

Dance-A Pathway to Strengthen Bones and Relieve Mental Stress

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Abstract

Several years of research and investigation have established that physical stress stimulates bone remodeling, posture change and affects bone structure and function through our current lifestyle system and practices. Modern exploration has propounded the theory that mental stress influences bone biology, in due course leading to osteoporosis and higher chances of bone fracture risk. This brings about modulation of hypothalamic-pituitary-adrenal axis activity, following the discharge of growth hormones, glucocorticoids and cytokines.

Dance is surely a form of meditation. While dancing, the brain has to harmonize with the body and mind to synchronize between melody and actions. Enjoying while dancing to a desired music helps any person's mind to adhere to the current feeling or moment they are experiencing. This supports in controlling the release of cortisol hormones from the brain that aids minimizing stress and tension levels. "When the body feels good, the mind does too". Dance is a very healing and a healthy way for people to channelize any feeling that they may be experiencing. Dance helps one connect to a constructive atmosphere and acts as an outlet to remove depression. Dance replaces stress hormones with pleasure hormones like endorphins and serotonins.

This paper includes the vital ideology of learning and reinforcement that are known to be effective methods in helping individuals to dance. The paper is an effort to depict the author's experiences about "Dance -a pathway to reinforce bones and relieve mental stress". The research methodologies used are literature survey, inputs in the form of survey and personal experiences of the author.

Methodology to inculcate classical dance as a continuous practice pattern and how to overcome the injuries caused on knee bones due to exertion in dance are also discussed. When a person dances continuously, we can see how dancing will naturally develop and increase one's self confidence and self-esteem, it will assist in strengthening your bones and muscles. Continuous practice and following a routine of physical activity and exercise can help prevent illnesses such as diabetes, high blood pressure, and heart disease and reduce the risk of osteoporosis, hence the bones become stronger.

Keywords: *Stress Hormones; Bones; Overcome Knee Injuries; Classical Dance; Pleasure Hormones*

Introduction

Bone tissue is constantly remodeled to maintain a healthy balance and adapt to changing environmental factors. Instability in the process results in reduced bone mass and an increased risk for fractures.

The succeeding reaction that occurs when we are stressed, is our bodies release a "stress hormone" called cortisol¹. In order to help bring our bodies back in balance, our system releases calcium from our bones and teeth, the calcium helps neutralize the PH balance of the cortisol, helping restore our bodies to neutral. Every time we do this we use up the stored calcium from our bones. The easiest way is by including more dairy food into our diet plan. Bones tend to become porous and brittle when stress becomes persistent, our diets cannot replace the calcium depletion so our bones are constantly being deficient of calcium. Often stress causes us to eat more, eat the wrong types of foods, skip a workout, or interrupt sleep patterns, thereby adding a blow to our physical functioning of the system and our bones.

¹http://cejssm.usz.edu.pl/wp-content/uploads/02_gurusathya.c.pdf

The main factor that can be done to relieve stress and help strengthen ones bones is 'Dance' which is a great stress reliever.

Purpose of the Study

This purpose of this study hopes to provide evidence to establish dance as an effective medium to reach out to people in various fields and how it reflects in the daily living of a person and relieves them of the mental stress that impacts the bones and also how dancing strengthens the bones for a longer period of time.

Hypothesis

The hypothesis tested in this study is based on "Dance-a pathway to strengthen bones and relieve mental stress"; it deals specifically with how dance acts as stress buster and dance also increases core strength which can improve balance, coordination, and posture thereby strengthening the bone tissues.

Materials and Methods

Initial research was done at libraries and through internet referring to books, journals and magazines to get inputs about meaning of stress, causes for stress, impact of stress on bone.

Real life experiences in teaching and conducting dance sessions for more than twenty years have revealed positive results on dancers, are being projected in this paper.

Limitations of the Study

While practicing the classical dance form there arise limitations at every stage of learning. One becomes a pro or perhaps great dancer over the course of time, not immediately or overnight or in a few weeks. So giving oneself time is key factor. Enjoy the time it takes and the journey of learning, rather than wishing to be an expert before you are ready. It takes time to learn to dance. This in turn is a major stress factor on amateur dancers, overcoming this phase of learning is a big challenge to be addressed by the instructor.

When learning, especially involving mind-body coordination, it is much better to practice 'little and often' rather than lots all at once. When we practice for too long the brain becomes tired after as little as 5 minutes. During intensive practice an effect on muscles, tendons and ligaments that probably have never been stressed is experienced, and it is easily causes wear and tear of the muscles, bones and connective tissues^{2,3,4}. Serious and professional dancers, have added anxiety while dancing like the movements that are recurring, stiff and hard stamping of sole of feet, leaping movements, staying in the half sitting positions during basic lessons of dance classes can lead to stress fractures if the students do not have adequate rest between classes. Eating healthy and nutritional diet is very much essential for dance students to promote good bone health.

²<https://www.businessballs.com/health-and-wellbeing/dance-history-theory-benefits-dance-teaching/>

³<https://www.justforkix.com/dance-talk/dancer-health/strong-bones-for-healthy-dancing>

⁴<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5410657/>

Research Questions

- How does dance impact on the knee bones?
- How to safeguard ones potential talent?
- What are the knee injuries developed while dancing?
- What are the key nutrients for bone development?

Results

Dance and impact on knee bones

Knees are simple, but one of the most complex joints of our body, it's the main connecting portion from our feet to the rest of the body structure. Dancers use knees a lot, and it helps one to improve concentration, memory, build flexibility and strengthen spine and back. The foot-tapping movements acts like an acupuncture, in turn helps to influence all the points of the body connected to the feet.

Dancers often execute several jumping, foot tapping movements during a single dance class, so it's no surprise that knee pain may be a common problem. Dancers from various styles presume pain and even injuries are part of the work, but knee problems are neither predictable nor everlasting.

Here are of the most commonly affected knee injuries in dancers and how to avoid them from occurring:

1. Patello femoral pain syndrome
 - a. Symptoms: Tenderness around beneath the kneecap. Pain is aggravated by dancing or sitting for extended duration.
 - b. Kneecap pain is frequent among dancers and dance students. There is a popping or cracking sound under the patella when bending or straightening the knee. Many young dancers get injured because they have a tendency to turnout their knees that put abnormal stress across the joints, particularly the inner knee.
 - c. Prevention: Turning out the knees with control is essential. Strengthen core muscles; flex hamstrings with focus on thighs, glutes, hip and maintaining correct placement of the feet in alignment to the knees.
2. Meniscal Tear
 - a. Symptoms: Pain and swelling aggravated by a section of cartilage in contact with the joints
 - b. Meniscal or cartilage tears are a familiar injuries seen in dance. It often occurs after execution of a jumping movement or a sudden entwining of the knee. Constant stress on the joints and twisting movements causes damage to the knee cartilage.
 - c. Prevention: Sitting on a high enough surfaces and swinging the legs reboots the knee.

3. Jumper's Knee

- a. Symptoms: Swelling of the patellar tendon. Pain intensifies while running or jumping and is usually felt at the bottom of the kneecap
- b. Dis-configuration of the feet is a main reason which amplifies the strain on muscles around the knee. Dancers who have knock-knees or bowlegs are more liable to patellar tendonitis.
- c. Prevention: Instead of forcing the feet, rotate the legs outward from the hip. In a ballet or bharatanatyam class the urge to attain the perfect position can be altered. Use muscle control to maintain natural rotation and making sure that the knee is aligned over the foot as you go through demi-plie or aramandi.

4. Osgood-Schlatter Disease

- a. Symptoms: Starts with increasing pain at a stage in movement. A noticeable bump develops on the tibia. This is caused by due to excess usage of the quadriceps, which straightens the knee, adding strain on the patellar tendon which is attached to the growing tibia.
- b. Young dancers can develop Osgood-Schlatter disease, which may cause a painful bump to form below the knee on the front of the tibia (shinbone). It typically affects growing dancers because the bone is not yet strong enough to withstand the force of the quadriceps pulling on it.
- c. Prevention: Osgood-Schlatter disease usually heals after the growth of a child has stopped. Dancers should stay away from heavy bearing through the pain, and it can worsen the irritation and the disease can extend for longer time.

5. Anterior Cruciate Ligament Tear

- a. Symptoms: Exhaustion is a key reason and damage occurs after a long performance session. The effects are serious once the damage is done though Anterior cruciate ligament (ACL) injuries are uncommon in dancers.
- b. Bumpy landings are a main cause of ACL injuries. The ACL stabilizes the knee, a partial tear does not necessarily require surgical repair, but may result in many months of rehabilitation.
- c. Prevention: The dancers can do strengthening exercises, floor exercises and stretches for building stamina and strength on their knees.

Routine to overcome the injuries caused on knee bones due to exertion in dance and how to safeguard talent?

Dancers are used to dancing in spite of soreness on knee, but exerting through pain can lead to severe consequences. Physiotherapy, icing and MRI ensures correct diagnosis of the knee injury caused. These are some of the stretching exercises that can help dancers to overcome injuries and retain their talent:

1. The flexibility of a dancer's muscles allows the legs to extend fully, especially when a wide range of motion is available. Elasticity is achieved by maintaining a stretch position for at least 15 seconds and ideally for 30 seconds or longer. Make sure to stretch thoroughly before any attempt at leaping movements. Dancers must do bending exercises, floor exercises to maintain a good balance of knee.
2. Practicing Natyobics, Suryanamaskar and Yogic Movements will help strengthen core muscles and makes the knee joints more fit and flexible.

3. The energy for a dancer comes from the leaping movements allowing the entire body to travel as a whole entity. Positioning of the body is a key factor in overcoming the injuries.
4. Dancers at all levels of learning beginners or in advanced levels of learning, concentrate in the choreography process and fail to remember to hold themselves appropriately when dancing. Some techniques to follow are:



Figure 1

- a. Lifted chin, elongated neck, eyes off the floor
- b. Shoulders pressed naturally down and back
- c. Rib cage closed
- d. Stomach muscles engaged
- e. Hips held tight
- f. Feet parallel
- g. Knees relaxed, not locked

While knee injury rates are high among dancers, there are things one can do to keep knee problems from worsening:

- Modifying the training during growth spurts and allowing body to fully recover after an injury.
- Kneel near a wall and place a cushion or pillow under your left knee. Face away from the wall and perform forward lunge at a 90-degree angle.
- Keep the legs parallel to hip level and place the left shinbone against the wall.
- Keep your back upright, pelvis and glutes tight.

- Position the feet until a stretch is felt on the front side of the left hip and thigh.

“You have to get smart about how you take care of yourself;” “Talent is not enough. You have to protect your talent”. Says Dr. Martin.



Figure 2

Dance alleviates mental stress and relieves stress on bones

When a human body undergoes sudden threat and face traumatic situations it releases stress hormones such as adrenaline and cortisol. Adrenaline increases the heart rate and elevates blood pressure. Cortisol, the principal stress hormone, boosts glucose level in the bloodstream by altering the immune system responses and restrains the functioning of the digestive system, the reproductive system and growth processes. This natural alarm structure corresponds with the parts of the brain that controls mood, motivation and fear.

An overexposure to cortisol can disturb the entire system and rhythm of the human body's creating an increased risk of many health problems, including:

- Anxiety and Depression: When you have anxiety you experience long term stress and as a result your body continually produces cytokines inflammation caused by these molecules causes your joints to swell and ultimately leads to more pain while executing your movements.
- Digestive problems, Headaches, Heart disease, Insomnia, Weight gain.
- Memory and concentration impairment.

Dancing surely reduces the levels of the body's stress hormones; it also stimulates the production of endorphins, chemicals in the brain that are the body's natural painkillers and mood elevators.

With dance when one exercises, the body becomes flexible and relaxed. This helps to beat obesity directly and immediately focus on weight loss. The happy hormones like endorphins, dopamine and serotonin are released after constant dancing or work out regime which beats depression.

Weather, food and seasonal allergies, vitamin D deficiency, smoking cigarettes and alcohol consumption are also reasons for stress on bones. Constant stress and the general feeling of being low makes people seek comfort in junk foods which aren't rich in calcium; magnesium causes stress on bones while doing any kind of physical activity. The wrong food choices translate into inadequate bone nutrition. Besides, the irregular timing of meals and multitasking like texting or working while eating seriously hinders optimum digestion. Of course, a regular intake of vitamin D3, obtained from the morning sun, is important as it helps in the utilization of minerals in the bones. The solution to this problem lies on refurbishing one's lifestyle.

Key nutrients for bone development

A variety of nutrients work together and sustains the growth and safeguarding of bone tissue:

- Calcium is critical to bone health since bone is composed mainly of a calcium-phosphate; sources of calcium include dairy products (milk, yogurt and cheese), calcium-fortified juices or plant milks, some types of tofu, certain vegetables (collard greens, kale, broccoli, bok choy), oranges and almonds.
- Vitamin D is essential to bone wellbeing as it is needed for the absorption of calcium from the intestines and plays a key role in bone mineralization. Vitamin D is present in foods including fatty fish, egg yolks and fortified foods, like milk and cereal. It is also made in the skin when exposed to sunlight.

Behavioral factors contribute to the emotional benefits of exercise, as the strength and stamina increases, ones self-image perks up. A sense of mastery and control, pride and self-confidence is achieved. The transformed dynamism and liveliness helps one accomplish in various tasks, and the discipline of regular exercise will help achieve significant lifestyle goals.

The recent discoveries about the effects of stress on health shouldn't leave one worrying. We now understand much more about effective strategies for reducing stress by

- Maintaining a healthy social support network.
- Following regular physical exercise pattern.
- Receiving an enough sleep each night.

Dance can be a healing and a healthy way for people to channelize any feeling they may be experiencing. Dance acts as an outlet for ones sentiments and bonds to a positive environment. This paper incorporates the basic principles of learning and reinforcement that are known to be effective methods in helping individuals to dance in both solo and group sessions. A practice pattern with respect to Bharatanatyam, Indian classical dance is listed below; however this is applicable to all dance forms.

Techniques to inculcate classical dance as a continuous practice pattern:

1. Focus on Strengthening and Stretching muscles - Warm up sessions, Yogic Movements like Surya namaskar and imbibing the different Asanas in Bharatanatyam.

2. Basic dance movement - Learning the basic adavus in Bharatanatyam, mastering the Aramandi posture, learning the Shiro, Drishti, Greeva, Mandala, Pada, Chaari Bhedas. Understanding Theoretical Aspects of Bharathanatyam, Understanding Facial Expression through Theatre.
3. Creative Dancing
 - a. Learning from Kalaripayattu-Martial Art of Kerala.
 - b. Folk Dances of India -Kalbelia, Garba, Koli, Bhangda, Bihu, Lavani.
 - c. Zumba Techniques.
 - d. Exploring Folk and Freestyle Dance.
 - e. Creative Expression- Choreography Techniques.
4. Continuous Knowledge Sharing on dance related topics
 - a. Dance Make-up and Hairstyle.
 - b. Dance Saree Drapery and Dance Charades.
 - c. Taalam Concepts and Writing Articles related to Art.
 - d. Knowledge sharing and knowledge transfer through power point presentations on complex topics.
 - e. Mythology Colouring with imagination of the Stories.
 - f. Classical Video Screening of Stalwarts in the Field.

Bharatanatyam involves two positions called aramandi (half sitting) and muzhumandi (full sitting) that involves turnout and knee bending. An intensive stretching exercises before and after dancing is very important to avoid knee injuries. As one continues to dance, the stretching exercises will make it easier to become more flexible. With this increased flexibility the dancer will notice to have a wider range of motion and eventually dancing will become much easier.

Methodology is the basis of all basics of dance, positioning the body correctly while performing, and proficiency in performing. A focused system of learning across varied areas of dance makes it aesthetically beautiful and safe.



Figure 3: Exploring folk dances of India.



Figure 4: Dance make-up learning.



Figure 5: Mythology Colouring with imagination of the stories.

Discussion and Conclusion

Dancers expend years of training to master talent and technique that expose bone to a large amounts of stress. Overuse and repeated stress on the knees joints causes bone and joint injuries resulting in abrupt trauma, a fracture or cartilage tear. People in good physical shape and high immunity levels have a natural tendency to automatically repair the bones and retain bone strength. Dancers involved in continuous, meticulous dancing, exercise too much and eat less; this is a risk for knee joints and develops bone stress injuries. All dancers need good bone health to stay active and healthy throughout their dance career hence the need to focus on maintaining a good bone health is the need of the hour.

Dance training requires a unique sustaining system to monitor dance students' growth and development focusing on bone density. With direction from experts, coaches and dieticians on strength and conditioning, dancers of all ages will benefit and helps in maintain a healthy and fit physical body.

Budding classical dancers can be enlightened and taught dance in a way that helps them minimize their short-term injury risks and make them realize the benefits of long-term health effects. Citing examples and talking about real life stories about bone stress fractures may be effective on the young dancers' mind and centralize the teaching practice in a healthy way. Dancers, their family members, and their teachers should create a culture amongst the students by fostering a culture of healthy relationships with food and body image, within the dance training environment. Dancing has the capacity to contribute to new healthy habits. Teenage girls who were struggling with problems like neck and back pain, stress, anxiety, and depression, improved their mental health and reported a boost in mood after they took the dance classes; the positive effects lasts longer.

The rhythm of dance can positively impact ones mood by lowering stress and anxiety levels. Dance as an exercise enhances confidence by teaching to trust our instincts and impulses. In group learning sessions, the act of collective movement decreases feelings of isolation and assist students in developing healthy bonds. The art of self-expression has the power to point one in new directions in terms of thought and behavior. Dance is a niche form of psychotherapy that uses bodily movements to heal and integrate the mind, body, and spirit of an individual [1-17].

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