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# Learning Dance: Defining Efficiency and Precision Through Animation

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## Abstract

Bodily efficiency and precision are crucial components in the execution of ballet technique. In conjunction with traditional studio ballet training, three-dimensional animation can showcase correct body placement, posture, and alignment during the execution of ballet technique helping dancers prevent injuries as well as maintain body longevity. Having digital three-dimensional animation as a pedagogical tool can help teachers, students, and parents see how steps should be executed from different angles. Such technology can also bring students' attention to common mistakes without the risk of repeated human error. Dancers can compare videos of three-dimensional animated figures showcasing correct ballet technique to videos of themselves in order to see where they may be misaligning their bodies and causing potential injuries or bad habits. This pedagogical tool can also be helpful for those who have limited access to taking ballet classes but would still like to learn in an efficient and safe manner.

## Introduction

Digital three-dimensional animation can be an important tool in helping dancers to gain precision and efficiency while dancing and in order to prevent injury, preserve their bodies, and support health throughout their careers. This is a significant technological development because dance has become more accessible through the internet and dancers can easily get injured if they do not execute movements accurately.

Ballet is a specific and precise dance technique and if performed incorrectly, can cause injury. In the journal *Potential Predictors of Injury Among Pre-Professional Ballet and Contemporary Dancers*, it is mentioned that there are roughly 22,000 injuries annually experienced by children in dance ages 3 to 19 (Yau, 53). Some of these injuries could be due to a lack of knowledge of the body by the student or by the teacher distinct from the mind also known as somatic principles. In the article *A Brief History of Somatic Practices and Dance: Historical Development of the Field of Somatic Education and its Relationship to Dance*, Martha Eddy explains that the term "somatics" was coined by Thomas Hanna in the 1970s, which led to the

formation of Somatic Education by philosophers and scholars of the late 20<sup>th</sup> century. Eddy also explains how dance professionals have created the field of Somatic Movement Education and Therapy (SME&T) which involves “‘listening to the body’ and responding to these sensations by consciously altering movement habits and movement choices” (Eddy, 7). Three-dimensional digital animation can be used to help reduce the number of injuries in young dancers by helping to increase and deepen somatic awareness and knowledge of the body. As online dance education becomes more abundant through applications such as YouTube, the need for precise knowledge of correct body alignment and efficient posture becomes even more crucial. Designing and creating pedagogical dance videos using digital three-dimensional animation is one way to demonstrate and explain movement that is technically correct, safe, precise and efficient. Creating movement digitally may also reduce the risk of demonstrations containing human error. Three-dimensional digital models can also be viewed at any angle or speed and can be paused or rewound.

### **Defining the Need for Precision and Efficiency in Dance**

According to the journal *Epidemiological Review of Injury in Pre-Professional Ballet Dancers*, young ballet dancers may be “...at risk because of underdeveloped coordination, technical skills, and spatial perception” (Caine 141). These dancers may not have the knowledge of somatic principles yet to protect themselves from getting injured while dancing. This article also states that “...early signs of osteoarthritis of the knee, hip, and first metatarsophalangeal joint (big toe joint) were present in a cohort of professional ballet dancers, ages 19 to 36 years...” (Caine 141). If young dancers have more access to knowledge of somatic principles applied to ballet including correct alignment and efficient range of motion, there could be a potential reduction in bone, joint, muscle, and ligament issues later in the dancers’ careers.

Part of dance training includes dancers repeating movements to perfect their technique. This practice of repetition can be very stressful for dancers’ bodies. In the journal *Injuries in a Professional Ballet Dance Company A 10-year Retrospective Study*, it is explained that “musculoskeletal injury is a sometimes forgotten consequence of repetitive extreme movements applied to the spine and extremities” (Ramkumar 30). Injuries to the lower spine may occur when dancers overly hyperextend their lower backs or if they land jumps on straight legs. Injuries to the knees can occur when dancers force the outward rotation of their hips past their

natural range of motion. Injuries to the ankles and feet may occur if dancers do not stand with their weight evenly distributed between the toes, the ball of the foot and the heel.

### **Learning to Dance Safely Through Animation**

Digital three-dimensional animations can showcase the correct placement and alignment of dance steps at any speed or angle. An animated video can be paused at any point to see where the body should be positioned at a certain point within the sequence of the movement. Also, a digital three-dimensional animated video can feature what the body should *not* look like during a movement, illustrating common mistakes that dancers make while executing certain movements. Improper movement is difficult to present; if the dancer is demonstrating “what not to do”, she or he could risk injury. However, it is important for dancers to be aware of how actions such as hyperextending the lower spine or forcing rotation of the hips can be dangerous for their bodies. If dancers do not learn how to safely practice technique from a young age, they will not be able to maintain a body that is capable of dancing throughout life.

Digital three-dimensional animated pedagogical videos for dance can also be helpful for parents of young dancers who do not know how dance movements should be correctly executed. Parents can watch the videos with their young dancers to see how the body should be placed during the execution of movements. This can help parents objectively become more aware of what their dancers might be doing incorrectly to prevent potential injuries.

The first dance-specific online class was developed by Iris Garland and Lisa Naugle in 1997 and was based in Lifeforms animation software which was used to develop choreographic animations. (Parrish 169). Since then, dance courses online have become more abundant and the use of technology and the internet has increased the number of people interested in learning dance. Digital three-dimensional animated videos for dance pedagogy can shift how dance technique is acquired and perfected and can lead to more accurate, methodical and secure movement.

### **Process**

The digital three-dimensional animated video I created demonstrates the correct and incorrect ways of executing four different ballet steps. The animation first illustrates the correct positioning and alignment of the five positions in ballet including first, second, third, fourth and

fifth position. These positions are fundamental and are used consistently throughout a ballet class. Next, there are animations of the most efficient as well as incorrect ways to execute: a turned-out pirouette (turn) from a fourth position, battements (kick) to the front, side and back, a rond de jambe (circle of the leg with the toe connected to the floor), and a sauté (jump) from first position.

Although this video depicts only four ballet steps, digital three-dimensional animation has endless possibilities for what can be created and presented. The concept of animated pedagogical videos for dance can be used within current delivery methods of online dance education or as supplemental materials for studio dance classes. This digital tool can also be helpful for those who cannot afford to take a dance class at a studio.

In time and with sufficient funding, animated pedagogical videos could be further developed to depict the specific and efficient execution of an entire ballet, modern, jazz or other dance class. Also, the character rig which is the skeletal framework used to create the animations, could potentially be created to be more anatomically correct and specific to either a male or female body or varying body types. If dancers could view precise ways to execute movement based on their particular body shapes and musculatures, they could visually interpret their proper turn-out and range of motion so that they could replicate movements in ways that are possible, efficient and safe for their unique bodies.

### **Conclusion**

As global cultures, including the dance world, adapt to digital technology and the internet, it is important that the media presented through these realms are accurate. Three-dimensional digitally animated pedagogical videos for dance can help dancers from all over the world learn dance techniques while also protecting their bodies from potential injuries. This tool can be used as visual supplemental material both in and outside the dance studio to help dancers of all ages and skill levels. In conjunction with dance classes in a studio, these videos could help increase access to knowledge of somatic principles of the body that young dancers can use for the rest of their dance careers.

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