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Dance Warm-up and Injury

Accompanying all physical activities is the possible risk of injury. To avoid injury, warm-ups are highly recommended and often utilized; however, warm-ups are not always executed fully or properly. Nancy Hamilton, Ph.D. presents in "Kinesiology of Fitness and Exercise" that "The warm-up prepares the muscles and joint tissues by increasing their temperature and permits the neuromuscular system to adjust the threshold levels, thereby making the muscles and joints less susceptible to strains and tissue tears." (Hamilton 401) There is a possibility of muscle damage, chronic or acute if warm-ups are skipped or shortened. Chronic injuries are those that are due to overuse or constant incorrect use of the structure and take time to develop, whereas an acute injury is something that happens suddenly and is usually the outcome of one specific event of injury. While both types of injuries are possible with a lack of warm-up, chronic injuries are also common to see alongside bad habits which in return, leads to chronic pain. Warm-ups prove to be a useful tool to ensure the safety of the body while undergoing external stress from the activity you are participating in. Gathering data from scholarly research, I have found multiple studies focusing on the importance of warm-up, functional movement screenings, and injury prevention both within and outside the field of dance. To further my research, I am conducting a survey gathering data from dancers on their warm-up habits, experience, and past or present injuries. Although I am solely looking at dancers in my survey, data from athletes in other sports will prove useful as evidence supporting my

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hypothesis. With the data from my survey, I hope to find a correlation between warm-ups and prevalence of injury to ensure the importance of proper warm-ups in maintaining a healthy body.

**What is a proper warm-up?**

Within a workout there are many different subgroups of exercises that when done in a specific order help to avoid injuries. Every physical activity should begin with some sort of warm-up which is often specific to the activity being performed. Following a warm-up is the endurance phase or activity, completed by a cool-down. This sequence from warm-up to cooldown begins by generating heat within the body, allowing for a gradual rise in muscle temperature and heart rate utilizing activity-specific movements. The pumping of the blood throughout the body and the muscles beginning to work generates heat while higher oxygen rates are supporting your body on this journey. Often, people believe that a warm-up only involves static stretching and stretch their muscles much further than their body is prepared for. This common misconception is something that leads to structural damage of the body. "The warm-up may also include gentle dynamic stretching activities, although stretching should not be done with cold muscles." (Hamilton 402) If cold, beginning with a stretch would take those tight muscles and begin to stretch them, potentially creating damage such as strain or tears.

A proper warm-up for dancers could begin with a cardiovascular activity such as a walk around the room slowly picking up speed as time goes by, allowing the muscle groups in the legs to start to get warm. From the increased walking speed, dancers can now move into an improvisational score to begin moving through the joints softly, allowing them to begin preparing for greater movements. Following the physical warm-up, some sort of body work including myofascial release, massage, or foam rolling to release tension in the muscles is a great

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next step. Body work allows muscles to begin to relax and stretch creating the least amount of tension possible. Imagine a sweater tied into a big knot. Now imagine taking two ends of the sweater and pulling them in opposite directions; your muscles experience the same. Stretching cold muscles may increase your muscle tightness and in return do the opposite of what you are attempting to, creating muscle damage. A dynamic stretch would be advised after body work and/or cardiovascular activity to ensure the body is increasing the range of motion (ROM) but has not yet began large movements that may cause damage to the structure of the body. A dynamic stretch "is a form of stretching that incorporates movement along with muscle tension development." (Hamilton 454) Dynamic stretching is sport-specific, "The goal is to move the specific joint in a controlled manner within a normal ROM in order to minimize the risk of injury." (Hamilton 454) Dynamic stretching for dancers could be low leg swings to get each muscle group and joint prepared for greater movements. This dynamic stretch will mostly prepare the hip joint where the femur head sits in the acetabulum. This triaxial joint allows for adduction-abduction, flexion-extension, and circumduction. To ensure maximum safety, this warm-up should include leg swings on each plane. Following the endurance section of the workout, dancers should cool down; this may include stretching and doing dynamic movements to lower the heart rate. Stretching at the end of the workout, both dynamic and static is the most beneficial because the muscles are warm and with stretching, will lengthen. If the muscles are not stretched, muscle cramping could be present post-activity due to a build-up of lactic acid.

**Dance and Sports**

To some, dance is considered an art, to others a sport, and some it is even considered both. Many studies on warm-up and injury correlations take data from sports which to some

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may not seem to be important, but this information deems just as valuable as data collected from dancers. Although the activity is different, the data collected in *A Warm-Up Program to Reduce Injuries in Youth Field Hockey Players: A Quasi-Experiment*, Barboza et al. shows valuable information that informs research on Dance Warm-up and Injury. This study gathered data from ten teams which were made up of 135 players, ages ten to seventeen years old. A questionnaire was sent to parents of both groups asking about their child's age, years of experience, and injuries sustained within the past three months. The study defined an injury as "any musculoskeletal condition or concussive event that caused the player to stop the field hockey activity or to not fully participate in the next planned field hockey training or game session (ie, time-loss injury)." (Barboza 376) Injuries were classified as acute if they were linked to an identifiable event and were otherwise considered overuse. Within the design, there were two groups with 67 athletes each, one group was the intervention group and the other, control. The intervention group went through a structured exercise including preparation phase consisting of agility and cardiovascular warm-up exercises, movement skills such as stability and flexibility exercises and then finally sport-specific, speed, and strength exercises while the control group kept their normal schedule. After gathering eligible subjects, the groups were made, an intervention group doing the structured exercises for the forty-week season and the control group who kept their routine going. The control group was designed by professionals and set to give these athletes the best performance outcome, including the lowered probability of getting an injury either chronic or acute. The results of the study show that the group participating in the intervention experienced 44 injuries while the control group experienced 67 injuries. This can be

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directly related to a well-rounded exercise program. The athletes could still experience injuries within the intervention group by not properly executing the exercises, but it is much less likely.

**Common Dance Injuries**

Moving through space uses the levers, structure, and musculature of the human body, together, to form a plethora of moving parts. These moving parts are all connected via muscles, tendons, ligaments and a thin sheet of connective tissue known as fascia, each of which correlate to a list of potential injuries. While undergoing further research to view the studies that have been conducted relating to dance and injury, I came across more information. A medical doctor and a group of physical therapists conducted a study that "sought to determine functional outcomes in dancers after operative and non-operative treatment for common dance injuries." (Junck 156) They found that not many studies report functional outcomes of dancers prior to injury, which is very different from the general athletic population. They were curious about the absence of data regarding functional outcomes of operative and non-operative dance injuries. This study collected data from 164 of many styles ranging in age from 18 to 77. The subjects represented 210 injuries with abilities ranging from professional dancers, choreographers, dance educators, students and recreational dancers, with professional dancers being the largest group represented. The data gathered in this study shows which injuries are most common among dancers with knee cartilage injury having the highest prevalence. Injuries in this situation may have stemmed from areas the subjects neglected. Knee injuries are often due to lack of strength and flexibility in the surrounding areas, which then can lead to chronic injuries. Other common injuries in the study include Achilles injury, ankle sprain, anterior cruciate ligament injury, patellar tendon injury, and anterior hip pain. Chronic injuries can be solely due to overuse but

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can also be a result of constant improper warm-up prior to movement. Acute injuries can either be due to improper warm-up or are unanticipated. Warm-ups do help prevent injuries like inversion ankle sprains, but do not guarantee an injury free movement session. The structure of ligamentous ankle is setup to allow for much more inversion of the foot than eversion, making it much more possible for the foot to invert while weight bearing, causing an ankle sprain. Viewing this study may give insight to what information will be collected via Dance Warm-up and Injury Survey.

**Survey Findings**

With 86 respondents, the survey yields useful information that, when translated, leads to some findings within the range of Dance and Warm-up. Unfortunately, with the survey platform's restrictions, 86 responses were collected but only the first 40 responses can be shown in detail. This study was made up of 27 subjects from ages 18-24, 11 subjects from ages 25-34, 1 subject age 35-44, and 1 subject age 55-64 most with studio backgrounds. This population could benefit from a larger number of older respondents, who may have been dancing longer allowing for more changes in warm-up and state of their body. This survey gathers information regarding dance training and style background, age, warm-up habits and frequencies, as well as injuries sustained through dance. The goal of this study is to find correlations between respondent's warm-up habits and their injuries to see if there are certain areas that are leading to dancers' injuries.

Most respondents said that a warm-up takes them 10-20 minutes, which is useful and can lower the risk of injury, but a longer 20-30-minute warm-up will ensure there is enough time to reach each subgroup of the workout. Frequency in this situation is just as important as quality.

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Warming up is only useful if done prior to each physical activity. Only 50% of survey respondents said they warm-up prior to dancing while 2.5% said that sometimes, rarely, or never stretch respectively. Gathering data on the types of warm-ups dancers begin with, 27.5% of dancers begin with static or dynamic stretching.

Dynamic stretching to begin is acceptable if your body is completely warm either from a warm environment or previous movement that has been completed recently. Static stretching, however, can cause acute pain in areas overstretched muscle or if done often, can lead to chronic injuries. Looking at areas that dancers incorporate in their warm-up practices, static stretching seems to be the most popular and well known. While static stretching is useful, most misconceive the purpose and intent of the stretch. Stretching isn't what warms your muscles up, therefore it shouldn't be done before warming the muscles up in some other way. Cardiovascular activities are those that increase heart rate and circulation, generating internal heat, also known as warming up. Twenty-nine participants said they include cardiovascular activities within their warm-up. In an ideal warm-up world, cardiovascular activities would be one of the first things executed, preparing the body's muscles, tendons, ligaments, and fascia for the dynamic stretching that is to follow. When comparing types of injuries dancers have experienced, there were twenty-two chronic injuries and thirty-three acute injuries. Dancers could report more than one injury. This information proves useful to all by showing that an improper or underdeveloped warm-up can lead to injuries both acute and chronic. If you experience acute injuries, try changing the layout of the warm-up to give the body the sequencing that it needs. Fifty-four participants changed their warm-up habits because they were either introduced to a new warm-up or gained knowledge on warm-ups through academic studies. Seven participants stated that they

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have changed their structure of a warm-up due to a previous injury. This change is something that can be done easily and as gradual as feels necessary.

While conducting research, questions arose, potentially leading to further research. The survey format, allowed unlimited responses but only allowed 40 subjects responses to be viewed in detail. The site broke down the answers chosen by showing how many and what percentage of subjects selected each response. I was hoping to see each survey from subject to subject to allow me to compare trends. This would allow me to take all subjects that are reporting an acute knee injury and see if there is a certain warm-up habit that most them use. When considering dance injuries, I thought about warm-up but did not consider the possible lack of cool-downs in dancers. The lack of cool-down can lead further problems with not only the structure of the body but also with internal elements. Cool-downs after a workout are designed to return your heart and respiratory rates back to a normal resting state, allow your body temperature to regulate, get muscles back to their length-tension relationship, and prevent venous pooling of blood in the lower limbs. The length-tension relationship is important to allow the levers of the body to function properly with the necessary muscle fiber length. Warm-up and cool down are both very important to maintain this. Cool-downs also prevent venous pooling in the lower extremities which helps prevent faintness or dizziness. Another aspect I am curious about is the age group. Would there be more valuable information with a larger range of subjects' age? I believe that with more participants over the age of 45, there could be a change in data that may help finding an answer to the research question. The survey only had one subject above the age of 45. This could be due to a lower number of dancers at an older age or a lower number of dancers on social media. To adapt to this, a hard copy survey could be an option for those who would like to

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participate but do not have social media or internet access. I believe that having information across the range of ages would create a well-rounded study that would cover all bases in regards to demographics, allowing for the most accurate information. The last area that I am questioning is muscle imbalance. If pain or discomfort is present, it is possible that acute or chronic injuries are not causing pain but muscular imbalance is. With pain in the lower back for example, it is often assumed there was an injury to said area. With muscular imbalance, a low muscle tone in the abdomen can lead to lengthening of the abdominal muscles. When these muscles lengthen, they lower the front of the pelvis, causing an anterior pelvic tilt and creating excess stress on the lumber spine. This excess stress is a similar feeling to a chronic lumbar back strain or structural imbalance at the hips. It is important for dancers to avoid muscular imbalance by maintaining a balance between stretching and strengthening the muscles of the body. Dancers with muscles that have experienced hypertrophy or muscle fiber growth, there is a limited range of motion which in return limits your ability to move your body in certain ways. This is not saying, however, that dancers should avoid a workout. Dancers must find the balance of the right amount of strength and flexibility because without the strength, the dancer couldn't support the shapes being made within their movement. These aspects, with further revisions, could be assessed. The survey distribution method could differ including something that would cater to all age groups allowing for a well-rounded group of subjects. A physical examination could be designed to test musculature of the subjects' body, seeing if the pain in a specific area is due to injury or muscular imbalance.

Warm-ups, although useful, will not solely assist in the avoidance of injury. Conducting this study has shown that there are many other factors that need to be tested and assessed to

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avoid injury. Dancers are still advised to review and research their warm-up habits to adapt them as they see necessary. A proper warm-up is a great place to begin when obtaining a healthy instrument for our movement needs, but through sport-specific exercises, endurance phase or activity and a cool down to stretch the body we can prevent muscle damage, limit orthopedic injuries, and reduce venous buildup.

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