PHYSIOLOGY IN DANCE:

INSTRUCTIONAL PRESENTATIONS FOR DANCE STUDENTS

By

EMILIE RENEE CHAMPAGNE WILLIAMSON

A Thesis Submitted to The Honors College

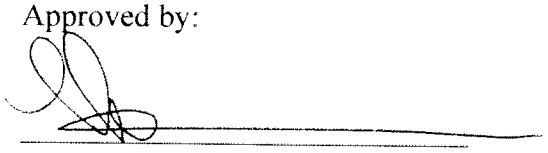
In Partial Fulfillment of the Bachelors degree
With Honors in

Physiology

THE UNIVERSITY OF ARIZONA

M A Y 2 0 13

Approved by:



Dr. E. Fiona Bailey
Department of Physiology

The University of Arizona Electronic Theses and Dissertations
Reproduction and Distribution Rights Form

The UA Campus Repository supports the dissemination and preservation of scholarship produced by University of Arizona faculty, researchers, and students. The University Library, in collaboration with the Honors College, has established a collection in the UA Campus Repository to share, archive, and preserve undergraduate Honors theses.

Theses that are submitted to the UA Campus Repository are available for public view. Submission of your thesis to the Repository provides an opportunity for you to showcase your work to graduate schools and future employers. It also allows for your work to be accessed by others in your discipline, enabling you to contribute to the knowledge base in your field. Your signature on this consent form will determine whether your thesis is included in the repository.

Name (Last, First, Middle)

Williamson, Emilie Renee Champagne

Degree title (eg BA, BS, BSE, BSB, BFA):

BS

Honors area (eg Molecular and Cellular Biology, English, Studio Art):

Physiology

Date thesis submitted to Honors College:

4/26/13

Title of Honors thesis:

Physiology in Dance: Instructional Presentations for Dance Students

The University of Arizona Library Release Agreement

I hereby grant to the University of Arizona Library the nonexclusive worldwide right to reproduce and distribute my dissertation or thesis and abstract (herein, the "licensed materials"), in whole or in part, in any and all media of distribution and in any format in existence now or developed in the future. I represent and warrant to the University of Arizona that the licensed materials are my original work, that I am the sole owner of all rights in and to the licensed materials, and that none of the licensed materials infringe or violate the rights of others. I further represent that I have obtained all necessary rights to permit the University of Arizona Library to reproduce and distribute any nonpublic third party software necessary to access, display, run or print my dissertation or thesis. I acknowledge that University of Arizona Library may elect not to distribute my dissertation or thesis in digital format if, in its reasonable judgment, it believes all such rights have not been secured.

☒ Yes, make my thesis available in the UA Campus Repository!

Student signature: Emilie Williamson Date: 4/26/13

Thesis advisor signature: _____ Date: 04-26-13

☐ No, do not release my thesis to the UA Campus Repository.

Student signature: _____ Date: _____

Last updated: 04/01/13

STATEMENT BY AUTHOR

This thesis has been submitted in partial fulfillment of requirements for a degree at The University of Arizona and is deposited in the University Library to be made available to borrowers under rules of the Library.

Signed: 

Table of Contents

Abstract 3
Introduction 3
Objective 1: Physiology in Dance 4
    Muscle 4
    Tendon 5
    Bone 6
Objective 2:Exercise and Stretching 6
    Endurance/Aerobic Training 7
    Strength Training 7
        Muscle/Tendon 8
        Bone 8
    Stretching 9
Objective 3: Nutrition 10
    Nutrient Sources 10
        Bone 10
        Muscle 11
        Tendon 11
    Nutrient Intake Timeframe 12
    Tracking Exercise and Food 13
Survey Analysis and Results 13
Discussion 15
Acknowledgements 15
Appendix A 17
Appendix B 26
References 27

Abstract

The purpose of the following document and supplemental presentations and questionnaire is to provide an overview of physiology as it relates to dance and introduce students of dance to physiology and nutrition and so begin to encourage them to think more about how the body works and how best to sustain it. The audience chosen for the original presentation of information are the University of Arizona School of Dance freshman students, who were chosen for their dedication to dance and with the hope that the provision of this information during their freshman year, will aid them in sustaining their dance for years to come. The resulting survey analysis provided information from which to base further physiological and nutritional emphasis in their education. At the conclusion of the survey it is clear that there is a focus among dancers in their cross-training and nutritional practices, though larger populations of students would also reveal more accurate survey results as well as guidance for future instruction. It is my hope that through providing information we may prevent young dancers from suffering under common misconceptions that may limit their performance and in turn, their career.

Introduction

The following is a series of three modules that could be used in presentations to undergraduate students of dance, the objective of which is to provide an overview of physiology and dance and encourage deeper thought about health and daily habits. The modules focus on physiology in dance, the importance of exercise, and the importance and need for appropriate nutrition in dance. To connect each module the focus is on three components that are of interest and importance to dancers - muscles, tendons and bones. These components recur throughout the modules to keep the audience engaged and to ensure a common level of understanding necessary to move on to the subsequent modules. It is also possible to combine all three modules into one longer presentation to accommodate time restrictions.

The target audience for these presentations is the Freshman Class at the University of Arizona, School of Dance. These students were chosen for their dedication to dance and with the hope that the provision of this information during their freshman year, will aid them in sustaining their dance for years to come. The presentation

incorporates a brief survey (Appendix B) that should be administered prior to the presentations. If the sequence of presentations is extended over several weeks then the same survey could be represented at the end to determine if the information affected the students' thinking or opinions. However, if all presentations are completed on the same day, it is preferable to administer a short answer questionnaire to assess what information students may have gained (Appendix C). Overall the goal in creating the modules and survey is to introduce students to physiology and nutrition and so begin to encourage them to think more about how the body works and how best to sustain it.

Each of the modules makes extensive use of images and schematics rather than words or descriptions to deliver information in a format to which a student of dance can relate. The images included in this iteration were selected from images of students in the dance program at The University of Arizona and with whom the participants in this short course dance regularly in dance technique courses. Images were selected for their ability to make clear the relationship between the information presented and the students themselves. In this way the ideas and information provided may be considered accessible even for those who do not have any background/training in physiology. The images will translate well to other audiences.

Objective 1: Physiology in Dance

The purpose of the first module is to introduce three components of the body; muscle, tendon and bone. The three components are vastly different in structure and function, and in this module the emphasis is upon the dynamic relationship between them. (Image 1.2)

Muscle (Image 1.3-1.4)

The contractile properties and structure of muscles are introduced, progressing from a muscle fiber to the whole muscle. Two images are used to portray the muscle. The first is an anatomical schematic of connection between muscle, tendon and bone, and the second is of a dancer with defined leg muscular tone and movement. Muscle filaments move past one another to produce the contractile properties, and thus shorten or lengthen the muscle. The hierarchy within muscle is what allows for various magnitudes of muscle

force to be generated.

Three types of muscle activation are evident in dance; isometric, shortening (concentric) and lengthening (eccentric). Each of these activations is simultaneously accomplished throughout a dance routine. For example, in order to accomplish a backward bend (see Image 1.4), the multifidus spinae (back muscles responsible for moving the spine as a whole) shorten as they activate. The transverse and rectus abdominus (abdominal muscles) undergo a lengthening activation. For this position to be maintained, isometric activation both of the multifidus spinae and the abdominus is necessary. Importantly, such isometric activation is often the cause of muscle fatigue.

Muscle soreness is often experienced by dancers, and while it is commonly thought that soreness is a result of strenuous exercise and a build-up of lactic acid, this is not generally the case. Lactic acid is produced a result of an exercise demand exceeding the rate of oxygen delivery to the muscle, and is flushed out of the muscles within 30 to 60 minutes of exercise. Although dance is aerobic it more often comprises “sprints” and agile movements. As a result, and especially in lengthening activations that are so common in dance, microscopic tears occur in the muscle. This is common and results in muscle soreness experienced a day or two after the performance.

Tendon (Image 1.5)

Tendons are the bridge between muscles and bones. Muscles are activated causing the skeleton to move, so creating dance. Tendons act as the intermediate between the muscle and bone, and thus as the bridge between two body components with vastly different structures and functions.

Here the concept of tendon as a spring is useful in explaining how tendons function in movement and as a bridge between muscle and bone. When a spring is compressed or stretched, it gains potential energy. When it is allowed to recoil, the potential energy is released and transferred to the object. A kangaroo illustrates this concept nicely as it has a large sartorius, rectus femoris, and other knee and ankle extensor muscles used for jumping and for propulsion. However, the tendon (analogous to the human Achilles tendon) when stretched builds up potential energy much like a spring that subsequently is released permitting the kangaroo to jump and to propel itself

farther forward than would be possible with muscle contraction alone. A similar situation occurs in a dancer. For example, when a dancer prepares for a jump, they bend their knees in a plié. This elongates gastrocnemius (calf) muscle/s optimizing the muscle-length and contributing to a more forceful contraction, and imposes a stretch on the Achilles tendon. Once stretched, the Achilles acts as a spring or a store of potential energy, that when permitted to recoil releases the energy for a higher and more effective jump than that achieved by muscle contraction alone.

Bone

Bone is the underlying support of the human body, and the structure of bone is very different from the hierarchical structure of muscle and tendon. Bone is made of both an organic component, composed of collagen and growth factors, and an inorganic component composed of bone minerals such as calcium and phosphate. The matrix of bone differs from other tissues in that it is very hard, and is therefore comparatively more rigid and cannot contract, be deformed or move as muscles or tendons. The human skeleton is a generic blueprint, providing support to the entire human body. Although the skeleton of an experienced dancer likely varies from that of the average person, or from someone who participates in other types of physical activity, the general possibilities and limitations on movement are likely similar due to similarities in joint construction and the restrictions on movements that joints impose.

A dancer in a static and abstract pose (Image 1.6) demonstrates the aesthetic beauty that is possible in dance, but only within the constraints of what the skeleton, muscles and tendons allow. Bones are the source of support for the body, without which the body would be incapable of remaining erect and performing the movements we are accustomed to. The structure of the human skeleton also contributes a great deal to the aesthetics and beauty that creates the physical component of dance.

Objective 2: Exercise and Stretching

The purpose of the second module is to emphasize the importance of cross training in dance. More specifically, this module provides students with basic information

regarding cardiovascular exercise for endurance, the benefits of strength and weight training, and stretching. Throughout the module there is an effort to tie together the components of muscle, tendon and bone mentioned in the first module, as well as the specific importance that aerobic exercise, weight training and stretching play in dance. Ideally, **cross training** in aerobic, weight and stretching practices will improve performance and decrease the probability of injury and thus extend a dancer's career (Image 2.2).

Endurance/Aerobic Training

Dance often requires long rehearsal hours and extended performances. For these reasons endurance training and aerobic exercise become critical. The ultimate goal of endurance training is to improve the heart's ability to efficiently pump blood, and deliver nutrients and oxygenated blood to the body, and to remove the waste products that result from extended exercise.

With exercise the body requires more oxygen delivery to the muscles in order for the muscles to continue functioning. Initially when the caliber of exercise is increased the heart pumps much faster to accommodate the demands associated with exertion. It is not possible or desirable to sustain a high heart rate throughout a performance because the requirements are often irregular. Endurance training (e.g., running, cycling and swimming) improves the strength and conditioning of the heart, with the result that the heart can pump more blood with each contraction such that the average heart rate is lower during exercise than in untrained individuals. Blood flows into the heart, and the cardiac muscle is responsible for pushing it back out into the circulation to be delivered to the tissues of the body. In this way oxygen is delivered and waste is removed from muscles. This is important in enabling extended and efficient exercise. The heart as a pump, and the systemic circulation as the pathway is illustrated in Image 2.3 and makes clear how far the heart must pump the blood, and how small some of the vessels become in the distal extremities.

Strength Training

Dance depends upon the strength and integrity of muscle, tendon and bone in

order to perform the movements necessary in a given performance. Strength training can effect changes in all three of these components, contributing to the quality of the performance and to the dancer's ability to sustain that performance in the short and long term.

Muscle and Tendon (Image 2.4).

Strength training increases the size and cross sectional area of muscle cells, not the number of muscle cells (Kravitz). A larger cross sectional area corresponds with an increase in the amount of force that can be generated in a given activation (Kravitz) However, if muscle mass increases too much then flexibility and range of movement are compromised. For this reason a certain level of strength and muscle tone is ideal, accompanied by flexibility. Whereas dance entails a variety of muscle activation patterns, cross training is very important in preventing injury and maintaining those muscle groups less often used in dance.

In strength training the cross sectional area of the tendons is also increased, thus improving the tendons ability to act as a spring. A stronger tendon stores more potential energy when stretched, and thus releases more energy into the body when movement is desired. Stronger tendons are also important in preventing injury. A very high demand is placed on tendons in dance, especially the Achilles tendon. As a result tendonitis is very common in dance and is a hindrance to maximum performance. Strengthening these tendons in ways outside of dance itself can help to prevent tendonitis, though ultimately rest is equally important in keeping tendons healthy.

A man and woman performing a dance lift demonstrates the dynamic aspect of strength in dance (Image 2.4). In the case of the male dancer, muscle activation supports himself but also his partner – in this example lifted above his head. The woman's pose also requires muscle strength to attain and sustain the position. One can imagine that the repeated motions and sustained activation that these maneuvers require utilize some muscle groups more than others, and that cross training could contribute to body stability and strength and to injury prevention. If either the man or the woman were to relax their muscles or give way earlier than anticipated, serious injury could result from the subsequent fall.

Bone (Image 2.5).

Strength training and other exercises that impact on bone are essential for maintaining bone strength and density. Applying force to bone stimulates bone growth and maintenance, and in turn bone density. Force delivered to the bone can come from muscles pulling on tendons, or via high impact activities such as running or jumping rope.

Weight lifting and strength exercise impact on bone in a less intuitive way. Muscle strength and mass ultimately are the goals of weight lifting, but bone density is also affected as a result and is very useful for increasing bone strength. Tendons connect to bones, exert forces on the bones, and bring about bone remodeling and maintenance at the connection location. Everyday impact from gravity places a high demand on bones as well. The force of impact on the bottom of the foot travels vertically through the legs and spine, with each step. This impact causes bone remodeling and maintains bone density and strength. It is important to participate in these impact exercises and consume the proper nutrients while young, because 90 percent of bone density is achieved around the age of 18 in women and 20 in men (Osteoperosis). Continued impact will preserve bone density for years to come, and is best accomplished via high impact exercises.

Dance is full of jumping movements, and the force of impact is constantly being transferred through the bones. In a leap, great height is achieved as well as a 180-degree line with the legs visible in Image 2.5. It is incredible that muscles and tendons enable dancers to reach this position, but without bone strength the force of impact upon landing could cause great harm to individual bones and skeleton more generally. In this regard, impact exercises such as running are good for improving bone health. Swimming is great for cardiovascular aerobic exercise, but has few benefits to bone health because there is little to no impact forces imparted on the skeleton.

Stretching (Image 2.6)

Stretching and flexibility are often incorporated into a dance technique class, but are not enough to insure injury prevention and improved performance. Stretching increases the flexibility of muscles gradually, and requires repetitive practice to make improvements. Stretching also increases the flexibility of tendons. Whereas a more flexible tendon is good from the point of view of injury prevention, increasing the length

of a tendon can contribute to the amount of potential energy the tendon can develop.

In yoga, there is a combination of strength and stretching, which is often the most beneficial way to stretch muscles and tendons. Positions such as "downward dog" illustrate the stretching effects on both muscles (the hamstrings) and tendons (Achilles tendon). This flexibility is extremely important to accomplish adequate range of movement in dance. If muscles and tendons, especially those in hip joints are not flexible, dance would not be nearly as impressive. Grande battements in which the one leg is kicked up forming a vertical line are the result of considerable flexibility and strength. It would also be painful to attempt this without the first working to achieve a level of flexibility that prevents injuries and strains.

Objective 3: Nutrition

The purpose of the third module is to review sources of nutrients that are needed by muscle, tendon and bone, to explain the time frame for nutrient intake, and provide examples of downloadable applications that dancers can use to track their exercise and food intake over the short and long term. Weight and body image are very important to dancers. It is important to provide information about healthy habits and common misconceptions and show students of dance how they optimize their training and performance by making prudent dietary decisions (Image 3.2).

Nutrient Sources

Bone (Image 3.3)

The demand placed on bone by gravitational impact and muscle pull causes bone to become stronger and more dense. Calcium and vitamin D are essential to bone maintenance and health. The most obvious source of calcium is in fortified milk. Fortified milk is enriched with other helpful vitamins and nutrients to help strengthen bone. However there are other more concentrated and overall more nutritious sources of calcium. Spinach and broccoli are two other sources of calcium and other vitamins, but many dark green vegetables are full of calcium without the fat content of dairy products. Salmon is also high in vitamin D, as well as omega 3's, which are very good for heart

health, and in dance overall good health is ideal.

Muscle (Image 3.4)

Muscles face a lot of strain in exercise and especially in dance (including microscopic tears mentioned in the previous Strength Training module), and as a result require a lot of protein to repair and rebuild muscle fiber. Muscle filaments are made of protein, and in order to build and maintain muscle protein is necessary. Protein can be found in many foods, such as meat, fish, nuts, and egg. Protein shakes and energy bars can be a more concentrated form of protein, and because consuming too much meat or eggs could ultimately prove to be less beneficial these artificial sources are often favorable in athletes.

Carbohydrates are an important muscular nutrient, as it is the metabolism of carbohydrates that can quickly produce the energy necessary for muscle activation. Other sources of energy are possible, but it is the metabolism of carbohydrates that occurs most rapidly and is most readily available to the muscles. Carbohydrates can be found in rice, grains, and many vegetables and fruits.

Water is also very important for muscle health and should be consumed regularly regardless of someone's experience in dance. Without water, cells will not function properly and especially not muscle cells, which are not the priority in the face of dehydration. Constant hydration is best for proper muscle function and repair. There is also a need for some salt in the diet, because water follows salt movement in the body and could improve hydration to an extent.

Tendon (Image 3.5)

The nutrients necessary for tendons are less well appreciated because tendons are not often the focus of childhood nutrition education. Tendons need protein for their contractile filaments, so the previously mentioned protein sources are beneficial for tendons as well (meat, fish, nuts and eggs).

Tendons also have a large amount of collagen, contributing the elastic characteristics and spring-like property. Vitamin C and E aid in the body's formation of collagen, and these vitamins can be found very potently in pineapples and other citrus fruits. Collagen can also be taken in directly through soup broths made from meat stocks. A combination of collagen and protein keeps tendons healthy.

Nutrient Intake Timeframe (Image 3.6)

Exercise of any kind, especially dance, requires proper nutrients to act as fuel but also to provide the building blocks needed for repair. For this reason a basic timeframe can be followed to be sure this goal is achieved.

The ideal pre-workout meal should be consumed two to two and a half hours before the workout. In order for there to be enough time for the food to be broken down to a molecular level that is accessible to muscles, two hours is necessary. In this situation, 200 to 500 calories of healthy carbohydrates are the best source of energy, such as oatmeal with fruit or whole-wheat snacks. If this amount of time is not available, then a quick 50 to 100 calorie snack 5 to 10 minutes prior to exercise will also be effective. In this situation something more easily broken down may be more desirable, such as a sports drink.

If the duration of the exercise is longer than 60 minutes without supplying the body with nutrients, it is likely that fewer calories will be burnt and less fat than when food is consumes, and post metabolic rate, or rate of calorie burning is also lower. One should try to eat 50 to 100 calories every half hour, preferably from a quick carbohydrate source that is easy to carry, like a bag of raisins, an energy bar, energy gels, or a sports drink.

It is important that within 20 to 60 minutes after exercise a post-workout meal is consumed. This is the time that muscles will readily accept the carbohydrates and protein consumed and uses them to be stored away as energy and building blocks for recovery. This meal is ideally composed of carbohydrates and protein, and a good reference for calorie consumption is about 2 calories of carbohydrates for every pound of target body weight. For example, if the dancer's target body weight is 150 pounds, about 300 calories of carbohydrate should be consumed and about half that number of calories should be in the form of protein. Some examples include chicken with brown rice, yogurt with almonds, or a protein shake with a banana. The calories eaten after a workout are used to replace energy stored in muscles that are used up during a training session. Importantly, the body also uses protein eaten to build and repair muscles that were broken down as a result of being pushed to their limits.

Tracking Exercise and Food (Image 3.7)

Tracking exercise and food is a good way to see patterns of everyday habits in exercise and eating. An abundance of technological resources makes this process of tracking very simple and quickly yields visible results in the form of charts/graphs. In this case we make use of free application software known as Training Peaks. This is available on smart phones and on the Internet making it very easy to use.

Entering foods and exercise daily produces pie graphs representing the percentage of calories by either caloric values or by weight in grams. Some pie graph examples illustrate to dancers how understandable the application is as well as encourage them to try it themselves. The application also creates graphs demonstrating exercise by category, and the amount of calories burned vs. calories consumed. Answering a few questions does all of this and creates an underlying metabolic rate that is applied to the statistics created.

Using an application such as Training Peaks could help dancers to visualize the effects of their habits in exercise and nutrition, and which may be key to encouraging them in changing their habits in favor of those that are most beneficial to them.

Survey Analysis and Results

At the start of the presentation a survey asking the dancers about opinions and habits in dance, exercise and nutrition should be implemented. The results from the survey conducted with the freshman class at the University of Arizona School of Dance are provided. Figure 1 shows the results of the survey completed by the female members of the class (n=20), and Figure 2 shows the results from the male members of the class (n=6). As shown, women appear more concerned with caloric value, tracking food intake and the nutritional information when making food choices relative to men. Men appeared to place less importance on nutrition, although a larger sample size of male dancers may yield a different result. Both male and female students placed considerable importance on strength, flexibility and endurance in their dance performance however, men reported less frequency of cardiovascular or aerobic activities in their non-dance exercise, whereas

more than 50% of women indicated that cardiovascular exercise is often or always part of their non-dance exercise.

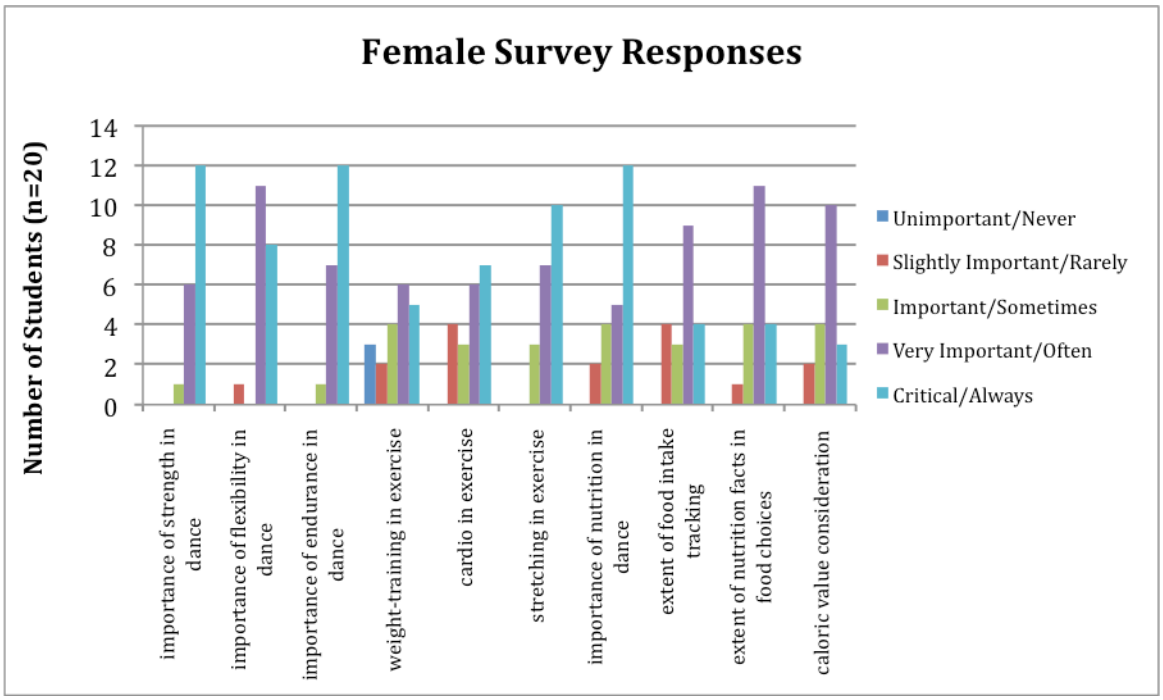


Figure 2: Survey results from female class members.

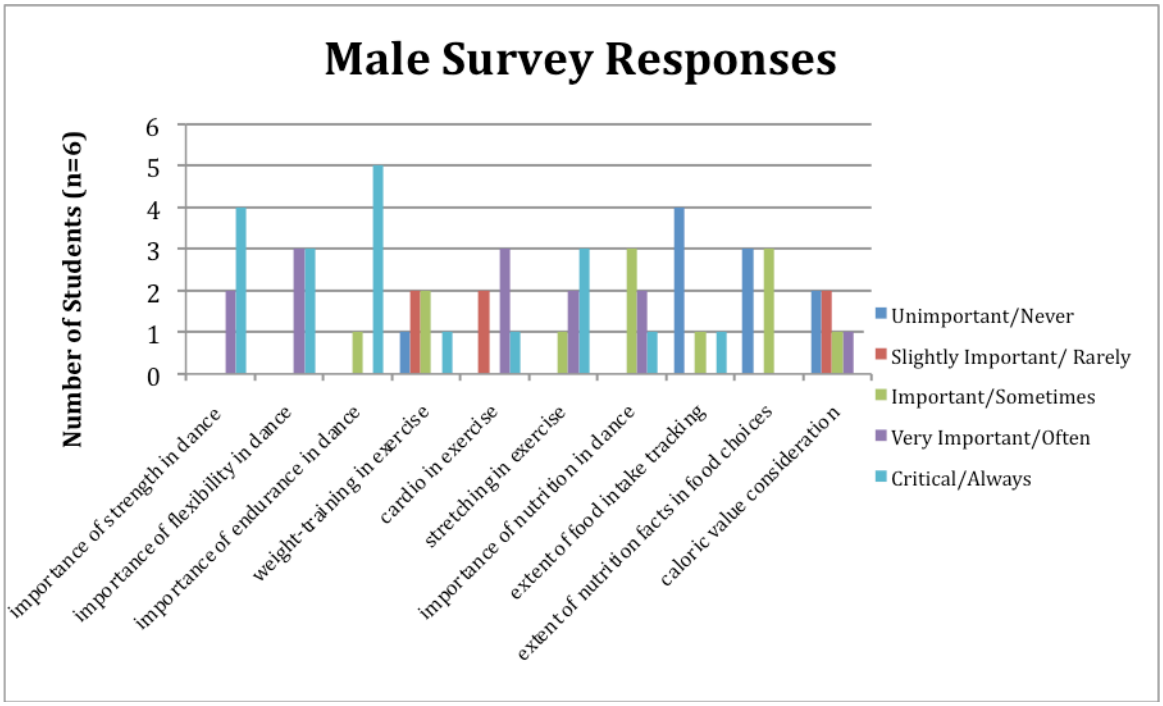


Figure 2: Survey results from male class members.

Discussion

At the conclusion of the survey it is clear that there is a focus among dancers in their cross-training and nutritional practices. It is common among female and male dancers to be conscious of food intake and exercise, for purposes of improved health and for weight and body image. Unfortunately, these decisions do not always place the importance of good health/nutrition ahead of weight loss, and unhealthy decisions come at the cost of good health and well-being of the dancer. For this reason, I suggest that time be taken early in the training of new dancers to inform them of healthy ways to maintain and extend muscle, tendon, bone, and mental health. The academic and intellectual capabilities of a dancer cannot be understated and given the right information and tools they may begin to make choices they based in science and medicine rather than word of mouth and habit. In this way, we may prevent young dancers from suffering under common misconceptions that may limit their performance and in turn, their career.

These presentations may be shown to future dance classes at any dance education institution. Where possible the survey should be administered in advance of the education modules to ascertain where the emphasis should be placed in each case. For example, all presentations were given in one sitting at the University of Arizona, so instead of repeating the survey, a brief set of questions was presented. These questions included "What, if any, information was new to you? What, if anything, would you like to know more about? What about this presentation was helpful?" From each of these questions the topic of nutrition for athletes and dance was noted as most interesting and important for both male and female dance students. The dance community, especially at the University of Arizona, is open to the information and would benefit from the provision of these basic guidelines.

Acknowledgements

I would like to thank Dr. E. Fiona Bailey for advising me in the creation of my physiology senior honors thesis. I would also like to thank Dr. Suzanne Knosp for allowing me to present the information during her class to the freshman dancers at the

University of Arizona School of Dance, and the dancers themselves for enduring the presentation as well as responding to the survey and providing additional feedback.

Appendix A

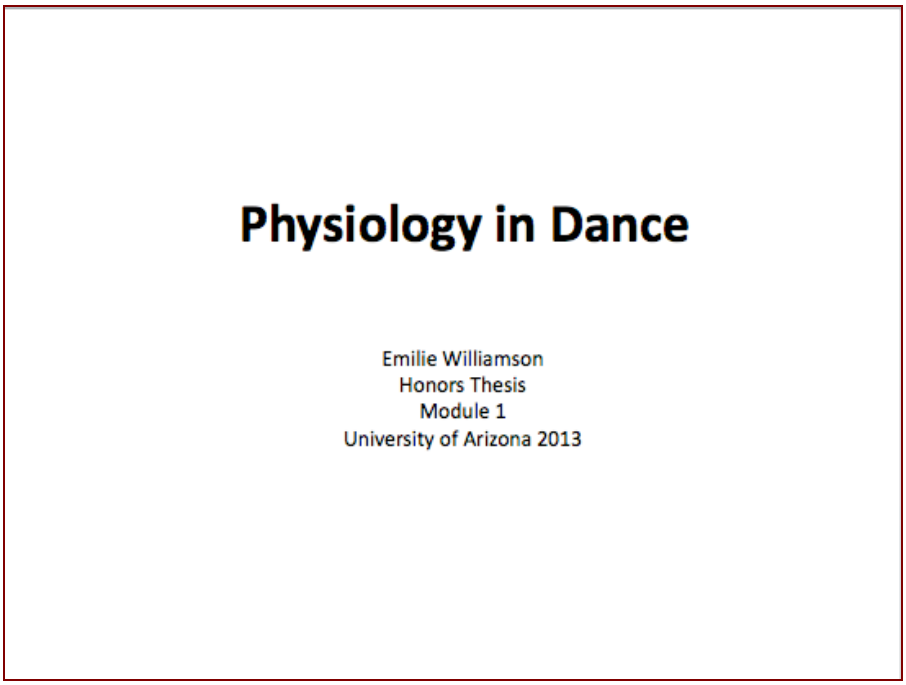


Image 1.1

Image 1.2

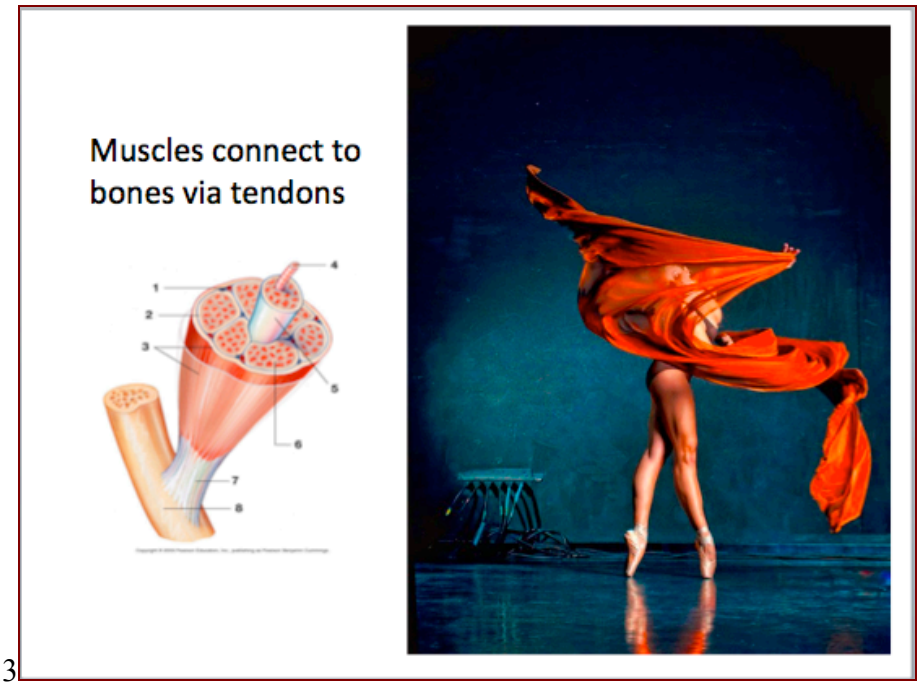


Image 1.3

Image 1.4

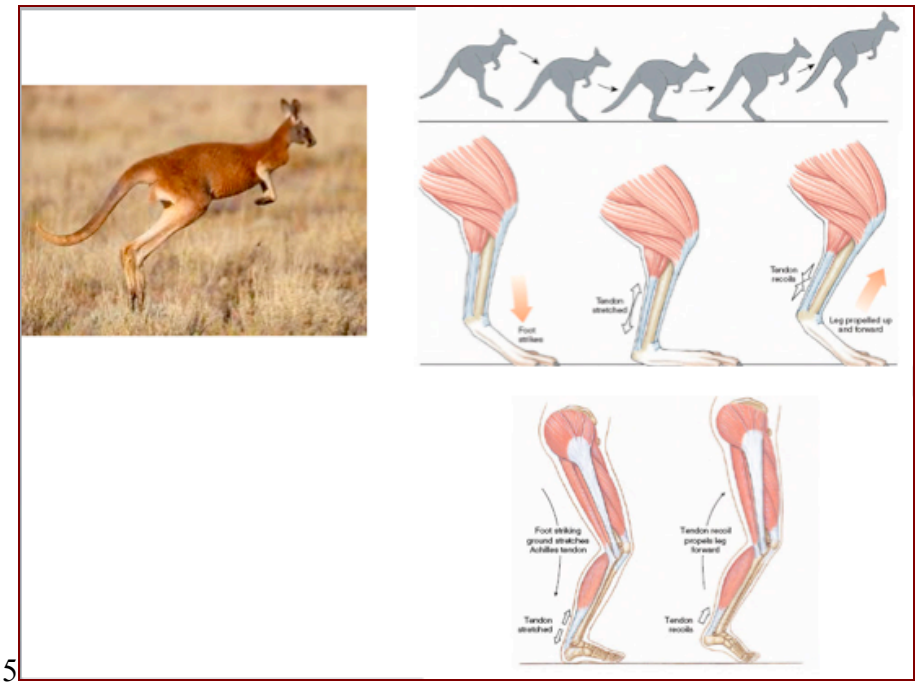


Image 1.5

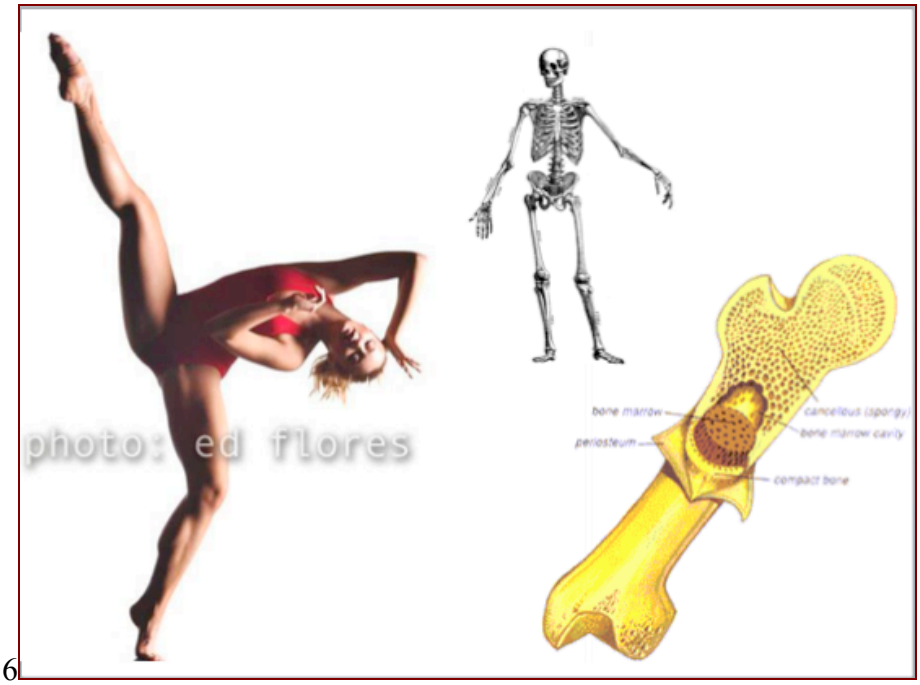


Image 1.6

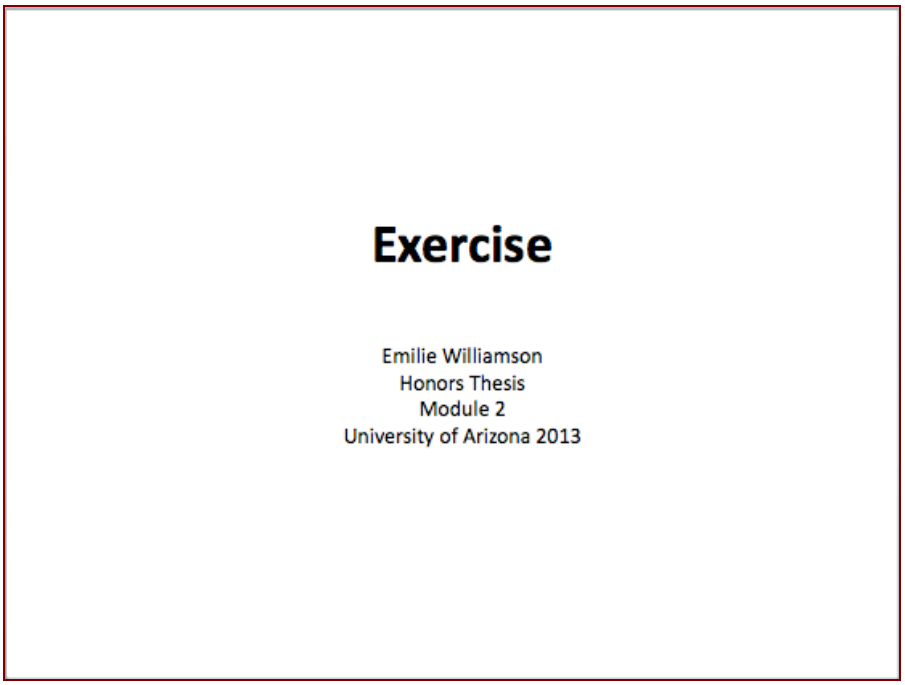


Image 2.1

Image 2.2

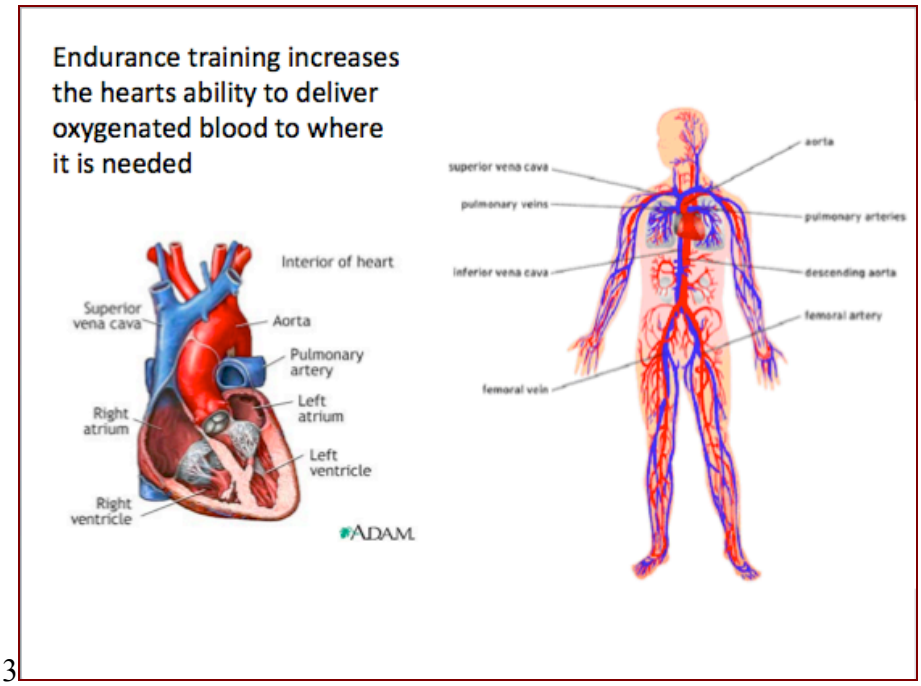


Image 2.3

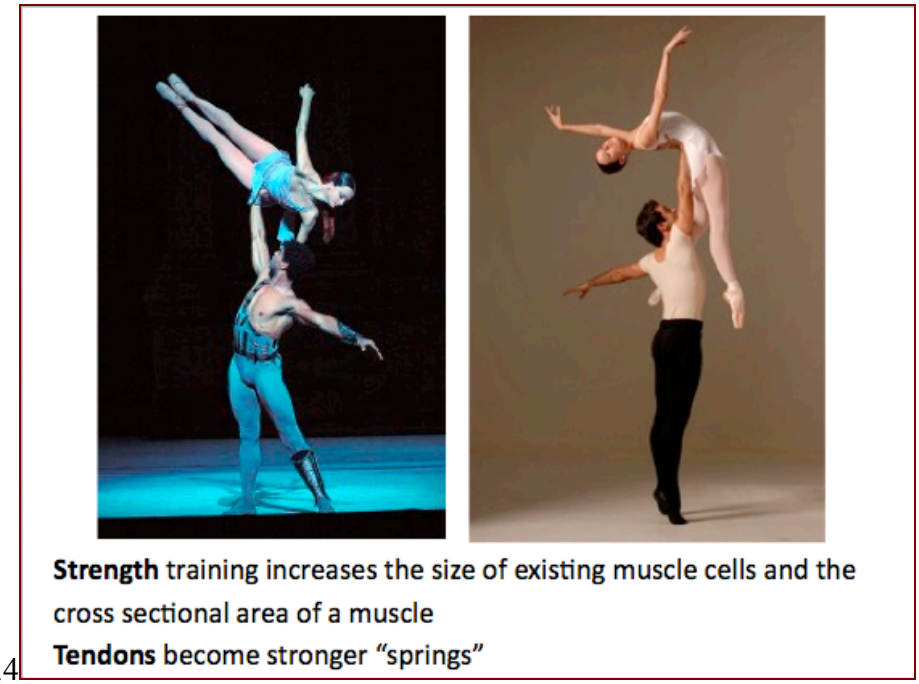


Image 2.4

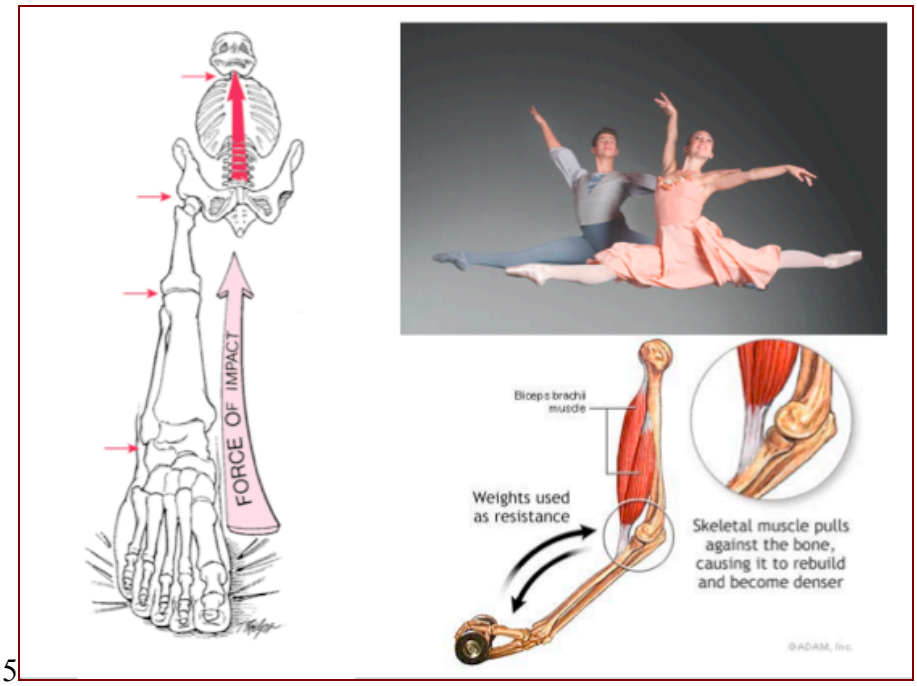


Image 2.5

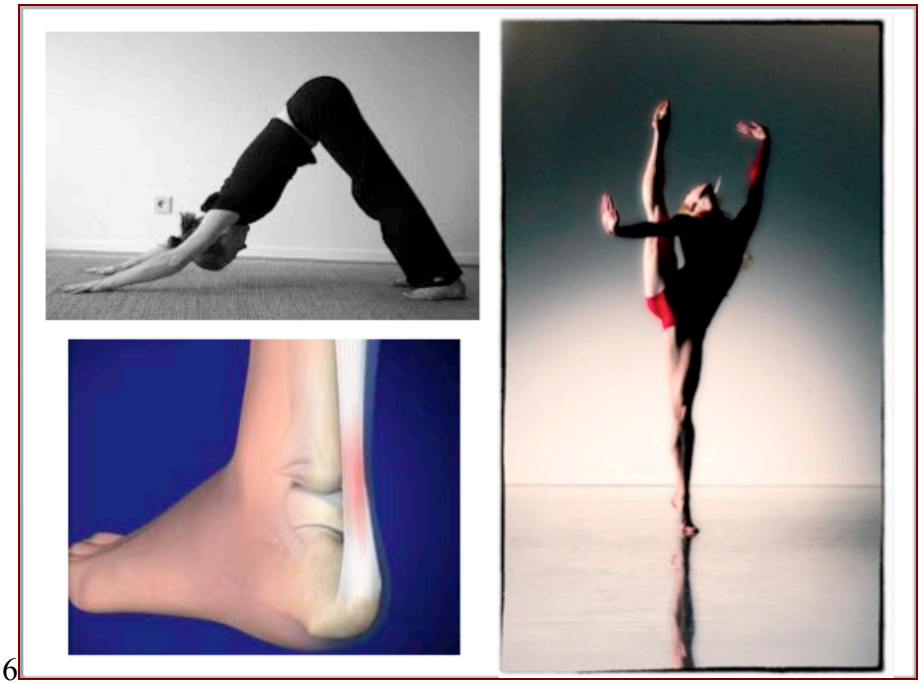


Image 2.6

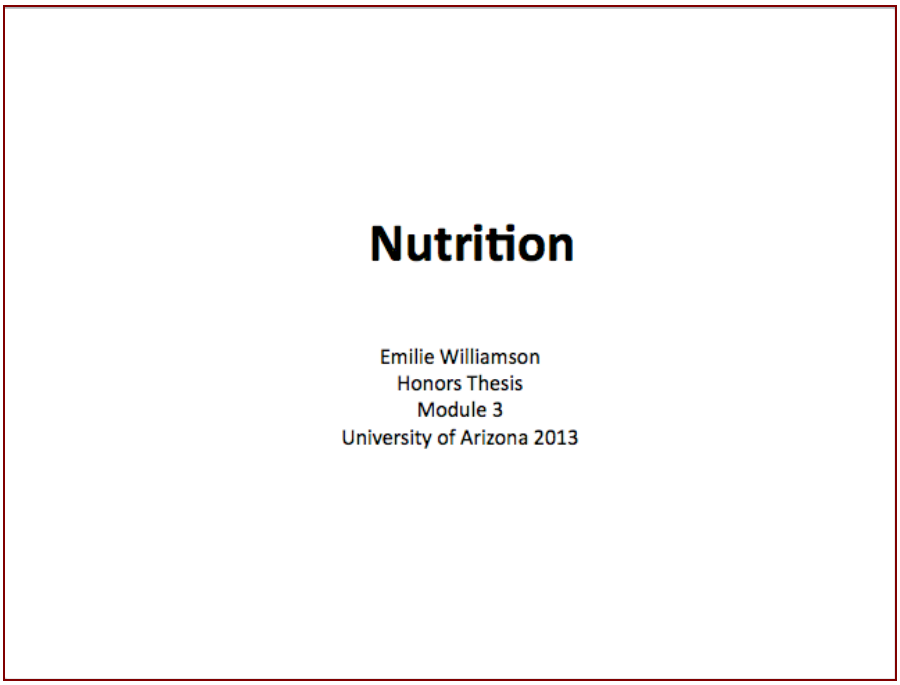


Image 3.1

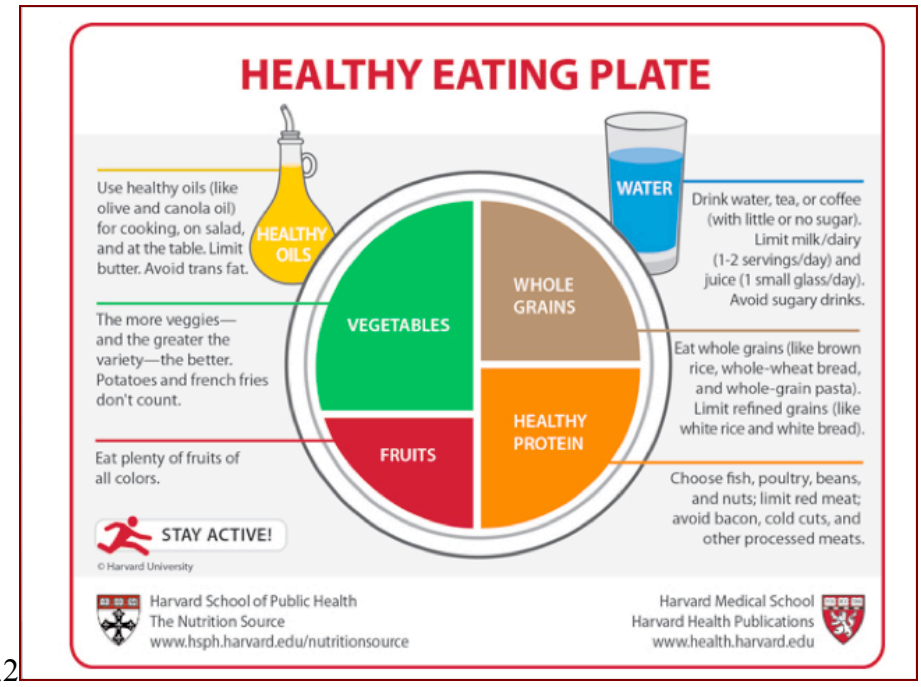


Image 3.2

Image 3.3

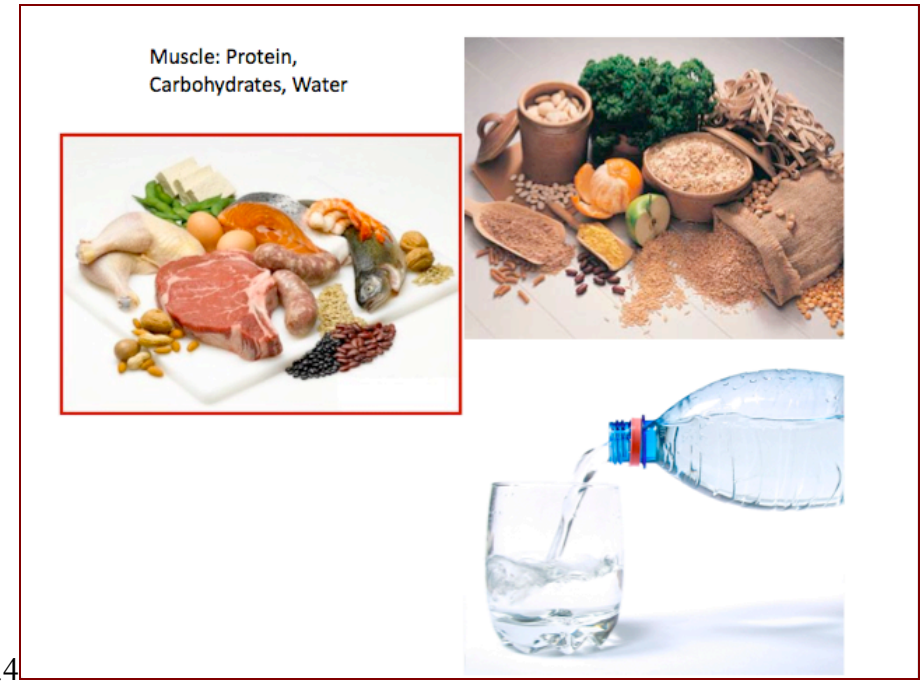


Image 3.4

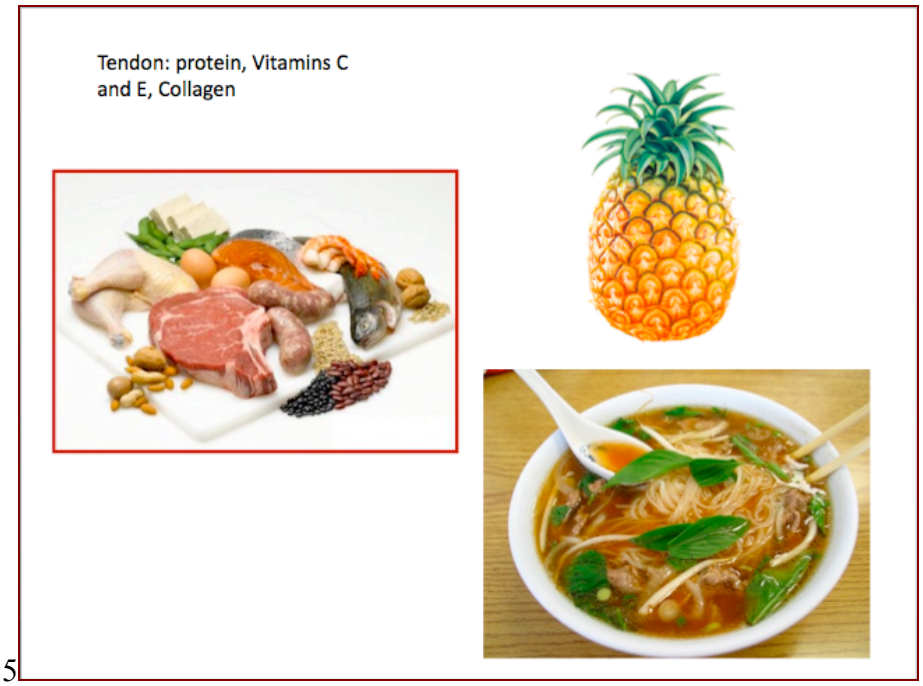


Image 3.5

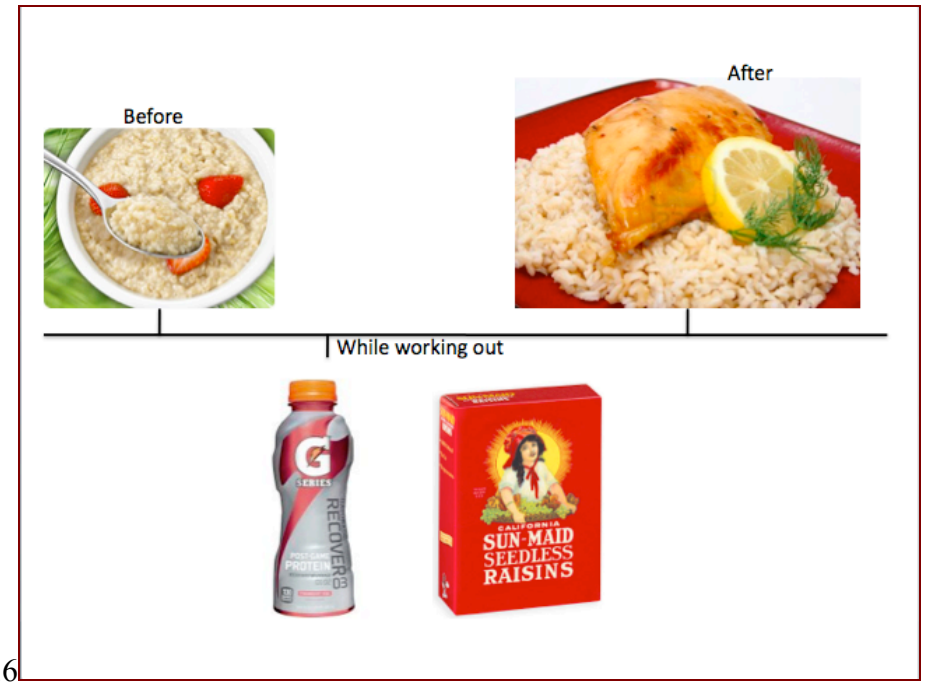


Image 3.6

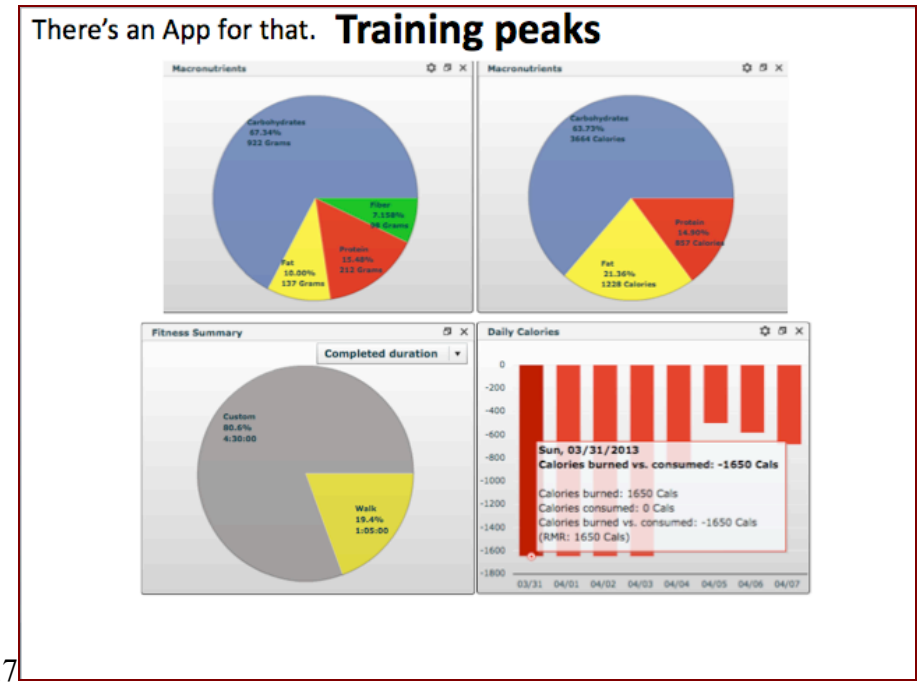


Image 3.7

Appendix B

Questionnaire

1. How important it strength to your capability in dance?

1	2	3	4	5
Unimportant	Slightly Important	Important	Very Important	Critical

2. How important is flexibility to your capability in dance?

1	2	3	4	5
Unimportant	Slightly Important	Important	Very Important	Critical

3. How important is endurance to your capability in dance?

1	2	3	4	5
Unimportant	Slightly Important	Important	Very Important	Critical

4. To what extent is weight training a part of your non-dance exercise?

1	2	3	4	5
Never	Rarely	Sometimes	Often	Always

5. To what extent is cardio a part of your non-dance exercise?

1	2	3	4	5
Never	Rarely	Sometimes	Often	Always

6. To what extent is stretching a part of your non-dance exercise?

1	2	3	4	5
Never	Rarely	Sometimes	Often	Always

7. How important is nutrition to your capability in dance?

1	2	3	4	5
Unimportant	Slightly Important	Important	Very Important	Critical

8. To what extent do you track your food intake?

1	2	3	4	5
Never	Rarely	Sometimes	Often	Always

If you use an App to track food intake, which one do you use?

_____

9. To what extent do nutrition facts guide your food choices?

1	2	3	4	5
Never	Rarely	Sometimes	Often	Always

10. How often do you consider the caloric value when choosing a food?

1	2	3	4	5
Never	Rarely	Sometimes	Often	Always

11. Gender:

Male Female

Supplemental Questions

1. What, if any, information was new to you?

2. What, if anything, would you like to know more about?

3. What about this was helpful?

References

Kravitz, Len, PhD, and Richard J. Hernandez. "Skeletal Muscle Hypertrophy." *Skeletal Muscle Hypertrophy*. N.p., n.d. Web. 24 Apr. 2013. <http://www.unm.edu/~lkravitz/Article folder/hypertrophy.html>.

"Osteoporosis: Peak Bone Mass in Women." *Osteoporosis: Peak Bone Mass in Women*. National Institute of Arthritis and Musculoskeletal and Skin Disease, May 2009. Web. 24 Apr. 2013. <http://www.niams.nih.gov/Health_Info/Bone/Osteoporosis/bone_mass.asp>.