ITF Coaches Education Programme

Coaching High Performance Players Course

Qualitative & Quantitative Analysis

By Machar Reid & Miguel Crespo

ITF™
International Tennis Federation

Contents to cover…

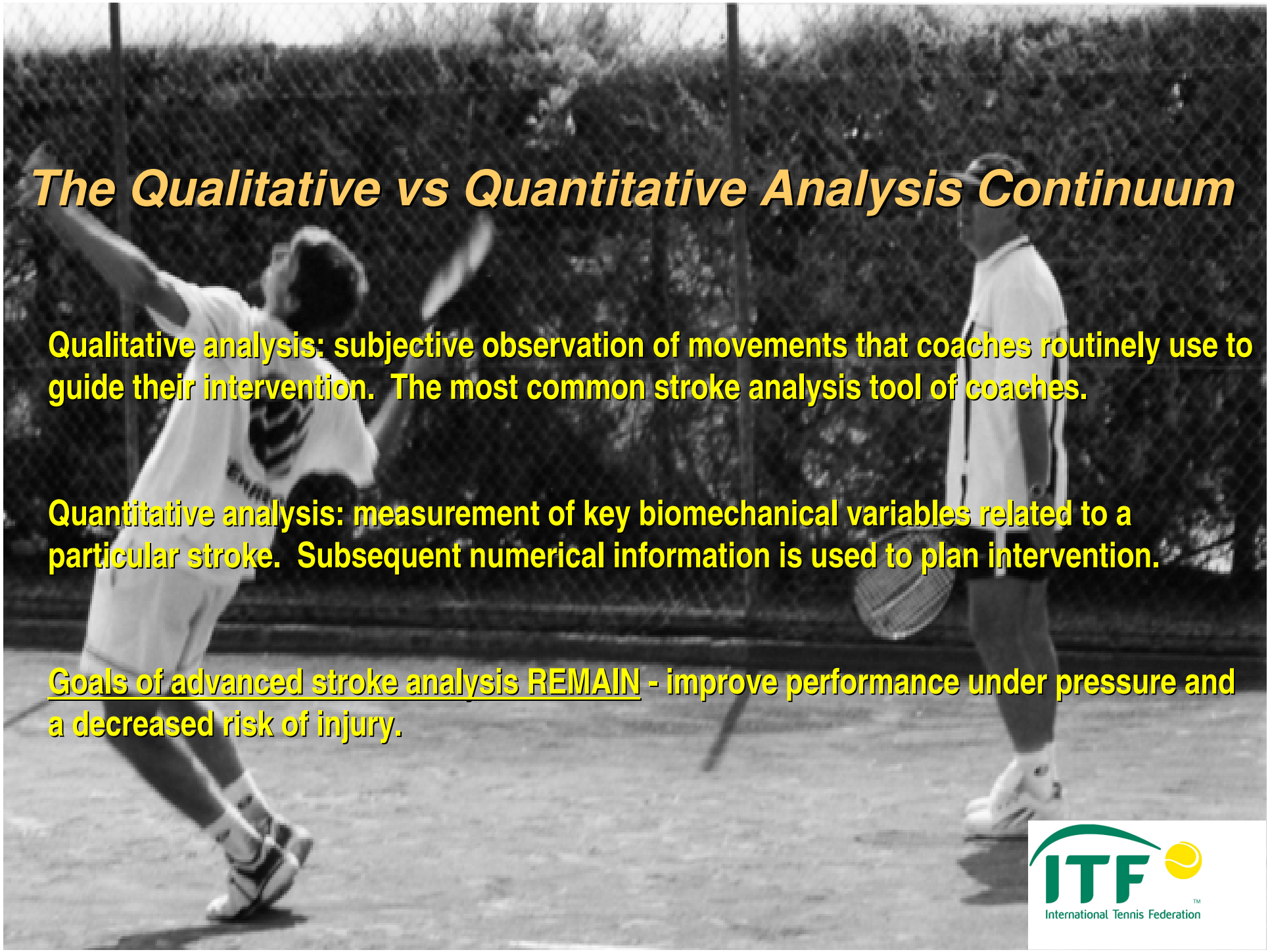
1. Outline characteristics (including advantages and disadvantages) of qualitative and quantitative analysis of advanced stroke production;

2. Highlight how and why visual, kinaesthetic and auditory information can be used to assist analysis

3. Introduce the characteristics of biomechanical performance models for stroke analysis

4. Demonstrate the use of software to assist in analysis, as a precursor to its use throughout the module

ITF™
International Tennis Federation



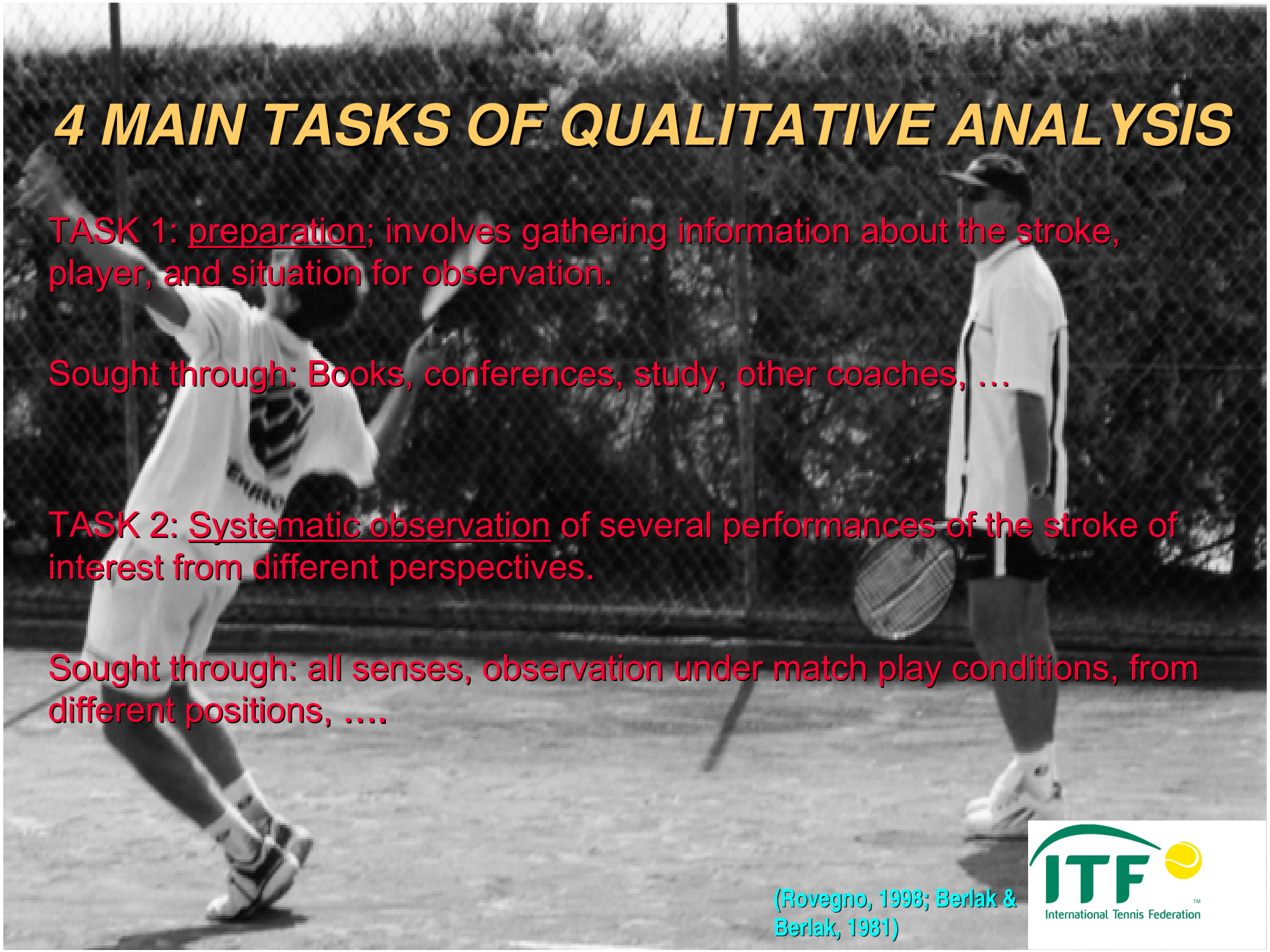
The Qualitative vs Quantitative Analysis Continuum

Qualitative analysis: subjective observation of movements that coaches routinely use to guide their intervention. The most common stroke analysis tool of coaches.

Quantitative analysis: measurement of key biomechanical variables related to a particular stroke. Subsequent numerical information is used to plan intervention.

<u>Goals of advanced stroke analysis REMAIN</u> - improve performance under pressure and a decreased risk of injury.

ITF™
International Tennis Federation



4 MAIN TASKS OF QUALITATIVE ANALYSIS

TASK 1: preparation; involves gathering information about the stroke, player, and situation for observation.

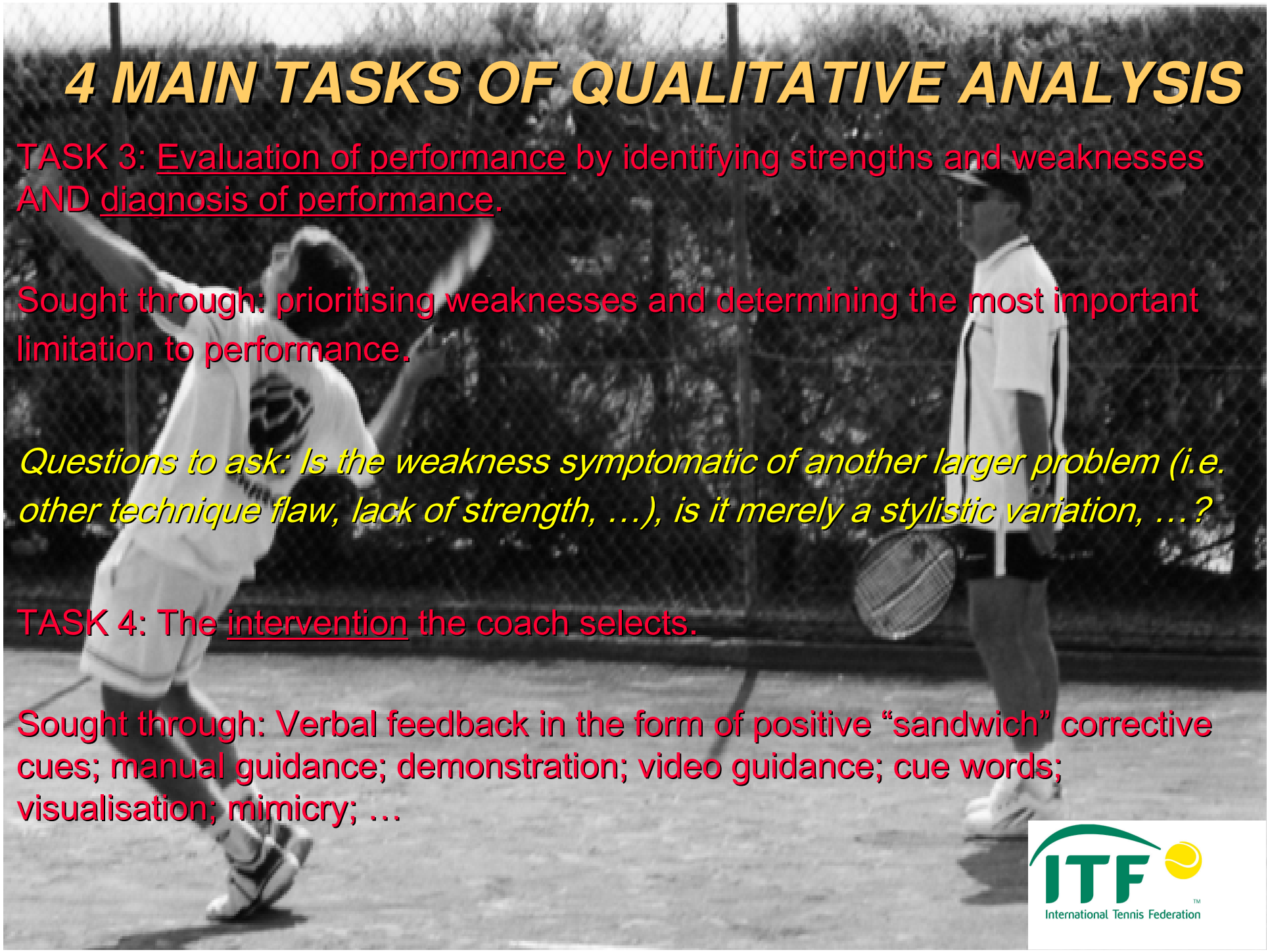
Sought through: Books, conferences, study, other coaches, …

TASK 2: Systematic observation of several performances of the stroke of interest from different perspectives.

Sought through: all senses, observation under match play conditions, from different positions, ….

(Rovegno, 1998; Berlak & Berlak, 1981)

ITF™ International Tennis Federation



4 MAIN TASKS OF QUALITATIVE ANALYSIS

TASK 3: Evaluation of performance by identifying strengths and weaknesses AND diagnosis of performance.

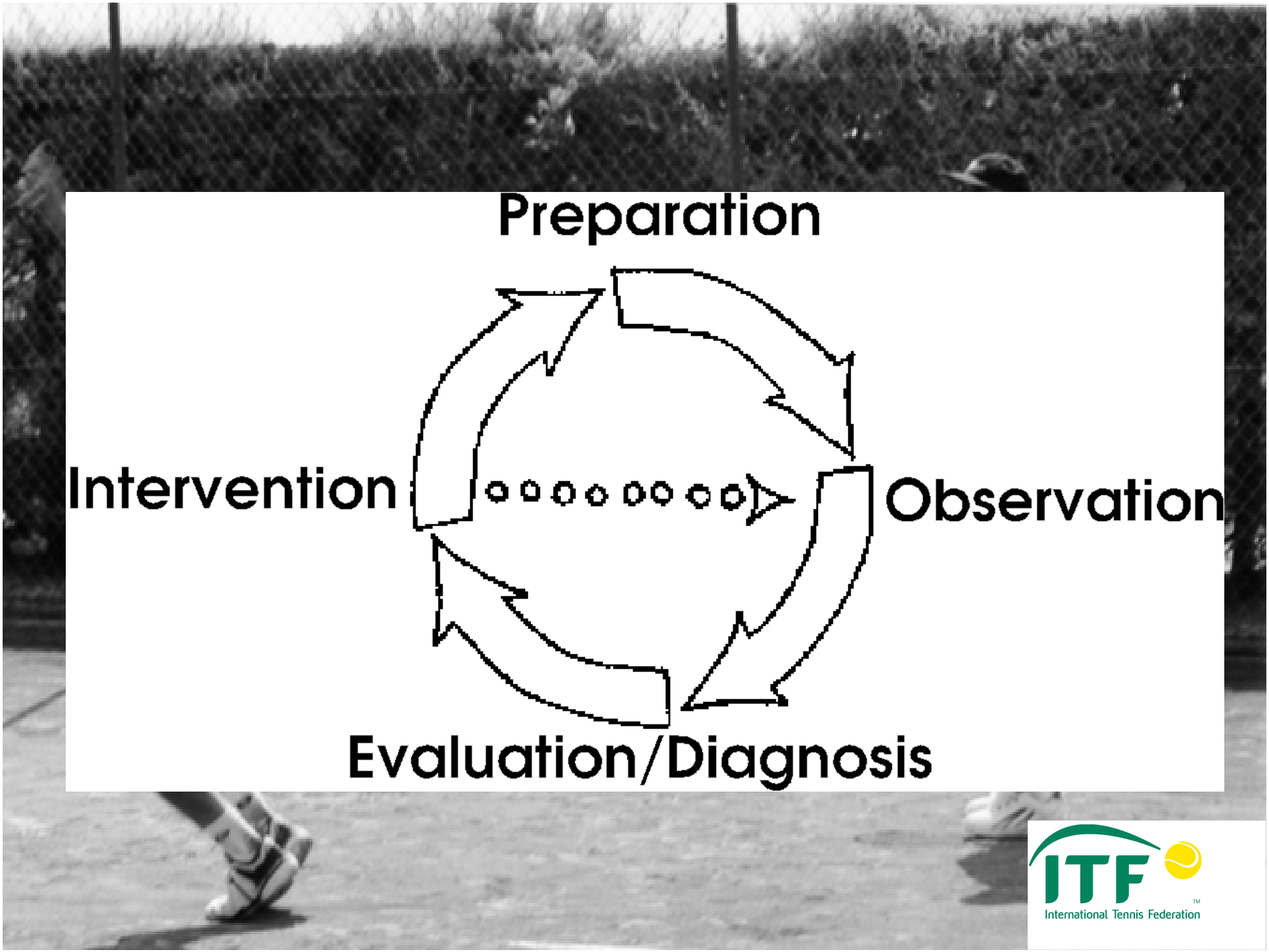
Sought through: prioritising weaknesses and determining the most important limitation to performance.

Questions to ask: Is the weakness symptomatic of another larger problem (i.e. other technique flaw, lack of strength, …), is it merely a stylistic variation, …?

TASK 4: The intervention the coach selects.

Sought through: Verbal feedback in the form of positive "sandwich" corrective cues; manual guidance; demonstration; video guidance; cue words; visualisation; mimicry; …

ITF™
International Tennis Federation


Preparation
Intervention
Observation
Evaluation/Diagnosis

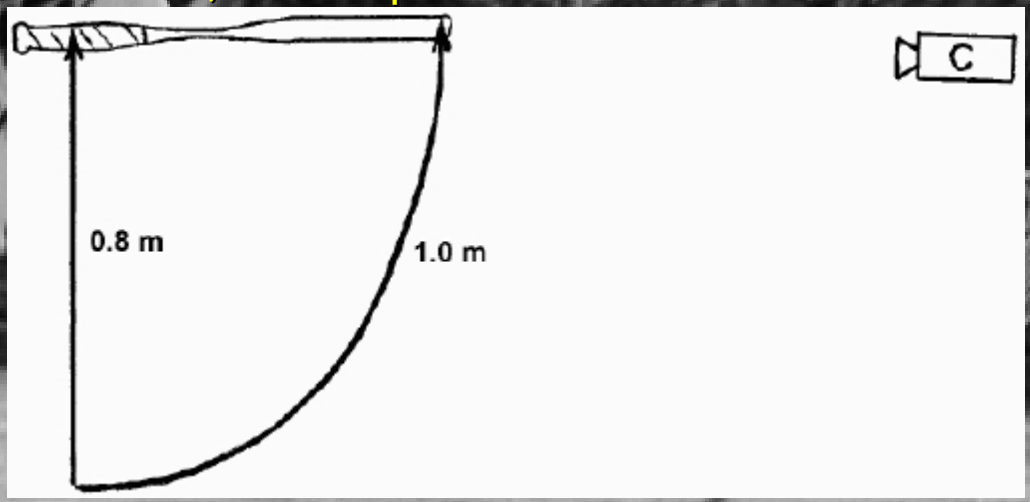
Qualitative Video Analysis

Advantages – helps us see what we physically cannot; useful educational tool for players, …

Human vision can only capture/view 4 to 5 frames per second.

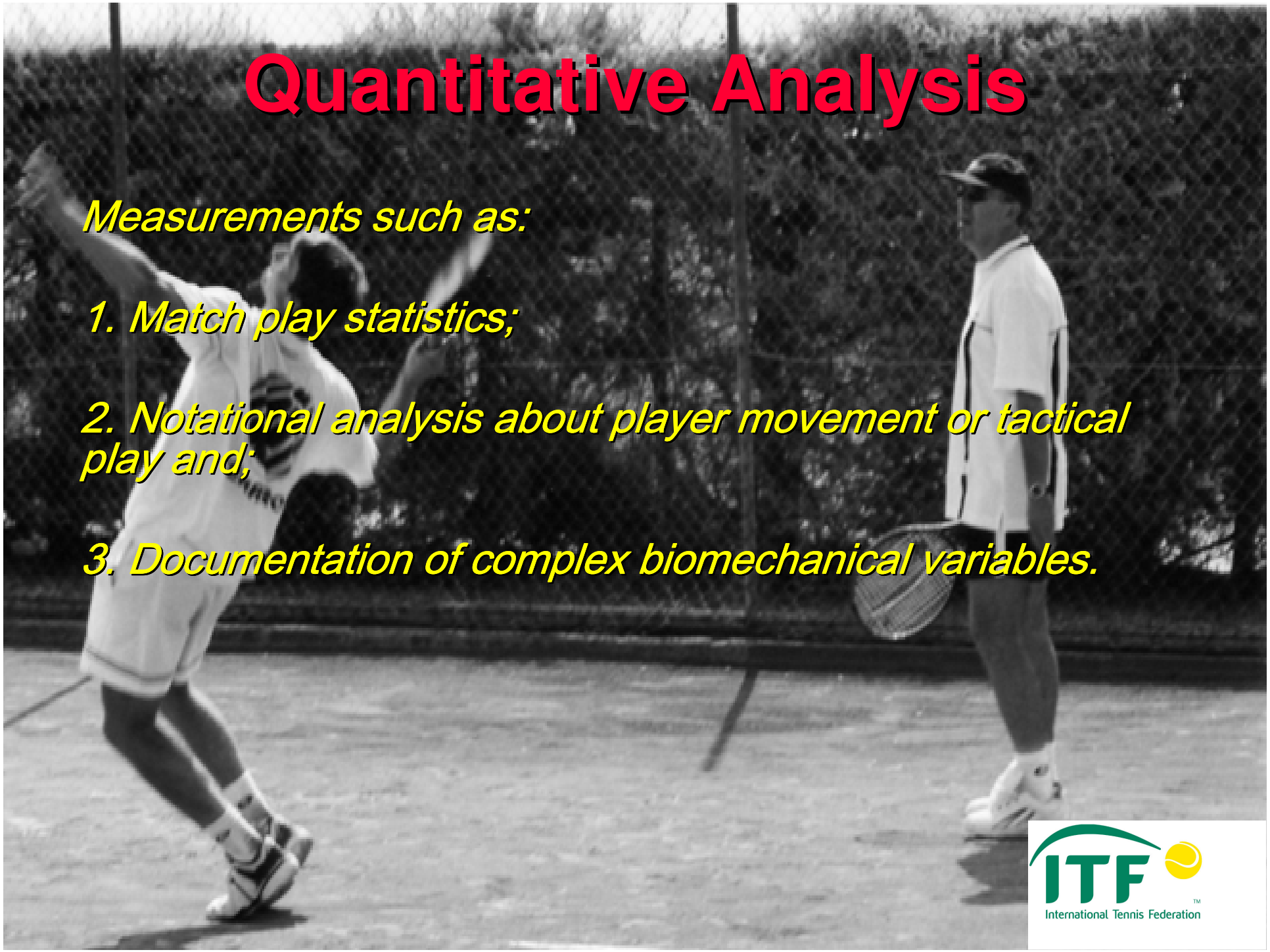
Standard analog or digital video captures 25 (Europe/Australia/Asia) or 30 (USA) images per second.

Disadvantages – distortion; a 2D representation of a 3D movement.



GUIDELINES FOR VIDEO CAPTURE

1. For clear video images shutter speeds of 1/500 or 1/1000th of a second are required. The shutter means that each of the 25 or 30 images per second are captured over 1/500th or 1/1000th of a second.



Quantitative Analysis

Measurements such as:

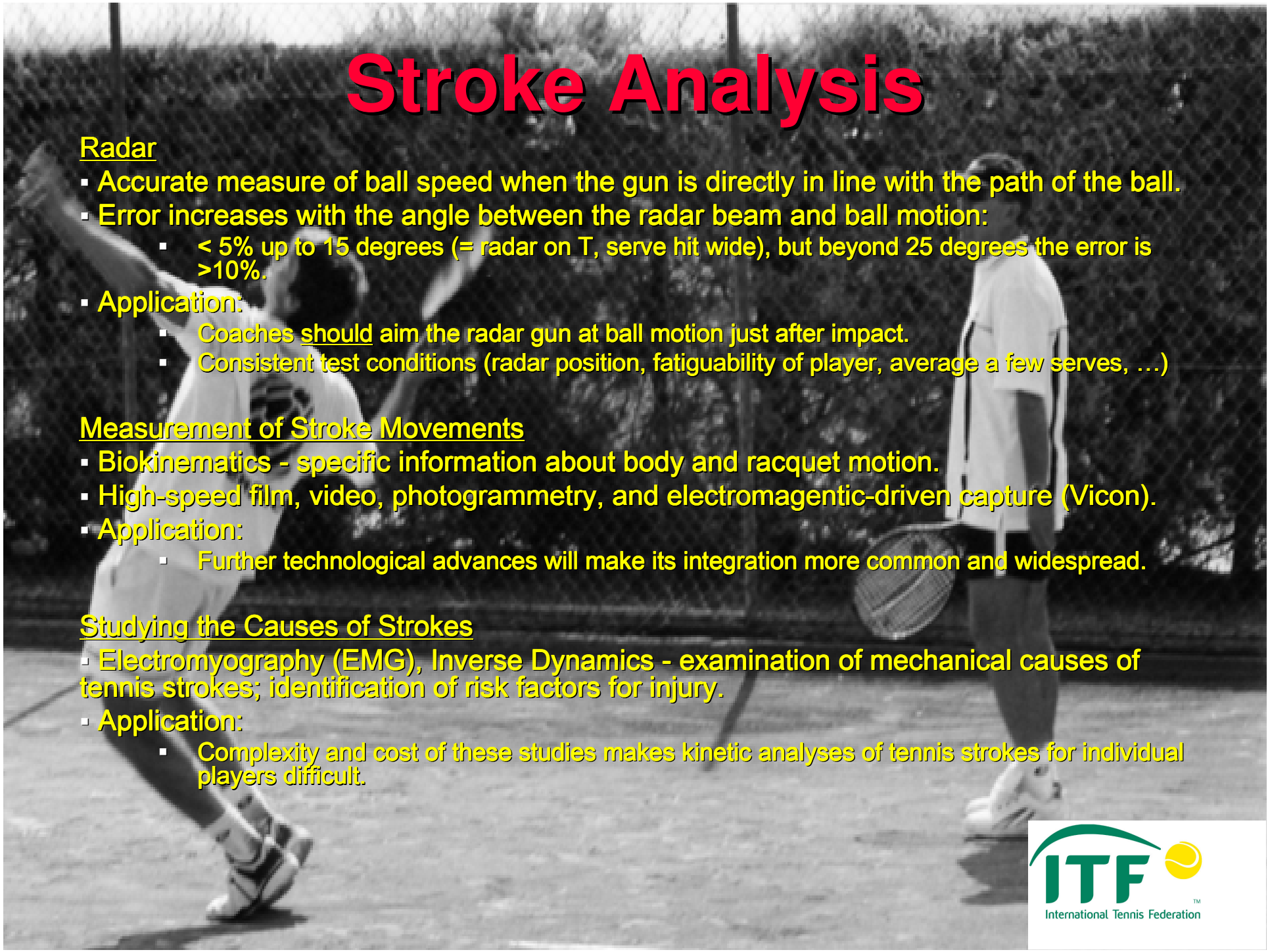
1. Match play statistics;

2. Notational analysis about player movement or tactical play and;

3. Documentation of complex biomechanical variables.

ITF™
International Tennis Federation

Stroke Analysis



Radar

- Accurate measure of ball speed when the gun is directly in line with the path of the ball.
- Error increases with the angle between the radar beam and ball motion:
  - < 5% up to 15 degrees (= radar on T, serve hit wide), but beyond 25 degrees the error is >10%.
- Application:
  - Coaches should aim the radar gun at ball motion just after impact.
  - Consistent test conditions (radar position, fatiguability of player, average a few serves, …)

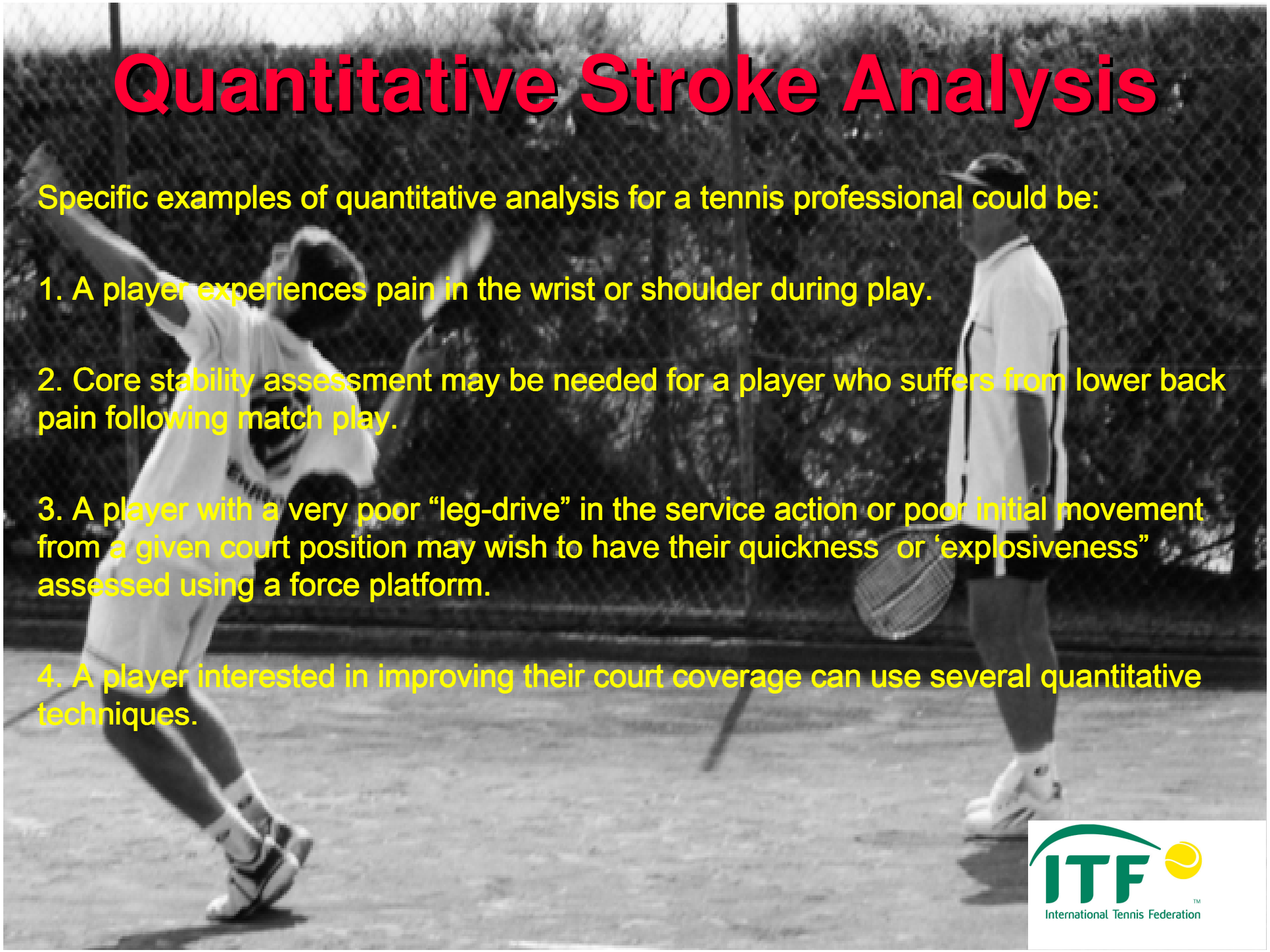
Measurement of Stroke Movements

- Biokinematics - specific information about body and racquet motion.
- High-speed film, video, photogrammetry, and electromagentic-driven capture (Vicon).
- Application:
  - Further technological advances will make its integration more common and widespread.

Studying the Causes of Strokes

- Electromyography (EMG), Inverse Dynamics - examination of mechanical causes of tennis strokes; identification of risk factors for injury.
- Application:
  - Complexity and cost of these studies makes kinetic analyses of tennis strokes for individual players difficult.

ITF™
International Tennis Federation



Quantitative Stroke Analysis

Specific examples of quantitative analysis for a tennis professional could be:

1. A player experiences pain in the wrist or shoulder during play.

2. Core stability assessment may be needed for a player who suffers from lower back pain following match play.

3. A player with a very poor “leg-drive” in the service action or poor initial movement from a given court position may wish to have their quickness or ‘explosiveness” assessed using a force platform.

4. A player interested in improving their court coverage can use several quantitative techniques.

ITF™
International Tennis Federation

Biomechanical Performance Models

INSERT EXAMPLE OF TABLE PUT TOGETHER – ELLIOTT (SERVE) + REID (FOREHAND)

ITF
International Tennis Federation

Summary

- Qualitative analysis - based on subjective judgements (guided by ranges of acceptability) about the quality of performance.
- Ranges of acceptability - established through quantitative analyses - should feature as part of biomechanical performance models.
- Quantitative analyses utilise definitive measurements of performance.
  - Radar, charting, fitness testing are inexpensive and available for coaches.
  - Others require specialised equipment and biomechanical expertise.
  - Advances in software and equipment will make quantitative biomechanical analysis more accessible.

ITF™
International Tennis Federation