A Biomechanical Analysis of the Jeté Dessus Using Dartfish Motion Analysis Software

Introduction

Beatrice Turrubiartes was enrolled in the KIN 417 class, Analysis of Movement, and in one of the KIN 417L classes (Analysis of Movement Lab, which is co-requisite with KIN 417) during the Summer II 2009 term. Her term project, A Biomechanical Analysis of the Jeté Dessus, was completed in her Analysis of Movement Lab, but it required her to also utilize the knowledge of biomechanical principles which she learned in the Analysis of Movement class. The biomechanical principles, which are discussed in her project, are derived from Newton’s Laws of Motion and help us to understand the forces that produce and affect movement. The uniqueness of her project is that she was able to scientifically analyze the performance of the jeté dessus, which is a leap in ballet, by using Dartfish Motion Analysis Software, which is the latest and most sophisticated computer video analysis software being used. This software is used by teachers, coaches, physical therapists, occupational therapists, and sports medicine specialists for detecting errors in a person’s movements, calculating angles, times, distances, and velocities, and for providing feedback to the performer through the utilization of drawing tools and production of a media book on a DVD. Over 95% of the United States Olympic Teams use the Dartfish Motion Analysis Software for improving movement performances. Stephen F. Austin State University is among an elite group of universities in the United States that has this sophisticated equipment.

Abstract

During a five-week course in the summer of 2009, Dr. Sandra Cole of the Kinesiology and Health Science Department supervised students in analyzing chosen movements using the latest computer version of Dartfish Motion Analysis Software. In this project, a leap called jeté dessus from the ballet genre of dance was analyzed by Beatrice Turrubiartes.

Analysis was performed using a videotape of the step being executed by a dance student. Creation and format requirements of the videotape were very specific in order to be recognizable to the software. The student was instructed to wear a leotard and tights, enabling all joints and body parts to be clearly visible, and to warm up. Meanwhile, the camera, containing a MiniDV cassette tape, was secured to a tripod and set up in a position where it was perpendicular to the plane of movement being videotaped, in the middle of the range of movement while being as far away from the performer as possible, and level in all directions. The student was then instructed to stand in her performing space holding a scaling rod, an object of known length which allows the software to recognize distances, and was recorded for ten seconds. Afterwards, the student was videotaped performing the jeté dessus. Four trials were recorded, with five seconds added just before and after the execution of movement.

Once the videotape containing the recording of the scaling rod and four trials of movement execution was properly produced, it was then imported into the computer. The camera was connected to the computer and, after opening the Dartfish program, it was set to VCR. Importing began after the cassette tape was inserted into the camera and advanced to the correct location of the recordings, beginning with the scaling rod. By clicking on the Import Video icon and following subsequent directions, the presenter was able to separately import all five recordings on the cassette tape, which she could then review in the Dartfish program on the computer.

Only one recording of a jeté dessus was analyzed: the presenter chose one in which the student performed an average execution. By using the capabilities and tools provided by the Dartfish Motion Analysis Software, she was easily able to distinguish the exact path of motion of the performer. For example, the presenter was able to deaccelerate the speed of the video, allowing her to clearly see the student’s position at the peak of the leap in the air. These tools allowed her to discern both strengths and weaknesses of the performance, which she was then able to either praise or correct by providing comments about the performance. Drawing upon the presenter’s years of training in ballet and by applying biomechanical concepts of physics to this particular movement, she was able to make suggestions for improvement to the student using sound scientific as well as artistic reasoning.

Methods

• A videotape of a jeté dessus was created requiring strict instructions.
• The videotape was imported, requiring strict instructions, into the Dartfish Motion Analysis computer software.
• The performance was critically analyzed by utilizing the drawing tools (see pictures at right).
• Conclusions were drawn by applying biomechanical principles and personal knowledge of ballet kinesiology (see comments beneath pictures).
• Results were provided to the performer by utilizing the drawing tools to illustrate errors and producing a DVD media book.

Ballet Terms

Leap. Rising movement in which a dancer leaves the floor from both feet and lands on one foot (differing from a jump).
• Turnout, refers to the rotation of the legs and feet outward.
• 5th position, a specific ballet position of the feet.
• Plié, a bending of both legs at the knees. A demi-plié is a half-bend.
• Dégagé, One foot quickly brushes slightly off the floor.
• Sissle: Unhealthy action of inverting the foot when pointing.

Summary

The Dartfish Motion Analysis Software enabled the presenter to better view the performer’s movement than with the mere naked eye, allowing her to evaluate the performance using a sound scientific basis and, at the conclusion, offering more detailed advice for improvement to the dancer. The images presented here were used to publish a DVD media book, which was then given to the dancer as a permanent resource of the instructions and reasoning of performing the jeté dessus correctly in a manner that prevents injury.