



Technology in Sport

Effective Integration of Technology for Coaches

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Introduction:

- Sam currently works at the Canadian Sports Centre Pacific as a performance technologist. His duties include the design, fabrication and testing of leading edge sport measurement and feedback systems. He also helps National teams operate and enhance their current sport measurement systems and technologies. Sam works with several National teams including:
- Rowing, yachting, diving, cross-country skiing, bobsleigh, luge, swimming, rugby and skeleton.
- Sam also sits on the National Sports Science and Medicine Advisory Council as the discipline lead for Performance Technology

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Technology:

- Technology can be defined as the entities, both material and immaterial created by the application of mental and physical effort in order to achieve some value.
 - In this usage, technology refers to tools and machines that may be used to solve real world problems.
 - Tools and machines need not be material, virtual technology such as computer software fall under this definition of technology

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Performance Technology:

- The current focus of the technology service area is to investigate what equipment/software is currently available and can be implemented as a performance enhancement tool; either directly within a sport or to streamline performance services delivery in general. Providing advice/guidance to sports/coaches/staff on the effective uses and implementation of technology for day-to-day training/work applications is also a substantial role of technology services.

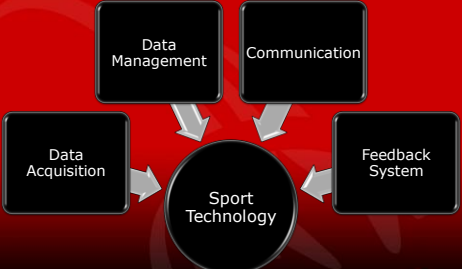


Credo:

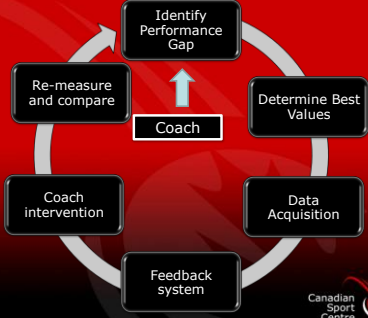
- In many respects technology is an elusive term that does not completely represent what we are trying to accomplish. As a performance technologist I am not only concerned with the application of technology in sport, but rather with rendering of data into useful feedback.



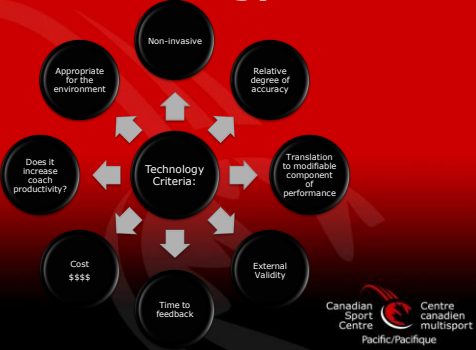
The 4 Major components of Sport Technology



Technology Cycle



What makes a good technology?



Degree of accuracy

- The measurement system that we employ (from a feedback standpoint) only needs to be as accurate as is necessary to provide information that will lead to a positive performance modification
- Novice performers= low degree of accuracy
 - (video)
- Expert performers= high degree of accuracy
 - (Peach)



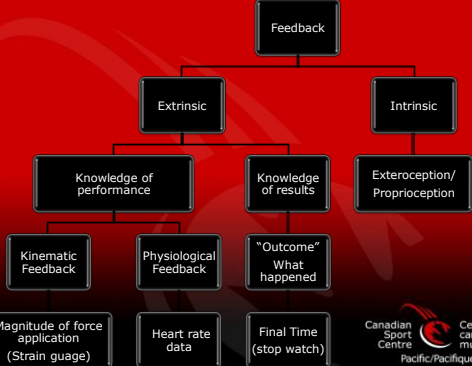
The 4 Components of Sport Performance



Hogg, 1995



Feedback

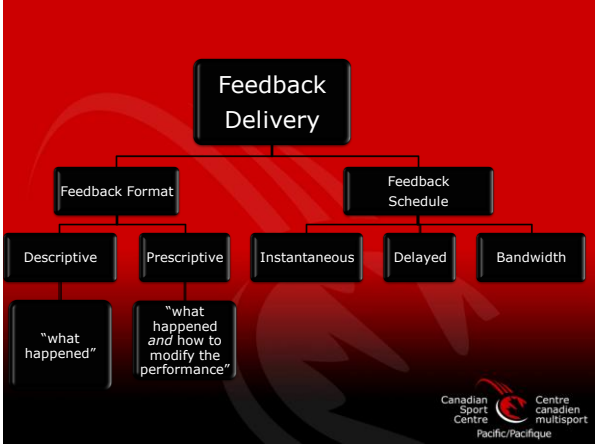


Feedback delivery

- Acquiring the data is not enough! It is necessary to present the information in a format and scheme such that it will lead to a positive and stable change in performance.



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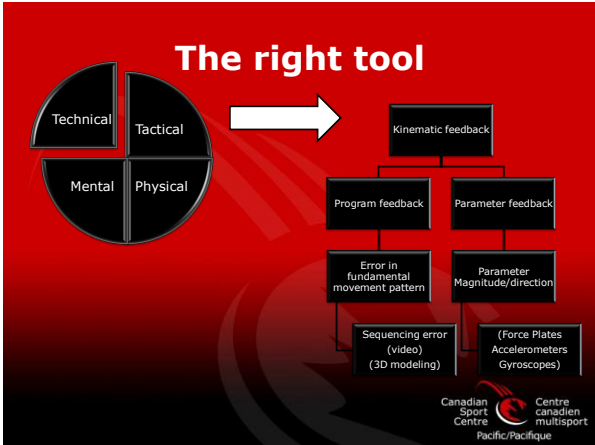
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The right tool for the job

- It is easy to use lots of technology
 - Selecting, measuring and presenting the correct information for the athlete(s) must be a well thought out process



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Addressing a sequencing error



Simple Solution for rowing specific sequencing errors



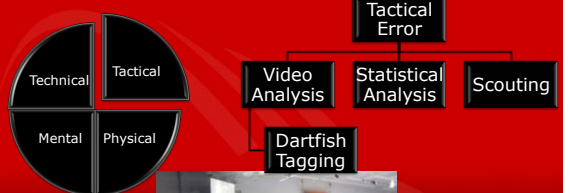
Custom built monitor case for immediate video review with athletes



Which is a big advantage over this:



The right tool for the job: Tactical



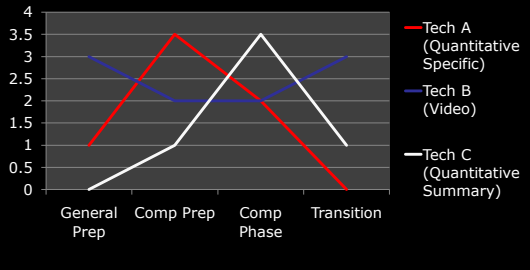
The right tool for the job: Physiological

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The Right tool for the job: Psychological

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Periodization of Technology



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Biomechanical Feedback for Rowing

- Factors that rowers can manipulate are:
 - Magnitude and timing of forces on the oar handles, seat and stretcher and the coordination of the body segments
- Overall performance then depends on the rower's fitness and ability to optimize the application of forces
- Feedback about the application of those forces should play an important role in the optimization process.

Smith, 2002


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- There are several biomechanical principals that warrant extensive measurement in rowing.
- Velocity cubed dependency of power
 - Constant boat speed, reduced variation in intra stoke hull velocity




The bottom line!

- Skin drag (friction between the hull and water) accounts for 80% of the resistive forces in rowing.
- And skin drag is proportional to the square of the velocity ($R=a.v^2$)
- Where:
 - v =the speed of the boat
 - a =is a constant depending on the area of the wetted surface and hull shape
- So what???




The Bottom Line

- Because:
- According to Newton's 1st Law to keep the boat at constant velocity the force applied must equal the resistive forces leaving us with the following formula:
 - $P=a.v^3$
 - So what???



The Bottom Line

- $P=a.v^3$
- So, even if you are able to double the power output you will only make the boat go 1.26 ($=2^{1/3}$) times faster!!



The Bottom Line

- Therefore: *it is more efficient to maximize the effects that positive forces have on the overall movement of the boat by reducing negative forces than it is to train for maximizing power output from the athletes.*
- Therefore:
 - Technical analysis is an **essential** component of any successful training program

Additional Considerations

- Increasing SR is a game of diminishing returns – variation in (inline) hull acceleration increases with SR

Case Study # 1

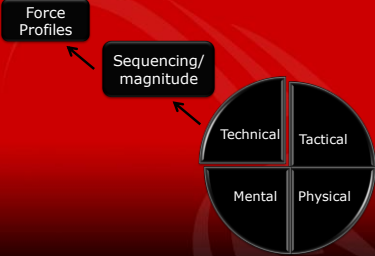
Rowing – Error detection and correction Light Weight 4-

Addressing a Specific Technical Issue

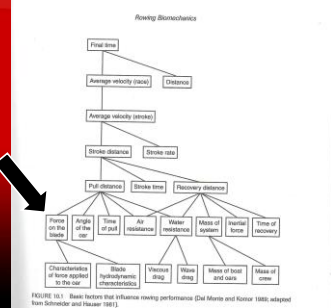
- LW4- Crew in the competition prep phase
- Some technical errors were apparent



Error Identification



Antecedents of stroke distance



Choosing the correct Technology

- Utilizing a combination of video and a quantitative specific measurement system we could identify specifics of asymmetries or inefficient movements.



Technical review within 15min after session



Follow –Up

- We are able to receive this data in real time thus allowing us to make rigging adjustments and technique adjustments on the water and see the effects.
- This has also been useful for seat selection.
- On the water we are now able to give athletes “bandwith” feedback to increase motor pattern retention. Hit or Miss or Nothing.

CASE STUDY # 2

Case Study # 2

- Athlete (A) making a transition from rowing in the heavy 8 to rowing the 1x
- Coach: Asked for help because visually they noticed that athlete A was having difficulty with the timing of the catch and the hull had excessive “pitch”

Experiment!

- Get past the pragmatic hurdles
- Try innovative technologies on you “expendable crew members”
- Be systematic in your approach
- Be persistent in finding the tools that address your performance gaps