burman (1993) concluded that the consequences of trying to compete against younger prepubescent gymnasts while one's body is going through developmental stages that make optimal self-presentation difficult and increases social physique anxiety in female gymnasts.

Puberty and adolescence is not only a major period of transition both physically and mentally, it also can either help or hinder a gymnastics career depending on gender (McAuley & Burman, 1993). As a female gymnasts start to go through the various hormonal and physical changes associated with adolescence when they are at the peak of their career, this may explain why age is positively correlated with social physique anxiety.

The successful male gymnast also has a low percentage of body fat, with more of an emphasis on muscular and upper body strength in order to be competitive on their events (Cogan & Vidmar, 2000). Male gymnasts become more successful on their events after the rapid increase of lean mass during puberty (Cogan & Vidmar, 2000). When
examining social physique anxiety in male gymnasts, the present results are the first in this area. Since, male gymnasts are not able to be physically competitive due to lack of upper body strength; it can be concluded that social physique anxiety is higher prior to puberty. As a male enters puberty there is a normal biological increase of FFM and decrease of FM, which is beneficial within the sport of gymnasts, social physique anxiety decreases. Therefore, this may explain why in male gymnasts age is negatively correlated with social physique anxiety.

4.2.5 Subhypothesis 3: Sum of skinfolds and social physique anxiety

It was hypothesized that as sum of skinfolds increases, the scores from the social physique anxiety scale would increase. When sum of skinfolds was a continuous variable, the results from this investigation supported the hypothesis for females, but not for males. In females there was a positive significant correlation between sum of skinfolds and social physique anxiety, indicating that females with a greater sum of skinfolds experienced higher social physique anxiety scores. In males, there was not a significant correlation between sum of skinfolds and social physique anxiety. This indicates that sum of skinfolds is not related to social physique anxiety scores in male gymnasts.

When sum of skinfolds was a categorical variable, again the results supported the hypothesis for females, but not for males. Significant social physique anxiety differences were identified within female and male gymnasts across sum of skinfold groups. This indicates that social physique anxiety is significantly different between sum of skinfold groups, and that genders show different patterns of social physique anxiety, with females
experiencing higher social physique anxiety with greater sum of skinfolds compared to males. This indicates that sum of skinfolds is not related to social physique anxiety scores in male gymnasts.

The results from the present study support earlier findings which state that social physique anxiety was related to body fat indices (Crawford & Eklund, 1994; Eklund & Crawford, 1994; Hart et al., 1989; Thompson & Chad, 2002). Malina and colleagues (2004) suggested that skinfold thicknesses are indicators of subcutaneous fat, the portion of fat that is located immediately beneath the skin. These researchers further suggested that skinfold measurements provide an assessment of subcutaneous fat in different areas of the body (Malina et al., 2004). Physical attributes, such as muscle development, body fat indices, or physical development may impact social physique anxiety in athletic populations (Martin et al., 1997). Negative perceptions and dissatisfaction with weight and body composition would be related to a higher social physique anxiety (Martin et al., 1997). Marshall and Harber (1996) also found that athletes with high social physique anxiety score had greater weight and body fat indices compared to athletes with low social physique anxiety.

Many young female do not positively regard the changes in their body composition at puberty (Thompson & Chad, 2002). In fact, the rapid physical changes experienced cause many young females to feel uncertain, insecure, and experience social physique anxiety.

Contrary to the present results, numerous studies found that body fat indices and sum of skinfolds were unrelated to social physique anxiety in athletes (Martin et al., 1997; Thompson, 1994). Although, Martin and colleagues (1997) acknowledged that the
athletes’ low mean body fat and low mean social physique anxiety scores may have limited their ability to detect a body fat and social physique anxiety relationship.

Because social physique anxiety and sum of skinfolds has never been previously examined in male gymnasts, it is difficult to compare these results to those of females. Since the males did have lower social physique anxiety scores and sum of skinfolds, it may have also limited the ability to detect a relationship.

4.2.6 Subhypothesis 4: Sum of skinfolds and body image dissatisfaction

It was hypothesized that as sum of skinfolds increases, the frequency of body image dissatisfaction would increase. The results from this investigation supported the hypothesis for males, but not for females. Among females, there was no association between sum of skinfolds and body image dissatisfaction. Whereas in males, there was an association between sum of skinfolds and body image dissatisfaction.

Those that have investigated body image dissatisfaction and sum of skinfolds have provided conflicting results. Previous research contradicts the findings from the present study, in that body fat was positively related to body dissatisfaction (Eklund & Crawford, 1994; Hart et al., 1989). It was also found that athletes who were dissatisfied with their body image had greater body fat indices than those athletes who were satisfied (Marshall & Harber, 1996). Thompson and Chad (2000) also found that females who were dissatisfied with their own physique had the highest body fat.

The discrepancies between the findings of the present study and the results from Thompson and Chad (2000) could be due to a few reasons. First, the present study examined competitive gymnasts and Thompson and Chad (2000) sampled young females.
with no mention of physical activity status. Second, the gymnasts in the present study possessed very low sum of skinfold values, much lower than the participants in the study conducted by Thompson and Chad (200). The gymnasts in the present study who had sum of skinfold values in the top 25th percentile were well below the females in the study by Thompson & Chad (2000) and the criteria for obesity classification in children. The extreme low levels of body fat in gymnasts could also explain the contractions between the present study and previous research.

Although an increase in body fat is a natural biological change, the effects of puberty and changing anthropometry that females experiences leads to negative changes in levels of body satisfaction (Thompson & Chad, 2000). In fact, females tend to be more dissatisfied with their weight, body composition, and physique with increasing maturity. In males puberty, which represents an increase in lean muscle and decrease in fat mass, helps men towards their pursuit of losing body fat and maintaining lean muscle mass. Due to the fact that males biologically have lower body fat, male gymnast may become more dissatisfied with their body image with increasing sum of skinfolds.

The present results of female gymnasts were consistent with findings that there was no relationship between body image dissatisfaction and sum of skinfolds. Thompson (1994) looked at young recreational female dancers (ages 7 to 16 years) and found that there was no relationship between body image dissatisfaction and sum of skinfolds. Since the participants were recreational dancers, it is questionable to compare these results to the present study of competitive female gymnasts.

Harris and Greco (1990) examined female competitive gymnasts (aged 17 to 23 years) and found that the gymnasts were extremely dissatisfied with their body image
despite having a low body mass and body fat when compared to national reference standards, which is consistent with the present findings. Therefore, the gymnasts were dissatisfied with their body image regardless of their percent body fat, showing no relationship between body fat indices and body image dissatisfaction.

Body image dissatisfaction in individuals with low body fat, could possibly be explained by the fact that females are more likely to be dissatisfied with their physique and judge themselves overweight (Furnham & Calnan, 1998). As well, Davison and colleagues (2002) also defined some potential explanations as to why there was no relationship between body image dissatisfaction and sum of skinfolds.

Females involved in competitive sports possess particular personal attributes that make them excellent competitors yet accentuate the risk for body image dissatisfaction (Wiggins & Wiggins, 1997). Specific personalities, such as obsessionality and perfectionsim, contribute to dissatisfaction with their own physique (Wiggins & Wiggins, 1997). In addition, the environment that a gymnasts is exposed to can also be detrimental to a healthy body image. Parental pressures, coaching style, public displays of skills, evaluation by others and themselves can lead to a dissatisfaction with one’s own body image and physique (Caine et al., 2003).

Future research is needed to further explain body dissatisfaction and body fat. Qualitative research may assist in understand the types and causes of the intense pressures and concerns these gymnasts are experiencing. A future examination of reasons why these gymnasts are dissatisfied with their body image is also necessary.

4.3 Limitations and recommendations
4.3.1 Limitations

Participants were examined using self-report measures of disordered eating behaviors, social physique anxiety, and body image dissatisfaction, therefore, researchers should be concerned with social desirability effects. It is well documented that individuals with disordered eating patterns carefully guard this secret, and even on an anonymous questionnaire, individuals may not reveal such behavior in fear that coaches, parents, or even peers may find out the results.

Since a crude measure of maturation was used, this could have the following consequences. Since, most gymnasts entering adolescence are classified as average or late maturers, with few early maturing girls, many of the participants may have been classified as pubescent or post-pubescent when actually not. Thus, these gymnasts may have a younger maturational age than average chronologically age-matched individuals. This could have resulted in participants being classified in the incorrect maturational group. In a study that compares genders, as the present study does, it is recommended that skeletal age or some form of somatic index be used as a measure of maturation.

The subjects in this study were predominately Caucasian. This lack of racial representation may have resulted in a sample population who may have a greater concern for physiques than would a completely random sample.

The sample was self-selected in that participants were all competitive gymnasts within the Saskatoon area. Competitive gymnasts, through repeated exposure of their bodies in training and competition may become desensitized to body image concerns. Those individuals dissatisfied with their body image may have selectively retired from competitive gymnastics because they lack the ideal physique leaving those gymnasts who
are satisfied with their physiques, which are perhaps genetically predisposed to be closer to ideal for gymnasts.

The silhouettes on the body image questionnaire may not be appropriate for gymnasts. The silhouettes used are not representative of gymnasts, who on average have increased muscle mass compared to age-matched children in the general population, of whom these silhouettes were based on.

The gymnasts in the present study ranged from 6 to 19 years, and age may have affected the outcome of the eating disorder inventory scores and explain the discrepancies. Since individuals are more vulnerable to eating disorders until the late teen or early twenties, this could explain why these gymnasts were not classified as at risk for an eating disorder.

The data was previously collected back in 1990 and 1991, and the findings and results may not be as applicable to results that would be found in 2005. The methods and measures used in the study were previously chosen for me, and may not be the most appropriate measure to examine social physique anxiety, body image dissatisfaction, and the risk for an eating disorder.

4.3.2 Recommendations

In addition to the use of self-report measures, qualitative research is needed to gain more insight into the complex issues of body satisfaction, social physique anxiety, and eating behaviors in athletes. Instead of just finding out how many gymnasts are affected by these issues, it is just as important, to find out what is causing these issues and how it may be prevented.
Future research should include measures of maturation when assessing body image concerns and eating disorder behaviors. Many females do not view the biological changes that occur at puberty, which often cause them to feel uncertain, insecure, and anxious about their bodies. Whereas, males as they mature, bodies develop towards the broad-shouldered, tall, and muscular ideal. Thus is important to take into account maturational stage of the participant.

Since it has been shown that females as young as 5 years of age are experiencing body image dissatisfaction and eating disorders are becoming more prevalent, regardless of the age of the intended audience, all intervention strategies should include sections on nutrition education and ways to enhance the self-esteem of young females and males.

Future research with the areas of body image concerns should not only focus on female athletes but also males. Body image dissatisfaction, extreme exercise, disorder eating and supplements are becoming more frequent in the male population. In addition, males are more likely to be dissatisfied prior to puberty, and these males need to be examined further.

Future research is needed to understand the types and sources of the intense pressures and concerns these gymnasts are facing and how they related to body image dissatisfaction, social physique anxiety, and disordered eating. These pressures may be from coaches, parents, judges, peers, and themselves. Gymnasts may be also dealing with living away from home, training, injuries, nutrition, and school. In combination these pressures and concerns are overwhelming and can trigger disordered eating behaviors in order to deal with them or to try to gain some control back into their lives.
Through the above future recommendations, researchers might gain some insight into why some individuals experience higher values of social physique anxiety compared to others of similar age, background, and experiences.

4.4 Summary and conclusions

4.4.1 Summary of hypotheses

The first main hypothesis, which stated that body image dissatisfaction increases the risk for an eating disorder and that it would be more prevalent in females, was accepted for females and rejected for males.

The second main hypothesis, which stated that a higher social physique anxiety score increases the risk for an eating disorder with a higher prevalence in females, was rejected for both female and male gymnasts.

Subhypothesis 1, which proposed that as age increases, body image dissatisfaction would become more prevalent in females and decrease with age in males, was rejected in both females and males.

The second subhypothesis proposed that as age increases, the social physique anxiety scores would be higher in females but lower in males, was accepted for both female and male gymnasts.

Subhypothesis 3, which stated that as sum of skinfolds increases, the scores from the social physique anxiety scale would increase, was accepted for females and rejected for males.
The fourth subhypothesis, which proposed that as sum of skinfolds increases, the frequency of body image dissatisfaction would increase, was rejected for females and accepted for male gymnasts.

4.4.2 Conclusions

A number of findings from the present study are novel. First and foremost, this is among the first studies to examine both behavioral and physical development in gymnasts and relate them to the risk for developing eating disorders.

It was demonstrated that the female gymnasts as a group were smaller and lighter than average for their age and that male gymnasts were no different than their peers. While female gymnasts exhibited a lower body mass index than averages for their age, males had higher body mass index for age. It must be noted that the gymnasts in the present study with a higher high body mass index are most likely not fat, because their increased muscle mass and other nonfat tissues and shorter stature may be contributing to their increased body mass index.

An association between body image dissatisfaction and the risk for an eating disorder was shown in female gymnasts, but not males. As well, there was no association between social physique anxiety and the risk of developing an eating disorder in either female or male gymnasts. These were also novel findings, as no previous study had examined male gymnasts in these areas. It is important to note that none of the gymnasts had a score greater or even near the at risk cutoff of 45, therefore, only the extreme eating disorder scores were examined. It must also be recognized that self-report measures were
used to examine disordered eating behaviors, social physique anxiety, and body image dissatisfaction, which limits the results of these measures.

In both female and male gymnasts there no association between body image dissatisfaction, age, and maturity groups among genders. The gymnasts were banded into maturity groups according to mean ages associated with reference standards for maturation, due to the large age range (6-19 years) and various stages of growth and maturation. This study contradicted most evidence that suggested that body image dissatisfaction in females tends to increase with age (Davies & Furnham, 1986; Davison et al., 2002; Paxton, 1993; Roland et al., 1997; Smolak, 2002; Thompson & Chad, 2000, 2002; Tiggeman and Wilson-Barrett, 1998). To date, the present study is the first to look at body image dissatisfaction and age in male gymnasts, and therefore, no comparisons can be made.

A positive significant correlation between social physique anxiety and age in females, indicating that social physique anxiety increases with age. In males there was a negative significant correlation between social physique anxiety and age, indicating that social physique anxiety decreases with age. When the gymnasts were banded into three maturational categories, social physique anxiety was significantly different between maturity groups, and genders showed different patterns of social physique anxiety. This study supports previous work that females consistently score significantly higher on the social physique anxiety scale, exhibit more social physique anxiety, and experience more negative thoughts about their body’s appearance than males (Hart et al., 1989; McAuley et al., 1995; Haase et al., 2002; Thompson & Chad, 2000, 2002). When examining social physique anxiety in male gymnasts, the present results are the first in this area. Since,
male gymnasts are not able to be physically competitive due to lack of upper body strength; it can be concluded that social physique anxiety is higher prior to puberty. As a male enters puberty there is a normal biological increase of FFM and decrease of FM, which is beneficial within the sport of gymnasts, social physique anxiety decreases. Therefore, in male gymnasts age is negatively correlated with social physique anxiety.

It was shown that females with a greater sum of skinfolds experienced higher social physique anxiety scores. In males, sum of skinfolds was not related to social physique anxiety scores in male gymnasts. When grouped into maturational groups, social physique anxiety was significantly different between sum of skinfold groups, and genders showed different patterns of social physique anxiety. The results from the present study agree and disagree with previous research. This study supports findings that social physique anxiety was related to body fat indices (Crawford & Eklund, 1994; Eklund & Crawford, 1994; Hart et al., 1989; Thompson & Chad, 2002). Athletes with high social physique anxiety score had greater weight and body fat indices compared to athletes with low social physique anxiety (Martin et al., 1997). Although, numerous studies found that body fat indices and sum of skinfolds were unrelated to social physique anxiety in athletes (Martin et al., 1997; Thompson, 1994). However, due to the fact that the athletes had low mean body fat and low mean social physique anxiety scores this may have limited their ability to detect a body fat and social physique anxiety relationship. Social physique anxiety and sum of skinfolds has never previously investigated in male gymnasts, it is difficult to compare these results. Since the males did have lower social physique anxiety scores and sum of skinfolds, it may have also limited the ability to detect a relationship.
Among females, there was no association between sum of skinfolds and body image dissatisfaction, whereas in males, there was an association between sum of skinfolds and body image dissatisfaction. The findings of previous research is conflicting in the area of body image dissatisfaction and sum of skinfolds. The study contradicts the findings that body fat was positively related to body dissatisfaction (Eklund & Crawford, 1994; Hart et al., 1989; Marshall & Harber, 1996; Thompson & Chad, 2000). However, the present results of female gymnasts were consistent with findings that there was no relationship between body image dissatisfaction and sum of skinfolds (Harris & Greco, 1990; Thompson, 1994). It can be concluded that regardless of body fat levels or sum of skinfolds, gymnasts may be extremely dissatisfied with their body image, therefore, showing no relationship.

In conclusion, it was found that these gymnasts here in the Saskatoon area were not a risk for developing an eating disorder. It was also found that these individuals participating in competitive gymnastics followed normal growth and development patterns and were overall satisfied with their body image and experienced low to average social physique anxiety. It should be noted that the environment of the four gymnastic clubs may have contributed to these findings in that they no do not do weigh ins or restrict their athletes food, instead they focus on fun, fitness, and fundamentals.
References


Eklund, R. C., & Crawford, S. (1994). Active women, social physique anxiety, and
exercise. *Journal of Sport and Exercise Psychology, 16,* 431-448.


Appendix A

Body Image Questionnaires:

i) prepubescent questionnaire

ii) pubescent and post pubescent questionnaire
A. Which (if any) of the above figures looks most like your body? ________________

B. If you were able to change your body shape, which figure would you choose? ________________
A. Which (if any) of the above figures looks most like your body? ________________

B. If you were able to change your body shape, which figure would you choose?

________________________
Appendix B

Social Physique Anxiety Questionnaires:

i) original

ii) modified
## SOCIAL PHYSIQUE ORIENTATION QUESTIONNAIRE

Name: ___________________________ Birth Date: _______ Date: _______

Read each item and indicate the degree to which the statement is characteristic or true of how you usually feel about your body on a 5-point scale. There are no right or wrong answers, simply answer as you honestly feel.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I am comfortable with the appearance of my physique/figure</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>2.</td>
<td>I would never worry about wearing clothes that might make me look too thin or overweight</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>3.</td>
<td>I wish I wasn't so uptight about my physique/figure</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>4.</td>
<td>There are times when I am bothered by thoughts that other people are evaluating my weight or muscular development negatively</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>5.</td>
<td>When I look in the mirror I feel good about my physique/figure</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>6.</td>
<td>Unattractive features of my physique/figure make me nervous in certain social settings</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>7.</td>
<td>In the presence of others, I feel apprehensive about my physique/figure</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>8.</td>
<td>I am comfortable with how fit my body appears to others</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>9.</td>
<td>It would make me uncomfortable to know others were evaluating my physique/figure</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>10.</td>
<td>When it comes to displaying my physique/figure to others, I am a shy person</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>11.</td>
<td>I usually feel relaxed when it is obvious that others are looking at my physique/figure</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>12.</td>
<td>When in a bathing suit, I often feel nervous about the shape of my body</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
SOCIAL PHYSIQUE ORIENTATION QUESTIONNAIRE

Name: __________________________ Birth Date: ______ Date: ______

Read each statement and circle the number that describes how you usually feel about your body. There are no right or wrong answers; simply answer as you honestly feel.

<table>
<thead>
<tr>
<th>not at all like me</th>
<th>kind of like me</th>
<th>like me</th>
<th>very much like me</th>
<th>extremely like me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

1. I am comfortable with how my body looks
2. I would never worry about wearing clothes that might make me look too thin or overweight.
3. I wish I wasn’t so worried about how my body looks.
4. Sometimes, I worry that other people don’t like how my body looks.
5. When I look in the mirror, I feel good about my body.
6. I worry that there are parts of my body that people may not like.
7. When I’m with other people, I am nervous about my body.
8. I am comfortable with how healthy my body appears to other people.
9. It would make me uncomfortable to know that other people were judging my body.
10. I am a shy person and don’t like other people looking at my body.
11. I usually feel relaxed when it is obvious that other people are looking at my body.
12. When I wear a leotard/bathing suit, I often feel nervous about the shape of my body.
Appendix C

Eating Disorder Inventory:

i) original

ii) modified
INSTRUCTIONS

This is a scale which measures a variety of attitudes, feelings and behaviors. Some of the items relate to food and eating. Others ask you about your feelings about yourself. THERE ARE NO RIGHT OR WRONG ANSWERS SO TRY VERY HARD TO BE COMPLETELY HONEST IN YOUR ANSWERS. RESULTS ARE COMPLETELY CONFIDENTIAL. Read each question and fill in the circle under the column which applies best to you. Please answer each question very carefully. Thank you.

1. I eat sweets and carbohydrates without feeling nervous. ...................
2. I think that my stomach is too big. ...........................................
3. I wish that I could return to the security of childhood. .................
4. I eat when I am upset. ............................................................
5. I stuff myself with food. ............................................................
6. I wish that I could be younger ............................................... 
7. I think about dieting. ..............................................................
8. I get frightened when my feelings are too strong. .......................
9. I think that my thighs are too large ...........................................
10. I feel ineffective as a person ....................................................
11. I feel extremely guilty after overeating ....................................
12. I think that my stomach is just the right size. .........................
13. Only outstanding performance is good enough in my family ........
14. The happiest time in life is when you are a child .....................
15. I am open about my feelings ...................................................
16. I am terrified of gaining weight .............................................
17. I trust others ...........................................................................
18. I feel alone in the world ...........................................................
19. I feel satisfied with the shape of my body .................................
20. I feel generally in control of things in my life ............................
21. I get confused about what emotion I am feeling ........................
22. I would rather be an adult than a child ...................................
23. I can communicate with others easily ......................................
24. I wish I were someone else ....................................................
25. I exaggerate or magnify the importance of weight ..................
26. I can clearly identify what emotion I am feeling .....................
27. I feel inadequate ........................................................................
28. I have gone on eating binges where I have felt that I could not stop.
29. As a child, I tried very hard to avoid disappointing my parents and teachers.............................................................
30. I have close relationships ......................................................
<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>31.</td>
<td>I like the shape of my buttocks.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td>I am preoccupied with the desire to be thinner.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33.</td>
<td>I don't know what's going on inside me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.</td>
<td>I have trouble expressing my emotions to others.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35.</td>
<td>The demands of adulthood are too great.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36.</td>
<td>I hate being less than best at things.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.</td>
<td>I feel secure about myself.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38.</td>
<td>I think about bingeing (over-eating).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39.</td>
<td>I feel happy that I am not a child anymore.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40.</td>
<td>I get confused as to whether or not I am hungry.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41.</td>
<td>I have a low opinion of myself.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42.</td>
<td>I feel that I can achieve my standards.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43.</td>
<td>My parents have expected excellence of me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44.</td>
<td>I worry that my feelings will get out of control.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45.</td>
<td>I think that my hips are too big.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46.</td>
<td>I eat moderately in front of others and stuff myself when they're gone.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47.</td>
<td>I feel bloated after eating a normal meal.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48.</td>
<td>I feel that people are happiest when they are children.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49.</td>
<td>If I gain a pound, I worry that I will keep gaining.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.</td>
<td>I feel that I am a worthwhile person.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51.</td>
<td>When I am upset, I don't know if I am sad, frightened, or angry.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52.</td>
<td>I feel that I must do things perfectly, or not do them at all.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53.</td>
<td>I have the thought of trying to vomit in order to lose weight.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54.</td>
<td>I need to keep people at a certain distance (feel uncomfortable if someone tries to get too close).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55.</td>
<td>I think that my thighs are just the right size.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56.</td>
<td>I feel empty inside (emotionally).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57.</td>
<td>I can talk about personal thoughts or feelings.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58.</td>
<td>The best years of your life are when you become an adult.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59.</td>
<td>I think that my buttocks are too large.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60.</td>
<td>I have feelings that I can't quite identify.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.</td>
<td>I eat or drink in secrecy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62.</td>
<td>I think that my hips are just the right size.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63.</td>
<td>I have extremely high goals.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64.</td>
<td>When I am upset, I worry that I will start eating.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FOR OFFICE USE ONLY

<table>
<thead>
<tr>
<th></th>
<th>DT</th>
<th>B</th>
<th>BD</th>
<th>I</th>
<th>P</th>
<th>ID</th>
<th>IA</th>
<th>MF</th>
</tr>
</thead>
</table>

130
NAME: _______________________

INSTRUCTIONS

Read each question and put a check under the column which best applies to you. Please answer each question. There are no right or wrong answers so try very hard to be honest in your answers. Thank you.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Always</th>
<th>Usually</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I eat sweets like candies, cookies and cakes without feeling nervous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I eat when I am upset</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>I think my stomach is too big</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I think about dieting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I stuff myself with food</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>I think my legs are too big</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>I feel guilty after eating too much</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Sometimes when I eat too much, I feel like I can't stop eating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>I think my stomach is the right size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>I am happy with the shape of my body</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>I do not want to gain weight</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>I think about eating too much</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>I like the shape of my bum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>I think how much I weigh is very important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>I eat normally in front of other people and stuff myself when I am alone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>I think my hips are too big</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>I think often about being thinner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>I think throwing-up would help me lose weight</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>I think my legs are the right size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>If I gain a pound, I worry that I will gain more</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>I eat or drink when no one knows</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>I think my bum is too big</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>I think my hips are the right size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>