Chaos COUNTS !

Why Uncertainty is as important as Predictability in Training for CONTEST Sports

Dr Ted Polglaze – Sport Physiology

Dr Richard Shuttleworth - CoachSG

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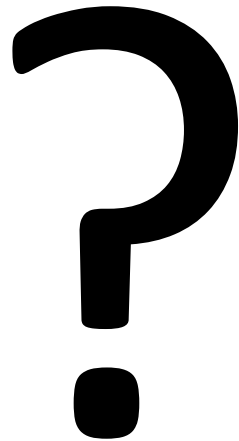**From Youth to Elite Sport: Harnessing Potential and the Pursuit of Excellence**

ChAoS COUNTS !

Why Uncertainty is as important as Predictability in ==Conditioning== for CONTEST Sports

Dr Ted Polglaze – Sport Physiology
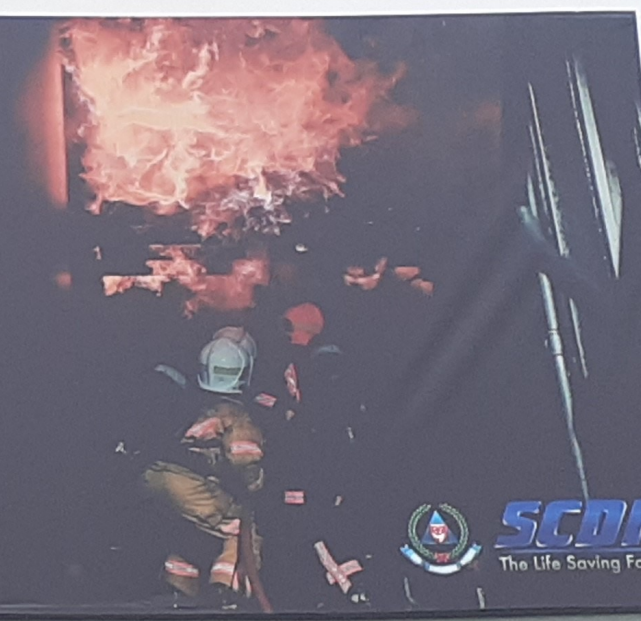
Dr Richard Shuttleworth - CoachSG

'We bring order to chaos, and we stand ready to confront the unthinkable'

?

WE BRING ORDER TO CHAOS AND WE STAND READY TO CONFRONT THE UNTHINKABLE

Civil Defence Academy
The Beginning of a Decisive, Courageous & Passionate Lifesaver

SCDF
The Life Saving Force

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Chaos

chaos / ˈkeɪˌɑːs / *noun*

a complex system whose behaviour is so unpredictable as to <u>appear</u> random

Conditioning

conditioning / kənˈdɪʃ.ən.ɪŋ / *noun*

the process of training or accustoming a person or animal to behave in a certain way or to accept certain circumstances

(…and specifically in sport)

the process of training to become physically fit by a regimen of exercise, diet, and rest

Chaos in Contest Sports
(i.e. where you are directly taking on an opponent)

Team Sports
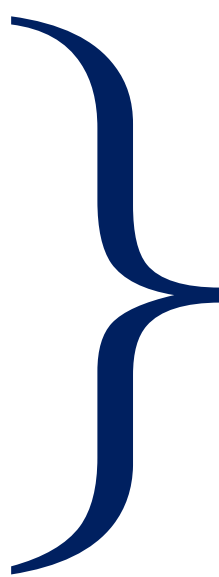

Racquet Sports

Photo: AP/Manish Swarup

Combat Sports

- you can't be certain what will happen next
- …or how long your current effort/rally/encounter will last

Chaos in Conditioning for Contest Sports

- Physiology/Physical aspects
  - Ted Polglaze

- Technical/Tactical aspects
  - Richard Shuttleworth

- Mental aspects
  - ….with permission from our colleagues in Sport Psychology ☺

How can we **OPTIMISE** training
…and **MAXIMISE** performance…
by addressing all these aspects ???

Predictable vs Unpredictable Sports*

- a.k.a.

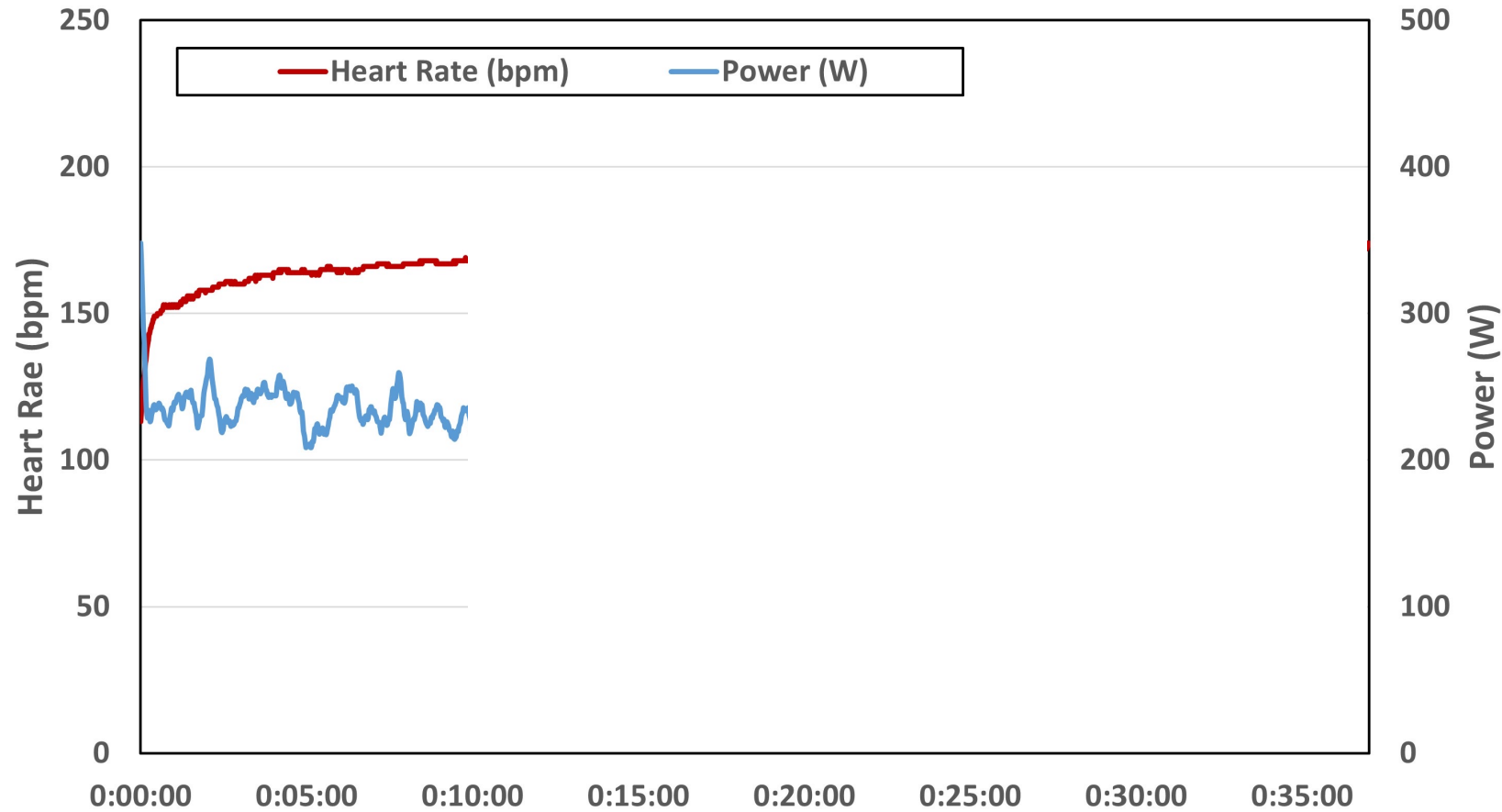Racing/Target/Acrobatic   vs   Team/Racquet/Combat

Photo: SG Sports TV

Photo: RunOne.co

* OR certain vs uncertain, steady vs erratic

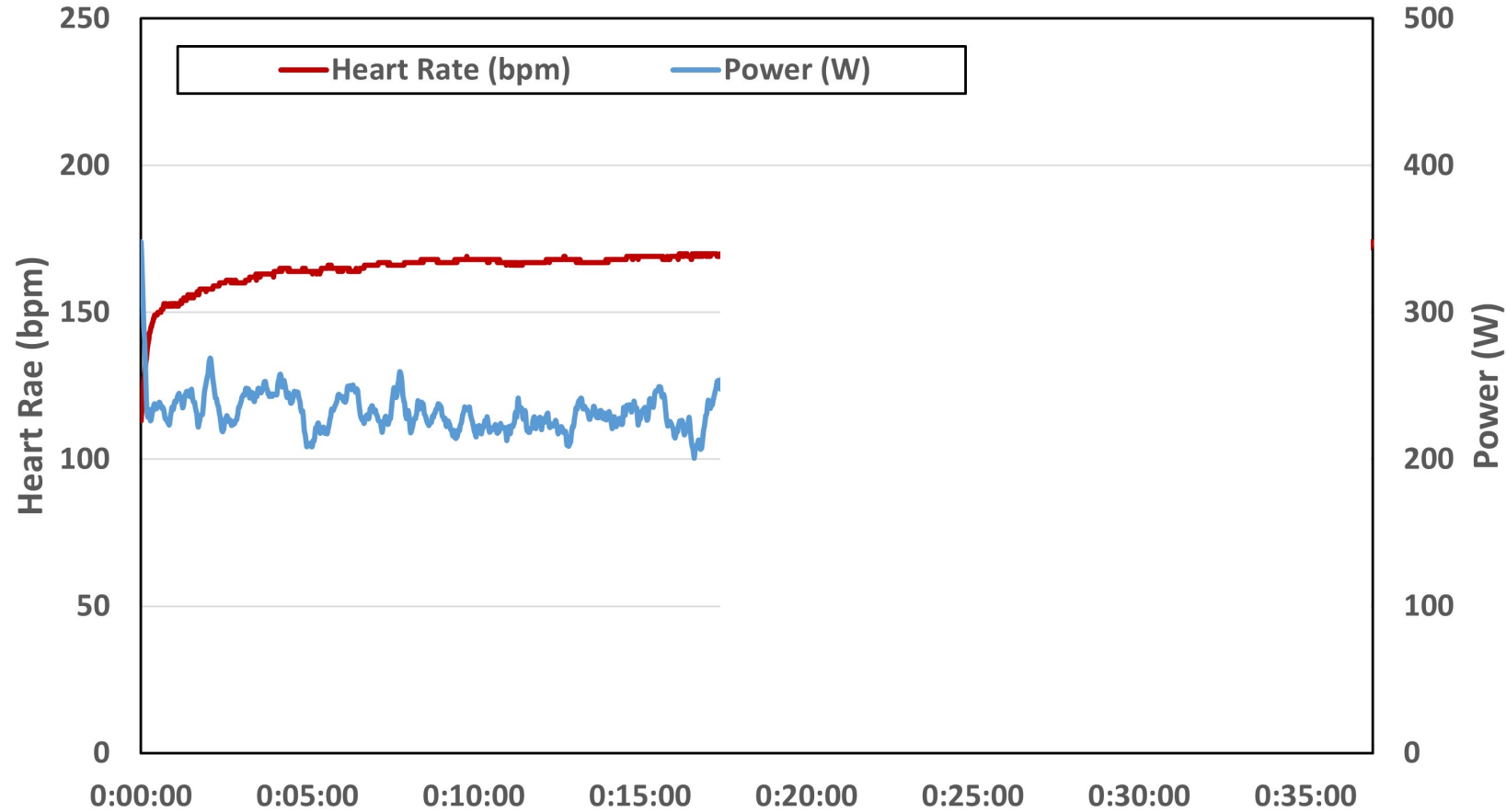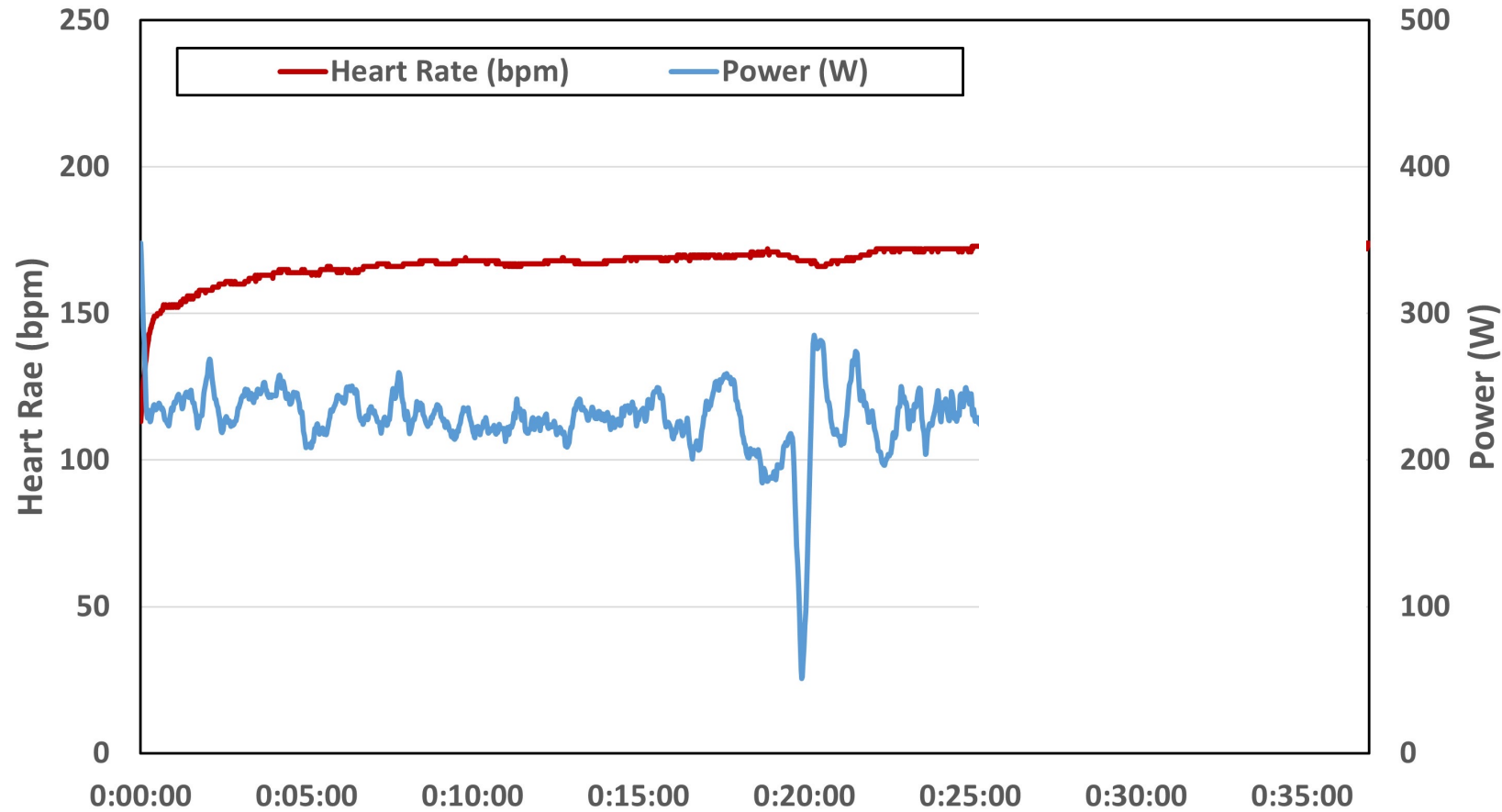# Cycling – Individual Time Trial (~ 37:20)

Cycling - Time Trial

Cycling – Individual Time Trial (~ 37:20)

Cycling - Time Trial

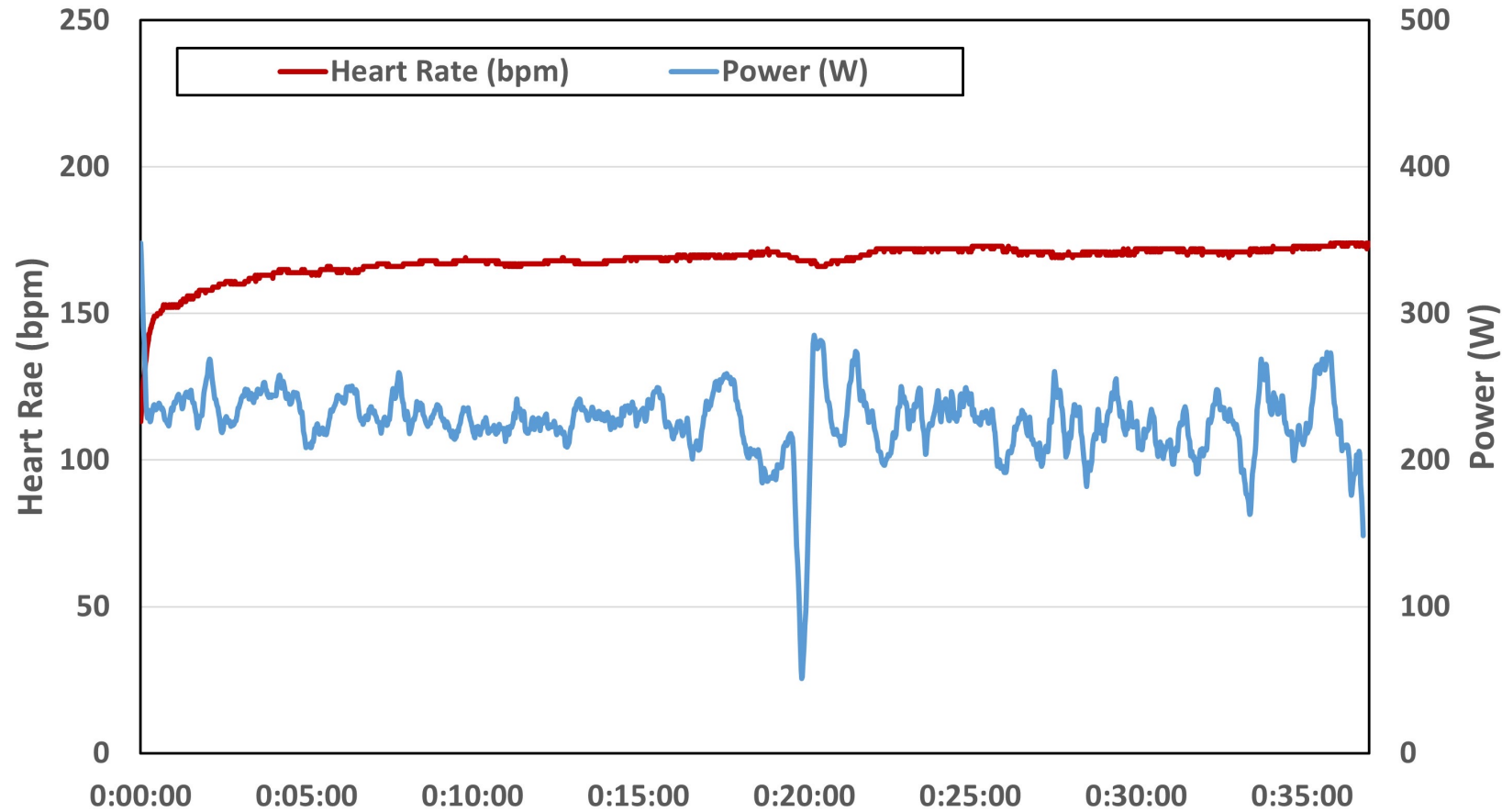# Cycling – Individual Time Trial (~ 37:20)

Cycling - Time Trial

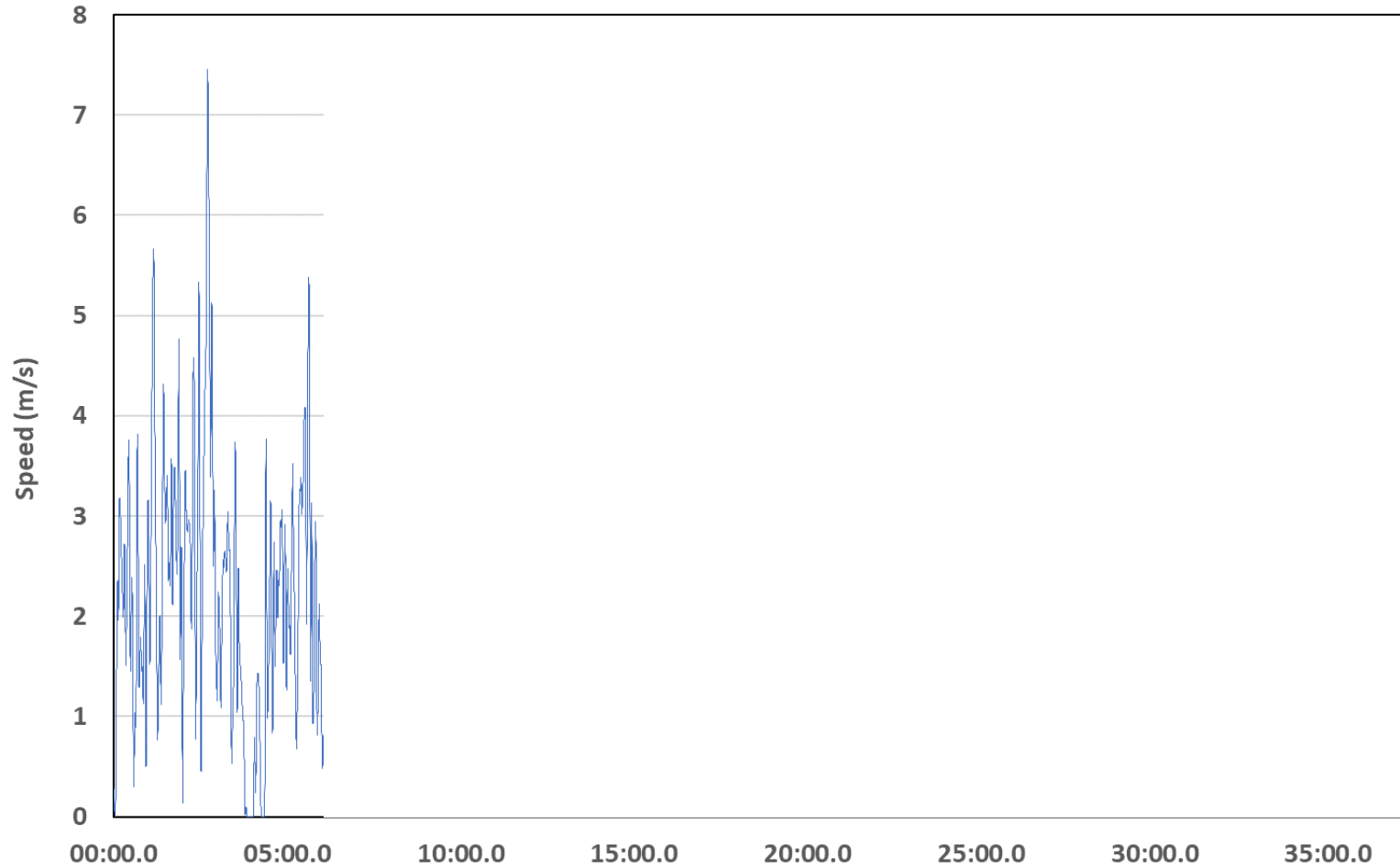# Cycling – Individual Time Trial (~ 37:20)

Cycling - Time Trial
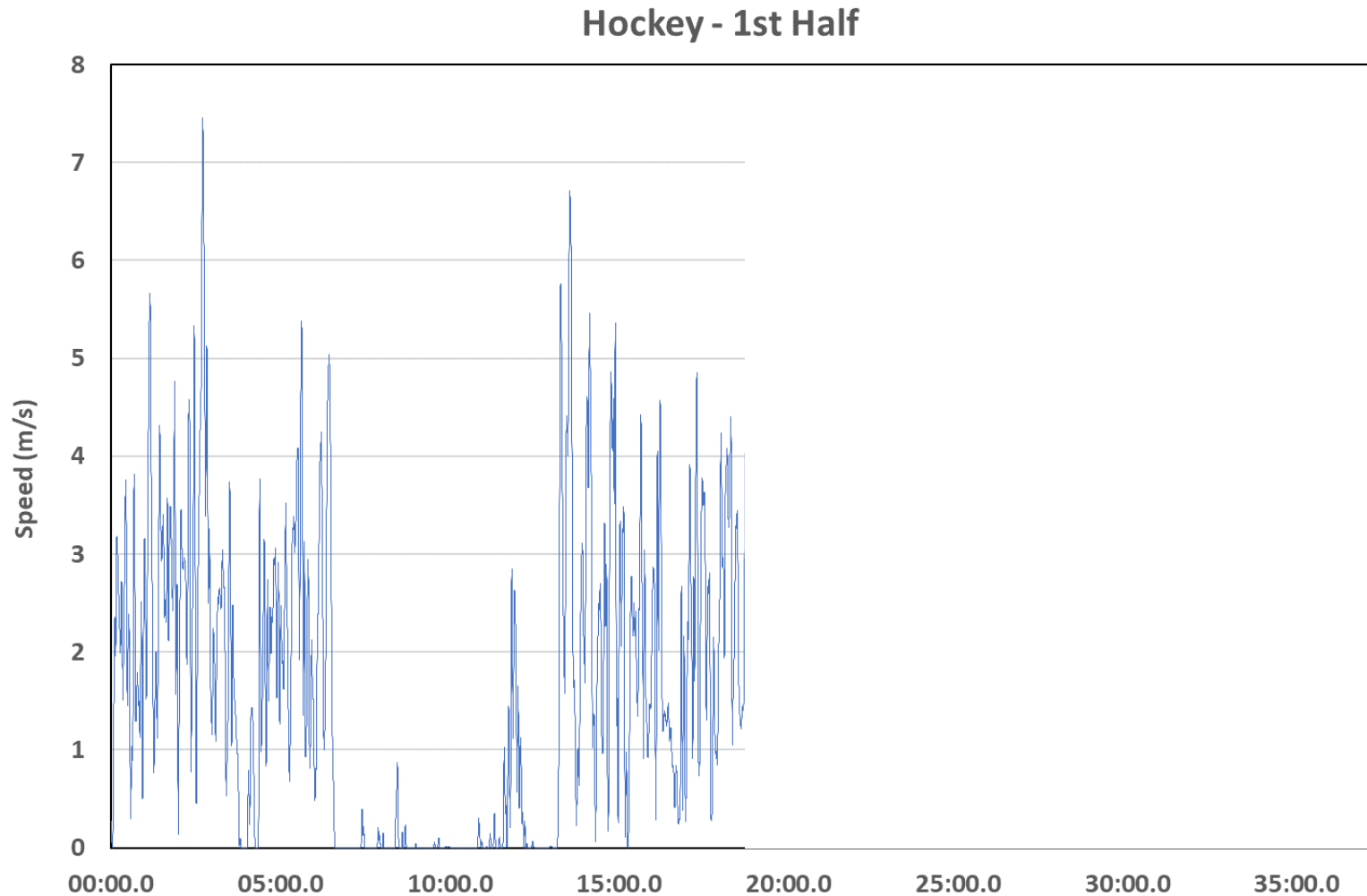
Hockey – First Half (~ 37:30)

Hockey - 1st Half

Hockey – First Half (~ 37:30)

Hockey - 1st Half

Hockey – First Half (~ 37:30)
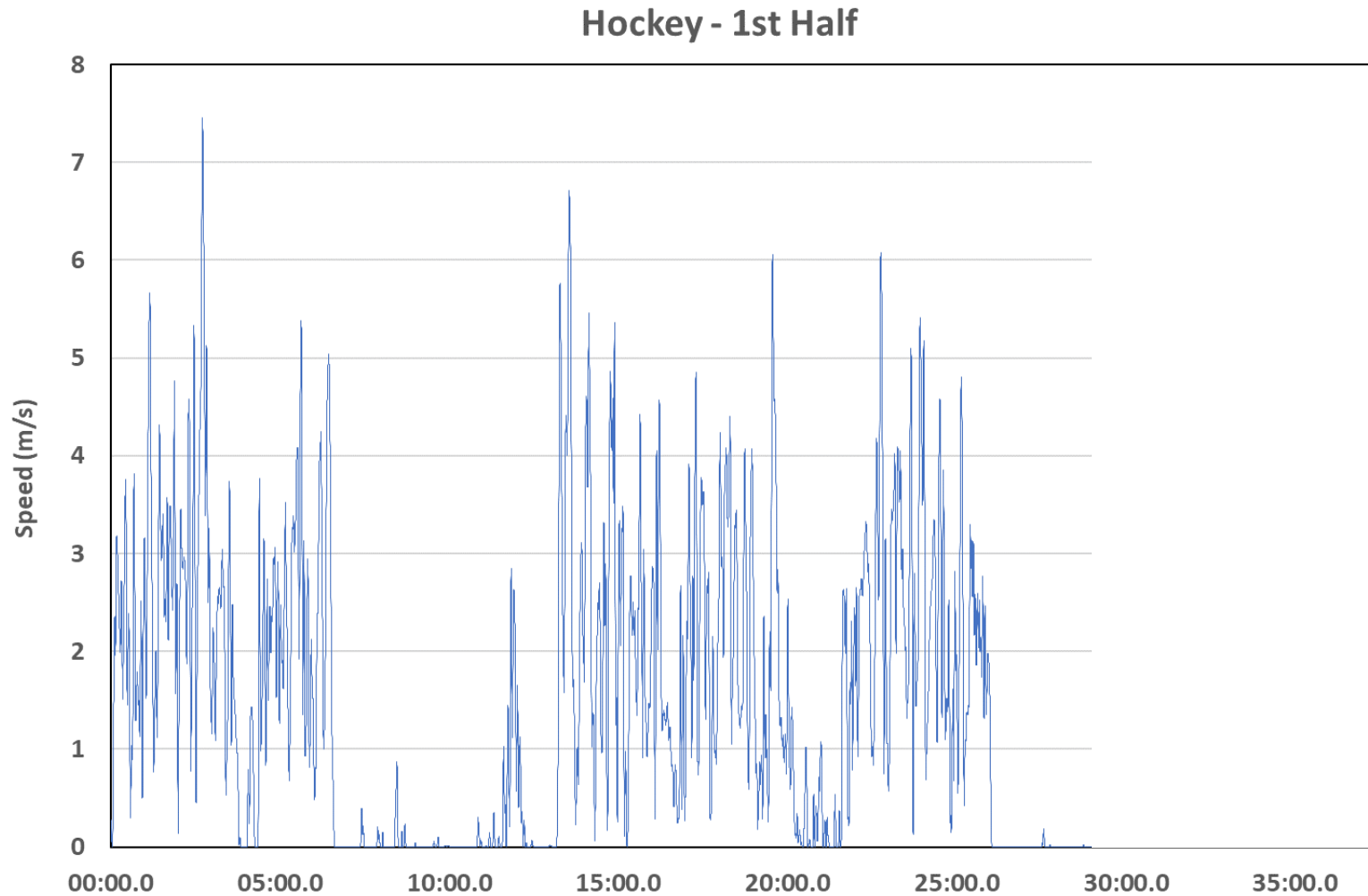

Hockey - 1st Half

Hockey – First Half (~ 37:30)
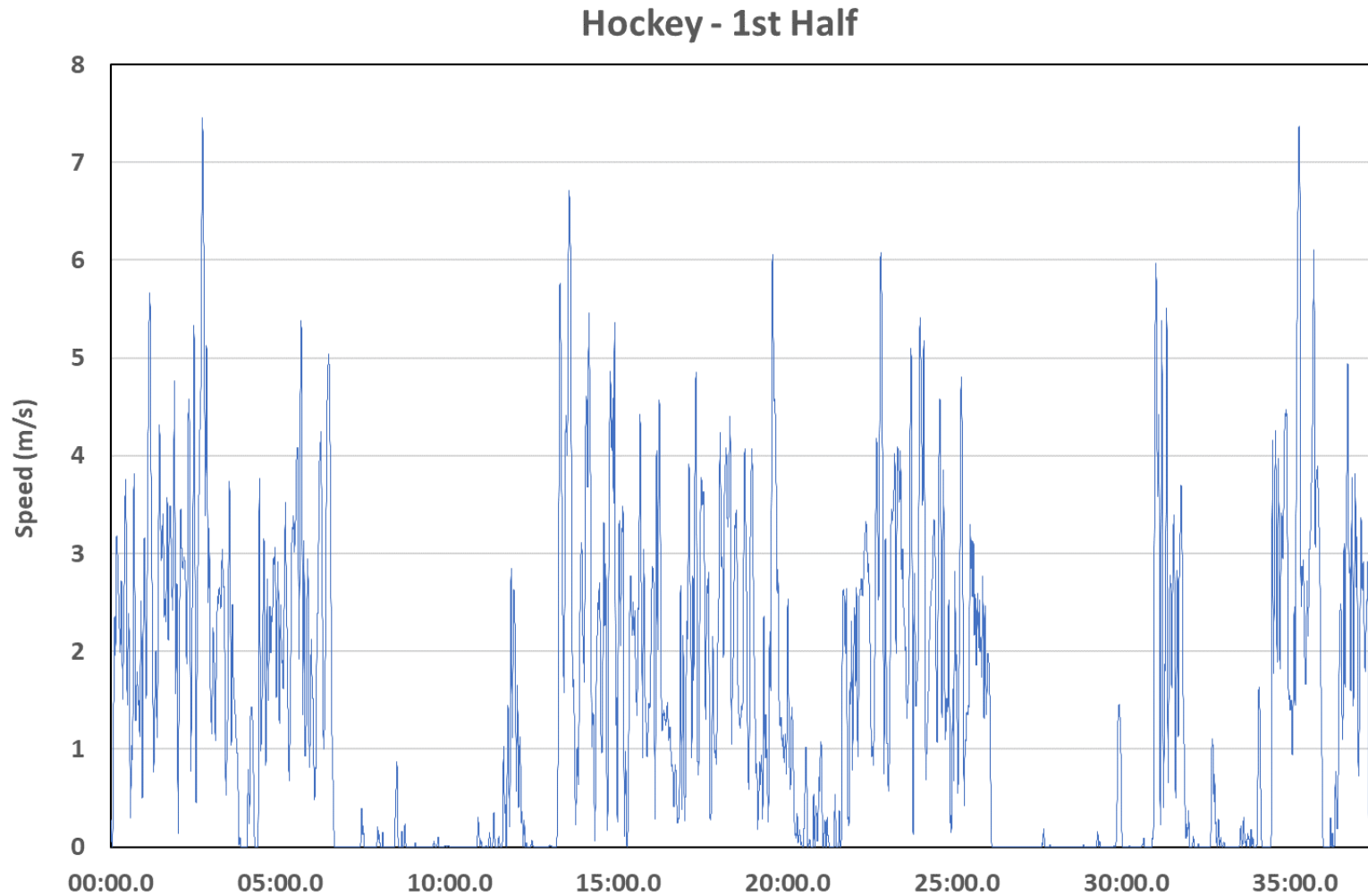
Hockey - 1st Half

Predictable vs Chaotic
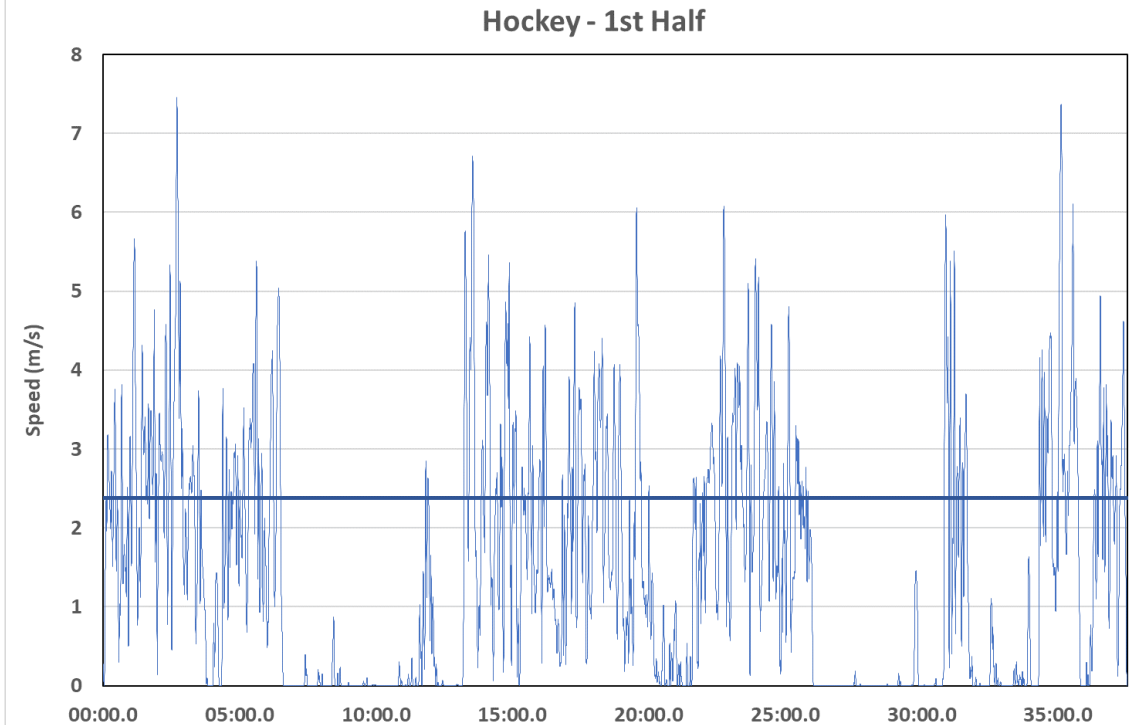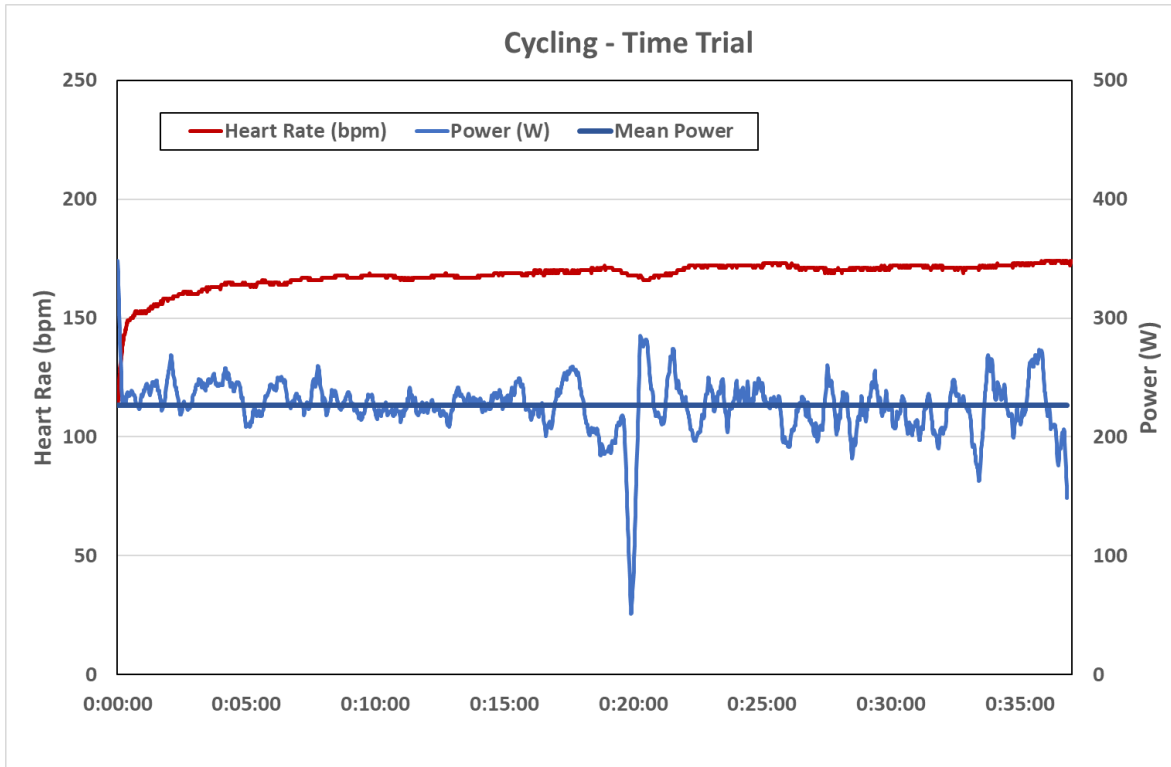
REDUCING the Data
(& "perhaps" missing out on vital information)

Hockey - 1st Half
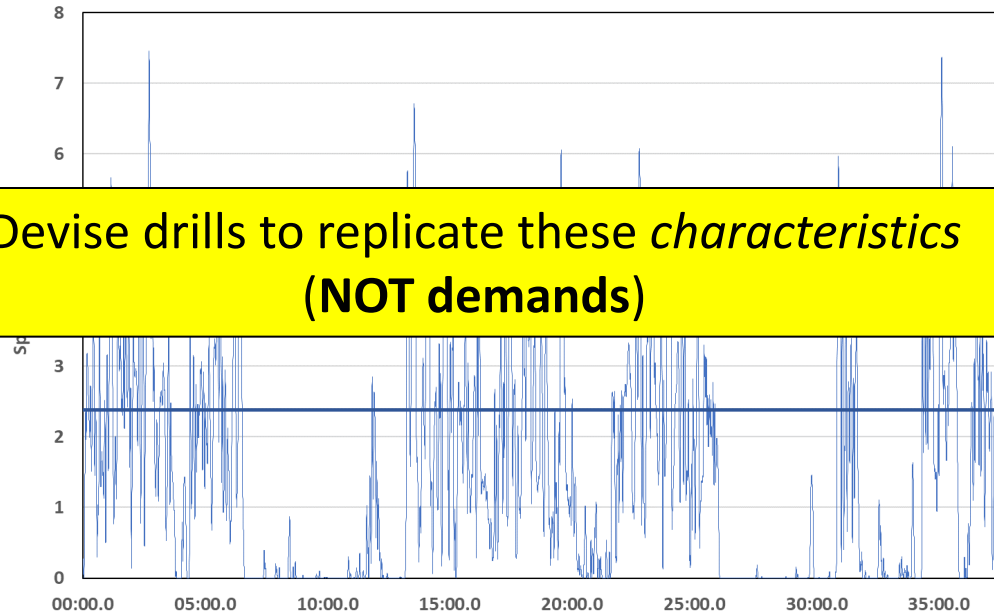
Devise drills to replicate these *characteristics*
(**NOT demands**)

- total playing time – 25:28
- total distance – 3298m
- average speed – 2.2 m/s
- peak speed – 7.4 m/s
- # accelerations - ?*#!!

Predictable vs Chaotic

"You must <u>unlearn</u> what you have learned" - *YODA*

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Steady-State vs Erratic Activity
(a.k.a. Predictable vs Chaotic)

- the more erratic the activity, the greater the Energy Cost
  - e.g. coming back from injury – "match fitness"
- acceleration VERY high demands, deceleration quite low
- change-of-direction
- backward/lateral/vertical movement
- physical contact
- ball possession
- posture/stance/gait
- upper body/skill movements

ALL of these things **INCREASE** energy demands
NONE of them happen with traditional conditioning

TRADITIONAL* Conditioning

(cyclical activity, planned, constant…but no decision making, no skill execution)

…….will leave you:

Photo: Straits Times

Photo: Straits Times

Photo: SportSG/Lim Weixiang

- •LESS FIT
- •WORSE FIT

* still has a role in foundation & cross training, but not as the primary modality for specific conditioning

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EFFECTIVE Conditioning

- Duration   *(how long?)*
- Intensity   *(how hard?)*
- # Reps   *(how many times?)*
- Work:Recovery Ratio

- Activity… *YOUR SPORT!!!*

Created using SoccerTutor.com Tactics Manager

Skills-Based Conditioning
OR………………....*Contested Conditioning©*

- Technique Under Fatigue (T.U.F.)

- Power Under Fatigue (P.U.F.)

- Decisions Under Fatigue (D.U.F.!!!)

- More **RELEVANT**

- More **FUN**

- More **COMPLIANCE**

- More **ENGAGEMENT**

Physiologically appropriate PLUS ----->

movement

Skill and Decision making

Practice Design considerations
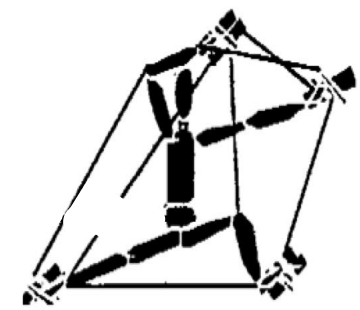
movement
Skill and Decision making
Practice Design considerations

- Sport Performance is **Open, Dynamic & Adaptive**

- Learning to Perform in Practice should be **Representative**

- Learning (Decision Making and Skilled Performance) is **Nonlinear Process**

- Learning is not a Process of Repeating a Solution, it's about **Repeating the Process of Finding a Solution**

- Practice the **Skill (Solution Finding)** and Not the Drill (Repeating Solutions)

- Coaches are **Learning Designers (Davids 2019)**

- Better Decision Making by Practicing **Making Decisions**

- **In Situ Decision Making** in Real Time (Space & Time)

- Bi-Directional Organisation (Coordination) from **Local-Global and Global to Local (or Glocal)**

- **Specifying Information** to Regulate Actions (**Knowledge acquired 'IN'** sport practice/performance)

- **Integration of** needs, intentions, attention, perception coupled with opportunities to improve actions (skill)

coach
Designing for inter-actions
In Complex adaptive systems

Planned
Action

Preplanned Movement Solution
Certainty over Planned Action
Roles and Responsibilities
Systems, Structure

Re
Action

Reactive Behaviour
Movement Response
Based on Opponents Actions

Designing for
Adaptive inter-action zone
In Complex adaptive systems

Planned

Action

Preplanned Movement Solution
Certainty over Planned Action
Roles and Responsibilities
Systems, Structure

Inter

Action

Meta Stable
Multi-Options
Tactical Adaptation
Skill Adaptation
Adaptive Mind

Re

Action

Reactive Behaviour
Movement Response
Based on Opponents Actions

Designing on a
Continuum of interaction
Scaling of interactions

coaches
Design for interactions
In Complex adaptive systems

Opportunities to Go Forward
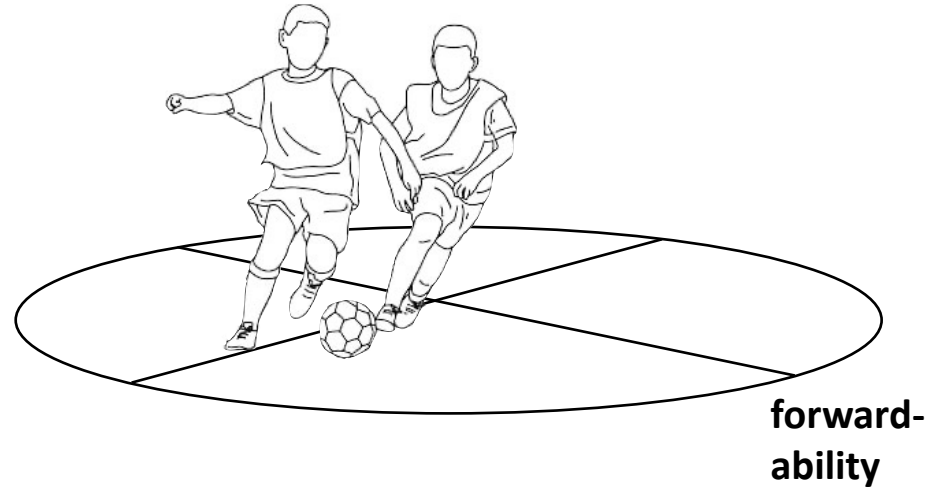
forward-ability

Skill Cap-abilities

coaches

Design for interactions

In Complex adaptive systems

Opportunities to Go Forward

around-ability

forward-ability

coaches

Design for interactions

In Complex adaptive systems

Opportunities to Go Forward

keep-ability

forward-ability

coaches
Design for interactions
In Complex adaptive systems

Opportunities to Go Forward

deceive-ability

hold-ability

coaches

Design for interactions

In Complex adaptive systems

Opportunities to Go Forward

disguise-ability

coaches
Design for interactions
In Complex adaptive systems

Opportunities to Go Forward

around

over

through
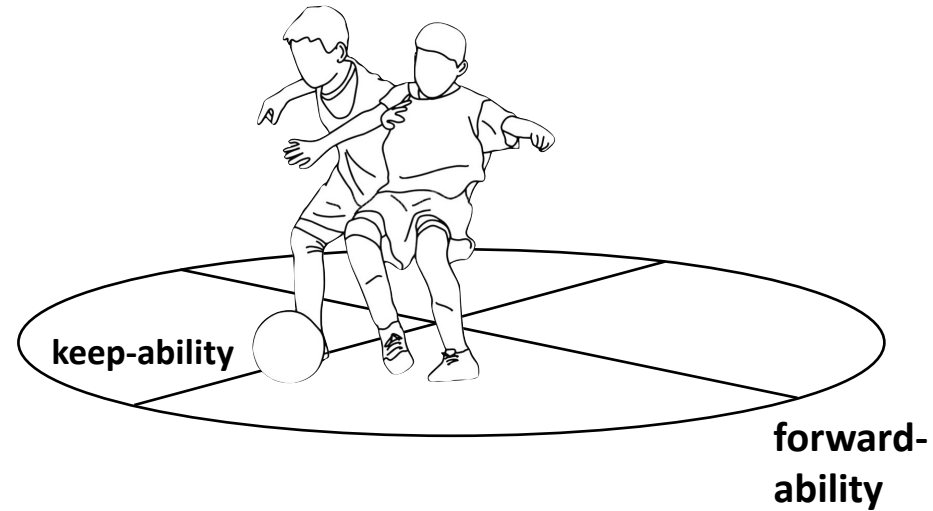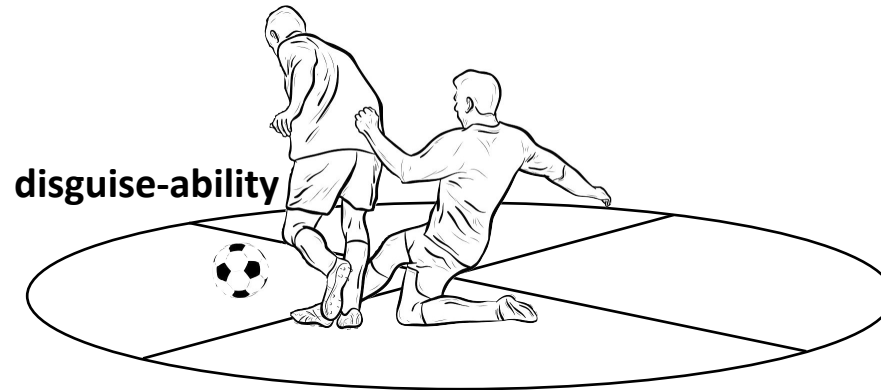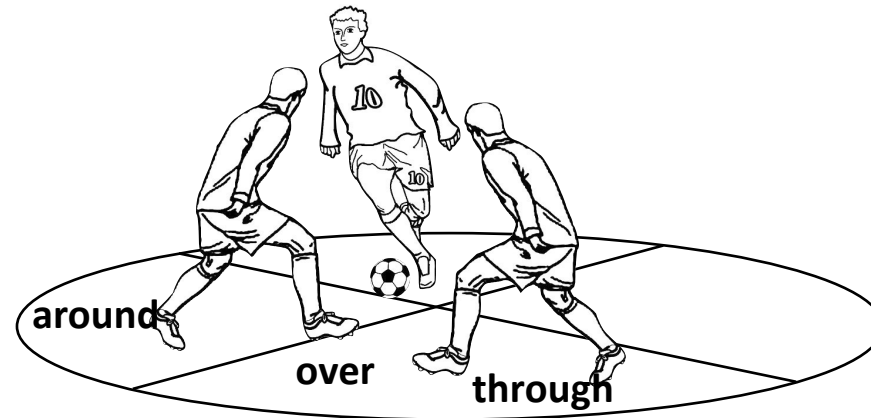
penetrate-ability

coaches

Design for interactions

In Complex adaptive systems

Opportunities to Go Forward

around

over   **through**
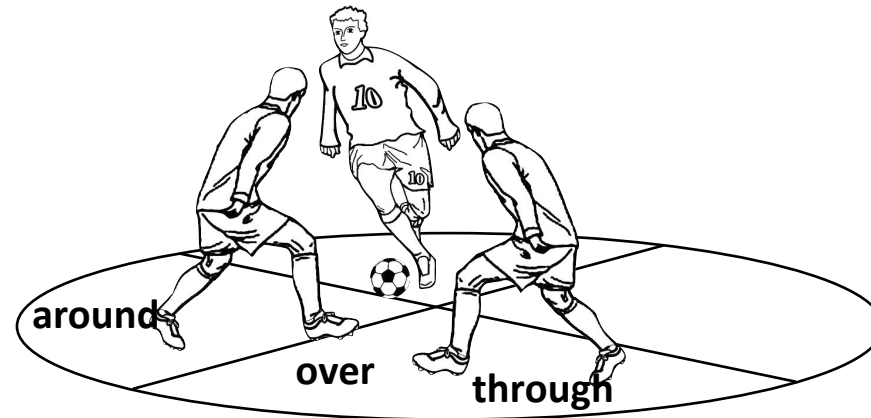
penetrate-ability

Manipulations

Task Goal
Rules Regulations
Space Boundaries
Equipment
Information

maximise

Movement diversification

Exploration and discovery

maximise
Movement diversification
Exploration and discovery

Ontogenetic Landscape for Locomotion

Gravity
Newborn Stepping
Treadmill Stepping
Parallel Kicking
Single Kicking
Alternating Kicking
Weight Bearing
Quad Rocking
Standing with Support
Dynamic Balance
Cruising
Walking with Support
Temporal Organization & Dynamic Balance

Skip
Hop
Leap
Jump
Gallop
Walking
Running
Stair Climbing
Climbing
Creeping
Bear Walk
Crab Walk
Crawling

development

shallow attractor
shallow attractor
shallow attractor
deep attractor

Download : Download high-res image (425KB)   Download : Download full-size image

Fig. 4. Illustration of the emergence of attractors in the course of development.

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Decision making
Affordance or invitation
for action

Decision making
Affordance or invitation
for action

- Opportunity to Act Skillfully
- Accept Invitation to Improve Ones Situation
- Coach Designs Affordances into Performance Practice
- Affordance may Invite Performer to Explore New Behaviors
- Refine Specific Skills that shape a certain Form of Life

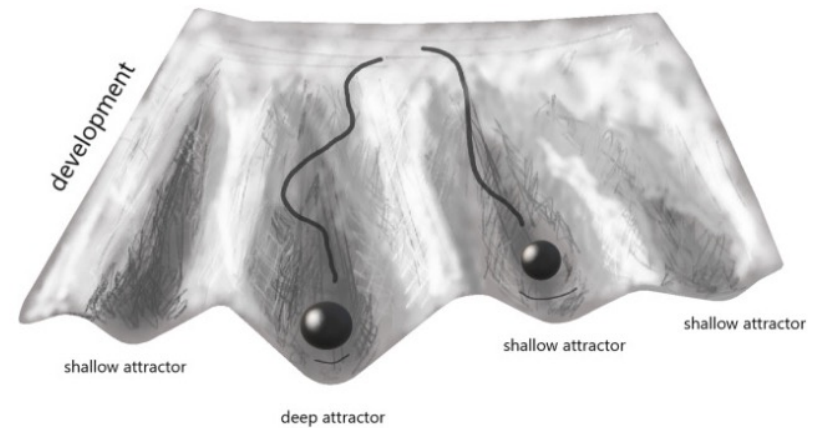**SINGAPORE SPORT & PERFORMANCE CONFERENCE 2022**
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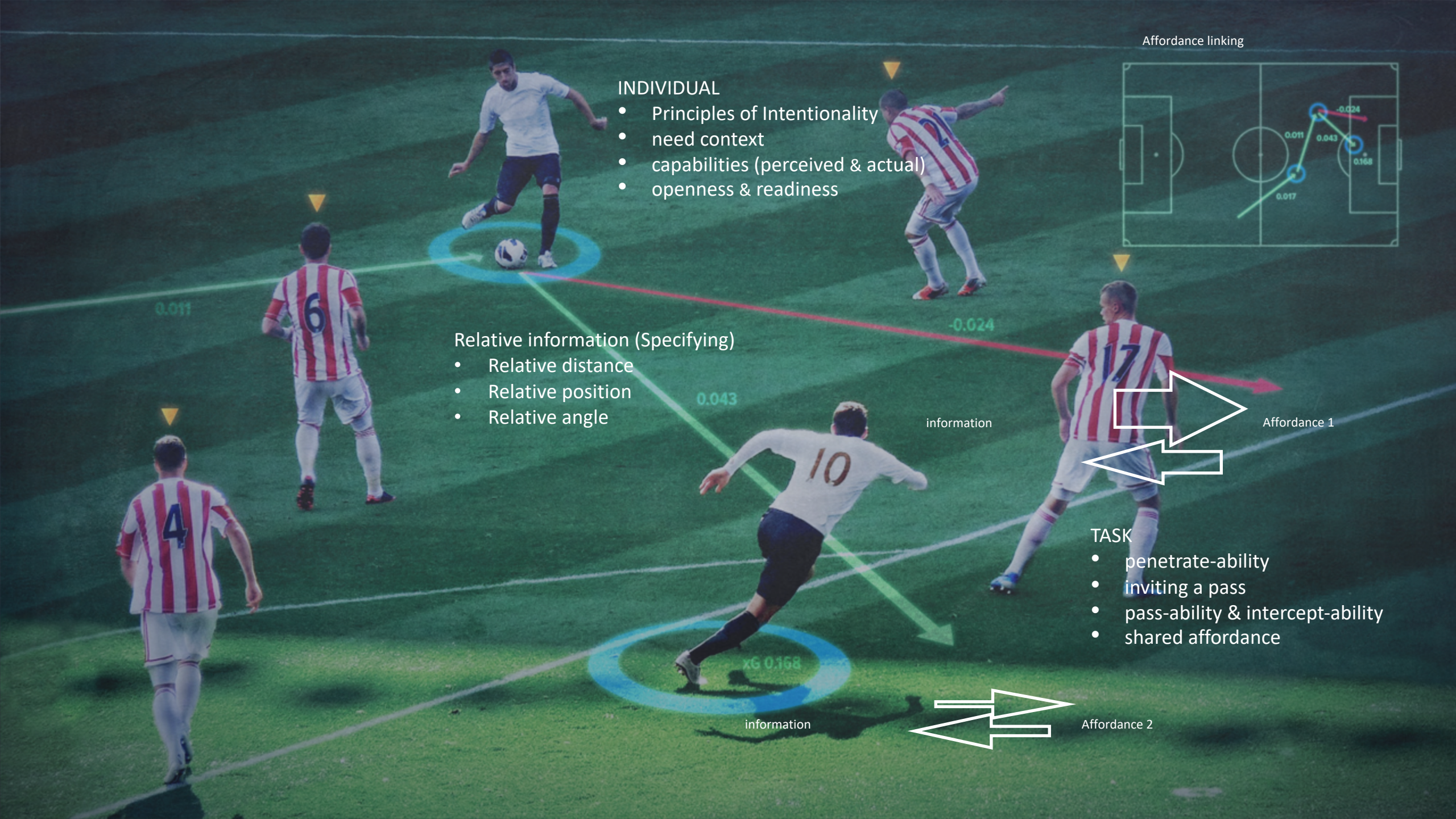
Decision making
Affordance or invitation
for action
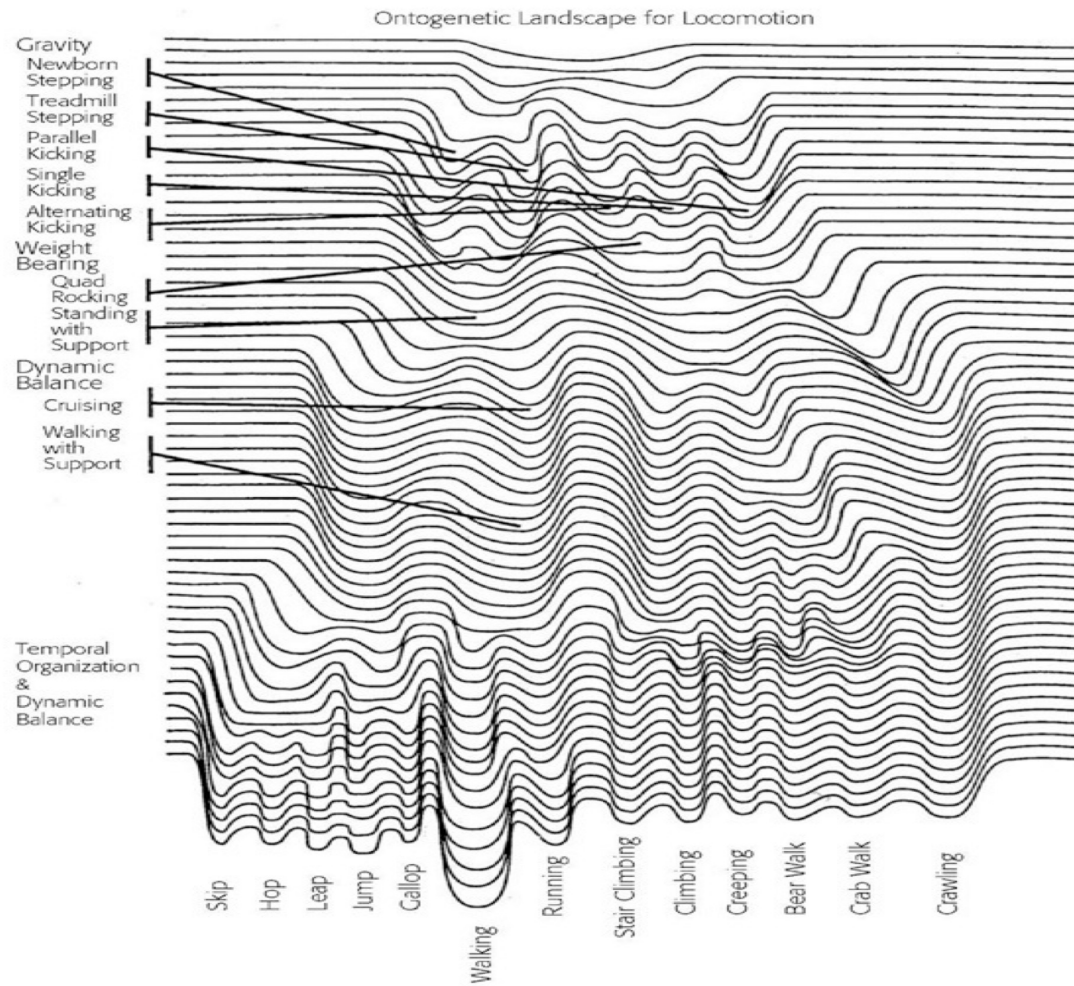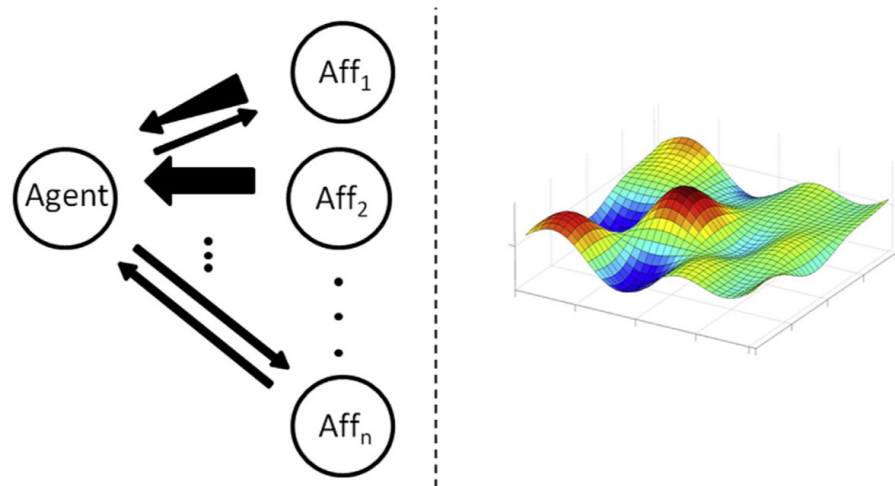

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INFORMATION

Perception and ACTION COUPLING

Attuned to information

INFORMATION for
Practice design considerations
Finding ways before pathways

Task

Context

variation

TCV

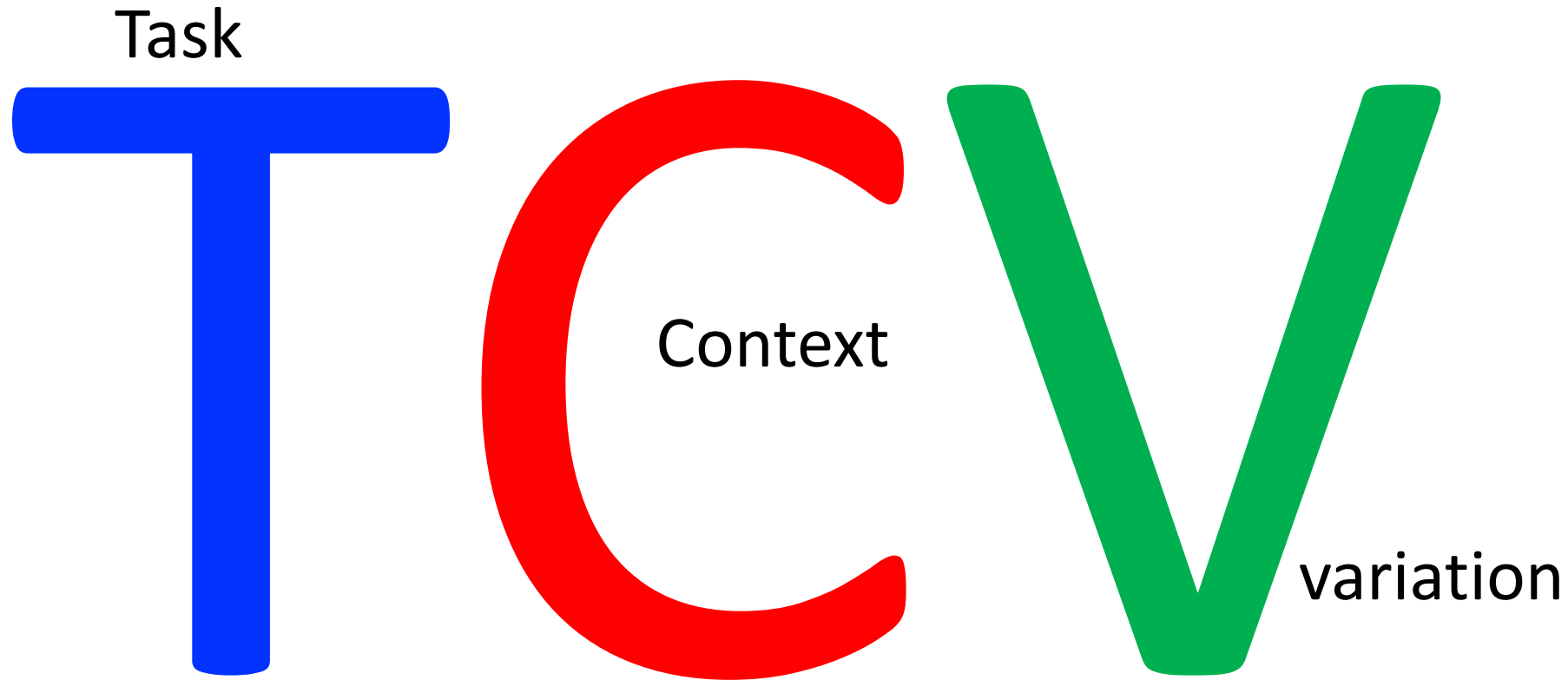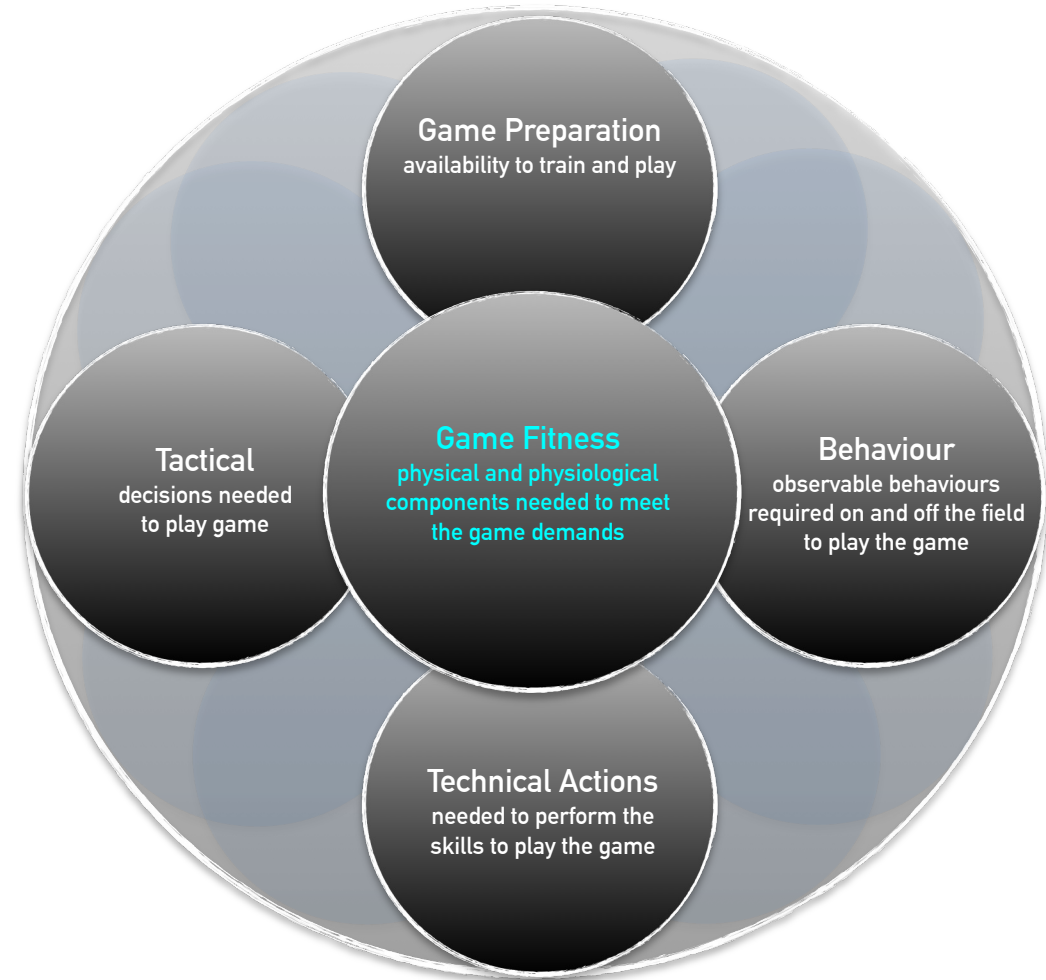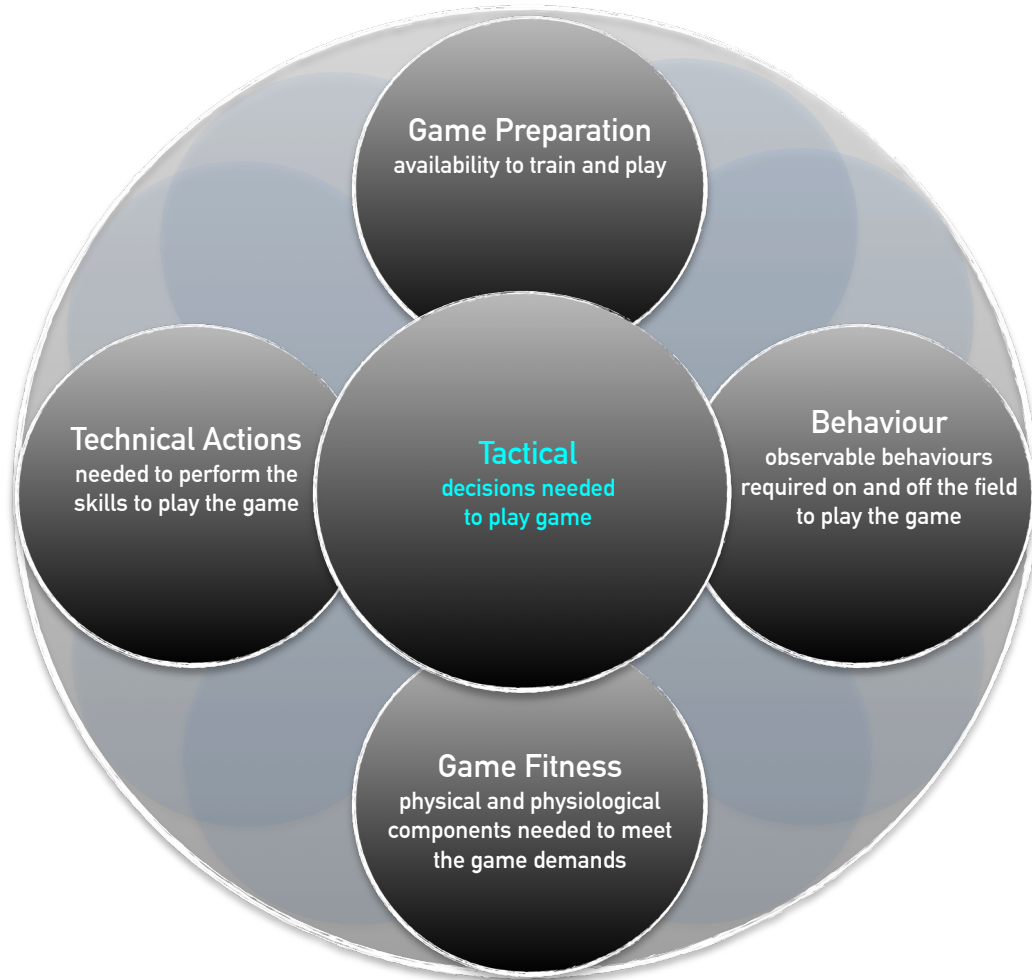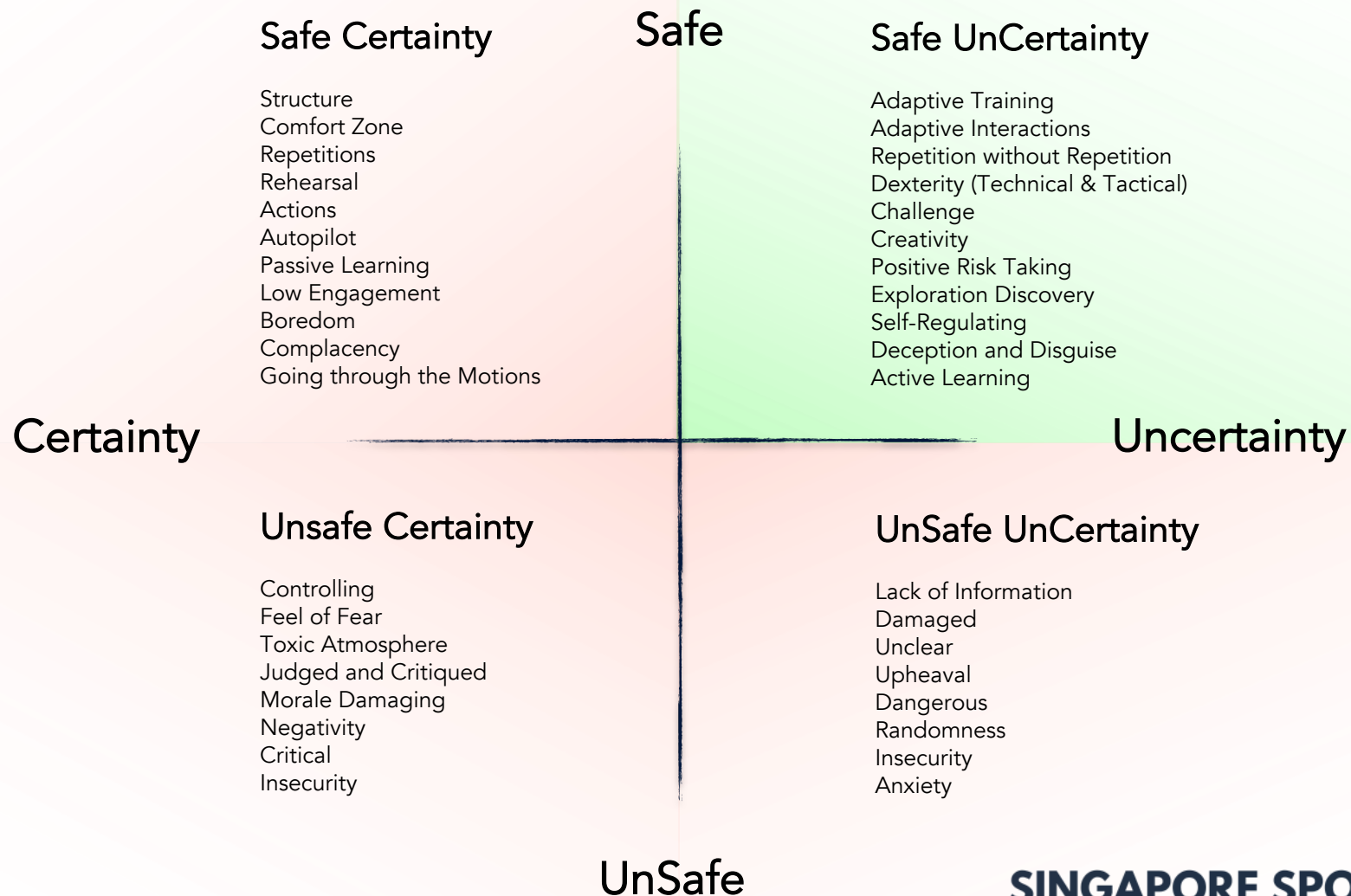| Teaching Actions	Definition
Practice Organization	
Isolated technical skill practice	Practice that focuses on one technique or skill in a de-contextualized environment (e.g., isolated dribbling drills, static passing drills, repetition of drills outside of context and without opponent, hitting a static ball on the tee).
Game Representative practice	Practice that has representative learning situations that mimic real game situations (e.g., practice drills that include opponent e.g., 1v1, 1v2...)
Modified game	Simulation of game with manipulation of task constraints like rules, equipment and task conditions (e.g., the use of scoring zones rather than goals, use 6 goals/baskets instead of 2, fencing with foam stick, different net heights).
Small sided game	Small sided game without conditions (e.g., 5v5 small-sided football game without other additional task conditions, 1v1 tennis on half court).
Regular play	Regular activity without specific rules/conditions (e.g., 5v5 basketball play, 11v11 football play, 1v1 or 2v2 tennis)
Repetitive task	Task includes repeating a movement continuously without any change (e.g., continuous passing and catching drill)
Room for variability	Practice allows for some variability in movement but this variability is not directly promoted by the teacher (e.g., allowing the ball to be kicked in different ways, allow to serve in multiple directions).
Infusion of space variability	Intentional variation of space in the practice within a single task or between successive tasks (e.g., using different sized courts that students can visit alternatively).
Infusion of players variability	Intentional variation of players in the practice within a single task or between successive tasks (e.g., playing with different number of opponents - 1v1, 2v1, 3v2).
Infusion of equipment variability	Variation of equipment used in the practice (e.g., using different sized balls, racquets).

Teaching Actions	Definition
Instruction	
Prescriptive instruction	Instructions of optimal and recommended movement patterns based on biomechanical research (e.g., specific information on how to grip the racket, how to perform a swimming stroke).
Use of analogy	Using an analogy to describe rather than a prescribed movement form, drawing attention to the similarity from one movement to another (e.g., throw the ball so that it travels 'like a rainbow', glide like a torpedo in swimming).
Movement form	Specific instruction that focuses on a preferred movement pattern. (e.g., instructing students to lean the body back, inside foot to contact below the midpoint of the ball for a lofted pass)
Movement outcomes/effect	Instructions that require students to focus on outcome rather than specific instructions on technique (e.g., focus on the trajectory of the ball flight in golf, on the sound of the ball at impact, push the wall backwards when pushing in swimming).
Verbal promotion of variability	Encourage students to search and explore individualized movement solutions in the absence of prescriptive instructions (e.g., "try something else!", "explore other solutions!", "what other solutions can you imagine?").
Feedback	
Prescriptive feedback	Feedback that focuses on optimal and recommended movement patterns based on biomechanical research (e.g., you should angle your racket face towards the floor more).
Use of analogy	Using an analogy to describe rather than a prescribed movement form, drawing attention to the similarity from one movement to another (e.g., throw the ball so that it travels 'like a rainbow', move up the racket like you follow the hypotenuse in table tennis).
Movement forms	Feedback that focuses on parts of the body used in the action (e.g., focus on the arm swing, focus on how you manage your body when you glide in swimming).
Movement outcomes/effect	Feedback that focuses on the effect of the action performed on the environment (e.g., "what sound did the ball at impact?", "how much defenders did you attract?").
Feedback on variability	Questioning students on individualized movement solutions or multiple solutions they found (e.g., "think of other ways to get the ball over"; "explore different ways to get past the player")

Integrated Skill Development (TUF, DUF & PUF)

Left diagram:
- Game Preparation — availability to train and play
- Technical Actions — needed to perform the skills to play the game
- Tactical — decisions needed to play game
- Behaviour — observable behaviours required on and off the field to play the game
- Game Fitness — physical and physiological components needed to meet the game demands

Right diagram:
- Game Preparation — availability to train and play
- Tactical — decisions needed to play game
- Game Fitness — physical and physiological components needed to meet the game demands
- Behaviour — observable behaviours required on and off the field to play the game
- Technical Actions — needed to perform the skills to play the game

Adaptive Learning Environments

Davids, Bickley, Rogers, Shuttleworth & Brown, (2018)

Safe

Certainty

Uncertainty

UnSafe

Safe Certainty

Structure
Comfort Zone
Repetitions
Rehearsal
Actions
Autopilot
Passive Learning
Low Engagement
Boredom
Complacency
Going through the Motions

Safe UnCertainty

Adaptive Training
Adaptive Interactions
Repetition without Repetition
Dexterity (Technical & Tactical)
Challenge
Creativity
Positive Risk Taking
Exploration Discovery
Self-Regulating
Deception and Disguise
Active Learning

Unsafe Certainty

Controlling
Feel of Fear
Toxic Atmosphere
Judged and Critiqued
Morale Damaging
Negativity
Critical
Insecurity

UnSafe UnCertainty

Lack of Information
Damaged
Unclear
Upheaval
Dangerous
Randomness
Insecurity
Anxiety

Training Design

Training Design

Intensity can be manipulated by:

- # players
- ball:player ratio
- playing area
- additional actions
  - e.g. jumps/sprints/rolls

- spare balls on standby
- conditional/qualifying rules
- emphasis on targeted skills/tactics

- COACH ENCOURAGEMENT