Video Analysis and Application in Sport

KIN 856 – Physical Bases of Coaching

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Why use video?

- Video archives
- Gain insight into performance
  - See “new” things
- Directly impact athletes
  - Feedback/Motor learning
  - Technique
- Linked into the “critical questions” you want to answer

Goals of this presentation...

- General Principles
- Overview - ways to use video in sport
  - Basic to complex
- Equipment & technology
- Pros/cons
- Video examples
General Videography Principles

- Know what you want before you film
  - What do you want to do with it later?
  - What angle should you use?
  - What equipment will you need?
  - Know capabilities of your “system”
  - What format do you need?
- Maintain consistency
- Lighting and camera settings

Qualitative vs. Quantitative

- **Qualitative** – analysis related to the quality of the athletic performance.
- **Quantitative** – analysis related to the “quantities” associated with an athletic performance
BUT, Don’t have preconceived expectations...

- “Inattentional Blindness” – if you’re looking so hard to find something, you will often overlook what is actually there.

- Depending on how you use video, you will have the opportunity to see things that you otherwise might not with the naked eye.

Qualitative: Basic I

- “Available” video

  NEEDS
  - Media
    - Recorder/ Player

  PROS
  - Inexpensive
  - Fast and “easy”

  CONS
  - Right view?
  - Right athlete?

Qualitative: Basic II

- Record your own video

  NEEDS
  - Camera, media, player

  PROS
  - Relatively inexpensive
  - Fast
  - Focus on what you want

  CONS
  - Limited views?
  - Consistency
  - Logistics (e.g. power)
Sliding Sports: Technical Eval.

**QUESTION 1:**
How do we best prepare for the track in Vancouver?

**QUESTION 2:**
Can we improve our ‘driving technique’?

Bobsled/ Skeleton: Turn by Turn Analysis

Point of View Video
Can you trust your eyes?

Qualitative: Computer-Based Analysis

- Many programs that allow you to play (e.g., Windows Media Player) or “manipulate” video (e.g., Dartfish)

  - Exercises:
    - Direct import into Dartfish
    - Frame-by-frame analysis
    - Side-by-side athlete comparison
    - Simulcam function
    - Stro-motion function

  - Audio commentary
  - Key Frames/ Positions
  - Limited quantitative analysis

Video Comparison
**Thoughts on Computers**

- **Processor Speed**
  - Minimum 3.0 GHz, but do your homework

- **RAM**
  - Minimum: 512 Mb

- **Video Card**
  - 128-256Mb of memory

- **Ports**
  - IEEE 1394/ Firewire ports

- **Hard Drive**
  - As much as you can afford
  - Also removable storage options

**Notes on File Types**

- **CODEC**: Compression/Decompression algorithm

- **DV**: Digital Video
  - Uncompressed, high quality (1Gb/5 min)

- **AVI**: Audio-Video Interleaved
  - DV-AVI: full quality video

- **MPEG**: Moving Picture Experts Group
  - MPEG2: various levels of compression
  - MPEG4: hard drive cameras, streaming

- **WMV**: Windows Media Video
  - Various levels of compression

- **Quicktime**: Apple/Windows
  - .MOV Extension

**Choosing the Right Camera**

- **What Media?**
  - Mini-DV Tape
  - Mini-DVD
  - Hard Drive

- **Definition**
  - Standard Definition (SD)
  - High Definition (HD)

- **Shutter Speed**
  - 1/1000 or greater
Qualitative: High Speed Video

- Added level of detail
  - Performance analysis
  - Injury evaluation
  - Equipment performance

- PROS
  - Great detail
  - Pretty cool

- CONS
  - Cost
  - Equipment
  - Utility?

Casio EX-F1 High Speed Camera

Bobsled/ Skeleton: High Speed Video
“Quasi-Quantitative:” 2D Analysis

- Putting numbers to data
- **NEEDS**
  - Computer/ software
  - Camera
- **PROS**
  - Numbers
  - Moderate turn-around
- **CONS**
  - 2D analysis
  - Confined to lab?
  - Time to analyze
  - Added costs/ expertise

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Quantitative: 2D Analysis

- Reconstruct and analyze 3D movements
- **NEEDS**
  - Multiple cameras
  - Specialized software
- **PROS**
  - Data, data, data.
  - New insights
- **CONS**
  - Costs (time and $)
  - Time consuming
  - Constrained to lab?
  - “General” information

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Quantitative: 3D Analysis

- Reconstruct and analyze 3D movements
- **NEEDS**
  - Multiple cameras
  - Specialized software
- **PROS**
  - Data, data, data.
  - New insights
- **CONS**
  - Costs (time and $)
  - Time consuming
  - Constrained to lab?
  - “General” information
Quantitative: 3D Analysis

Quantitative: Video Overlay

- **NEEDS**
  - Video acquisition
  - Sensors
  - Computer/software

- **PROS**
  - Real-time feedback
  - Actual data/numbers
  - Specific questions

- **CONS**
  - Software development
  - Expertise
  - Costs

Swimming: Technique Analysis

**QUESTION:**

What is the relationship between technique and propulsion in the water?
Swimming video overlay system

Boxing: Punch Analysis

QUESTION:
How can the US boxers deliver more effective blows to their opponents?

Boxing: Punch analysis video overlay
**Weightlifting: Technique Analysis**

**QUESTION:**
How can we promote symmetry to enhance performance/ reduce injury risk?

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**Weightlifting: Lift Performance**

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**Scouting/ Performance Database**

- Evaluation of “future competition”
- Establish database of competitors, situations and/or events
- Tagging
  - Dartfish
  - XoS
- Examples:
  - Soccer
  - Softball
Team Sports: Match (notational) Analysis

Immediate Video Feedback
QUESTION: How can we provide real-time feedback of performance during training?

Eye on Performance System
Video Sharing/ Evaluation

- Education efforts
- Communication
  - Long distance
  - Coach to athlete
  - Athlete to coach
- CD, DVD, iPod, websites...
- Evolution of Eye on Performance

www.playerdevelopment.usta.com

DartfishTV

- Upload video content
- Tagged video
- Password protection
- Media books/ education
- Meet your specific needs

The End