

Using Technology in Coaching Gymnastics Hardware & Software Options

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In this second of three articles about the use of the new video capture systems in coaching gymnastics, the specifics of hardware and software setup are described. This description should be considered a "bare bones" listing of what is needed for basic analysis. Systems are becoming more and more sophisticated and options are expanding daily.

As discussed in the previous article in the August 2002 issue of *Technique*, technology is becoming increasingly important for modern coaching as biomechanical and physiological testing and monitoring systems are becoming more accessible to the common coach. However, many coaches are reluctant to enter this "new age" of coaching, for a multitude of reasons that may include 1) lack of sufficient understanding of the benefits of the technology in coaching their athletes, 2) inadequate knowledge regarding the "nuts and bolts" of the equipment required to perform such analyses, and 3) insufficient time to devote to the initial set-up and learning processes involved in utilizing technology such as motion analysis. Younger coaches just entering the profession often already possess these skills by virtue of their exposure to similar video editing systems in high school or in their private homes. What exactly do you need to have in order to setup a motion analysis system in your gym?

Computer Requirements

It used to be that if large amounts of space or high speeds were needed, (which video files often do), a desktop computer was your best option. However, today's laptop models are very advanced and are really the only choice for making your system portable anywhere in the gym. I have found most video editing software can be run on Windows 98 OS (operating system) or newer, however some are requiring Windows 2000 or XP. Generally a laptop with an Intel Pentium II or better CPU (Central Processing Unit) will suffice along with 128-256 MB of RAM. Another handy option is a CD-RW, that will allow you to write the video analysis or clip to a CD, which you can then sell/give to mom and pop (or grandma and grandpa or whomever...), give to the gymnast to review on her home computer, or use as a college recruiting tool. If you want to add voice-overs or verbal comments to videos or CD's, then you will also need a microphone.

Video Capture Cards

A video capture card is a device that grabs pictures from your video camcorder and transforms them into a language that the computer can understand and read. If buying a new laptop, you can request an internal video capture card to be included in your computer. If you do not have a computer with video capture capability already



Figure 1



Figure 2

[missing]

Figure 3



Figure 4

residing within its structure, you can purchase one of many types of external video capture devices. These devices may plug into the PCMCIA (Personal Computer Memory Card International Association - impress your friends with this bit of mumbo-jumbo!), or USB (Universal Serial Bus - Figure 1) ports (i.e., connections) of your computer. Some external card options include OrangeLink (Figure 2) and Dazzle. They range in price from about \$69-\$500. If you are spending more than \$150 you probably are spending too much for basic video capture needs.

If you have an internal video capture card, you will have a "video in" port on your laptop. This is where you will insert the cable that links your video camcorder to the computer. An external card will have a similar port along with a cable (included with the device) that will insert into your video camera. Figure 3 shows a complete system including a laptop, external video capture card (PCMCIA type), tripod, and digital camcorder. In choosing a video capture card, internal or external, you will need to be sure that the card and camcorder type are compatible. That is, if you have a digital video camcorder then you will need to be sure the video capture card is designed to capture from a digital camcorder, and vice-versa if you are using an analog camera such as VHS or Hi-8 you'll need an analog-type video capture device. You will also need to ensure that the video capture card will work with the software you choose (see below). Finally, video capture cards are often specific to MAC or PC. Be sure that the device you buy is the correct one for your type of computer.

There are several types of cables that you may see, specific to your camcorder. Analog systems may have RCA (Figure 4) or s-video plugs (Figure 5), while digital camcorders often use Firewire (also listed as IEEE-1394 or iLink, see Figure 6), but may also have analog plugs as well.

Video Camcorders

There are many options for video camcorders. Most gyms probably already have one available that will be sufficient for video capture and motion analysis. The best options are any number of digital video camcorders available (\$500-\$2500+). Digital video cameras (Figure 7) will give you a superior picture to that of conventional camcorders and are often smaller. Other camcorder options include VHS, S-VHS, VHS-C, Hi-8 (Figure 8), and 8-mm camcorders, all of which provide outputs that are analog, rather than digital. The purpose of a capture card is to transform the analog signal into digital language that the computer can read. Hi-8 images are 50% sharper than VHS and 8-mm camcorders and in my opinion offer an image that is nearly indistinguishable from digital. I have conducted many analyses using various analog camcorders and they serve their purpose just fine. Whichever camcorder you choose, you will need to ensure that the shutter speed is at least 1/1000 of a second. The higher the shutter speed you can use, the better the image quality, however higher shutter speeds require much brighter lighting conditions in the environment. You will also need to purchase a tripod to mount your camera, or have a stable surface



Figure 5



Figure 6

[missing]

Figure 7



Figure 8

upon which to place it. Tripods can be purchased for as little as \$20.00 at your local camera store.

Software

Finally, you need to have some sort of software (computer program) that will take the images from the capture device and allow you to manipulate and analyze them into something meaningful. The software programs allow you to manipulate images, draw on the video to accentuate positions, and even perform simple quantitative measurements such as angles. Most software options allow you to split the screen and simultaneously show two (or more) different videos, perhaps of different trials of the same gymnast, or an expert gymnast versus a beginner. This is where motion analysis becomes very advantageous to the coach and gymnast. While a coach can use his/her eyes to observe technique errors in performance, the gymnast must rely on the coach's ability to translate what he/she sees to what the gymnast thinks she is doing. The software allows the gymnast to see what the coach sees, and provides a visual image of the technique corrections that are desired.

While there are a multitude of software options available, you will be best advised to purchase a software system that is designed specifically for analyzing sport motions. Listed at the end of this article are the web-sites of several software options specific for analyzing sport motion. If you are considering purchasing a system for your gym, or are simply curious, I encourage you to visit several of these sites. Many have free trial downloads and all display specific hardware requirements compatible with their software. It is important to be sure that your software choice will communicate with your capture device. I highly recommend that whichever software option you choose, that you purchase the recommended video capture card for that software. Software manufacturers test their product with particular capture devices to ensure that they recommend the device that functions the best with their software. At the very least, when purchasing the software inquire as to whether or not your software will be compatible with the device you intend to purchase.

You can also capture video from your VCR or a TV monitor, provided your capture device has an analog input (such as composite video or S-video). This will allow you to create files of expert gymnasts performing certain skills for comparison with your own gymnast's performances, or to create a master library of skills as examples for demonstration.

In the final article, several specific uses of motion analysis technology will be displayed and discussed to provide the coach with a broader understanding of the power of technology, and hopefully motivate the coach to action in acquiring and utilizing a system.

Software Options for analyzing Video Performance

- Farwire - www.farwire.com
- DartFish (DartTrainer) - www.dartfish.com
- Competing EDGETM - www.competingedge.com
- HU-M-AN (more advanced analysis) - www.neatsys.com
- Pro-Trainer - www.sportsmotion.com
- siliconCOACH Sport - www.siliconcoach.com
- SMART (Sports Motion Analysis and Video Review Tool) - www.eci-soft.com
- SportsCad - www.sportscad.com