- 1. UNIT TITLE: Biomechanics and Movement Analysis
- 2. LEVEL: Foundation
- 3. ALLOCATION (HRS): 30
- 4. PRE-REQUISITE STUDY MODULE: Nil

5. INTRODUCTION:

. . .

This course introduces the field of movement analysis and focuses on Kinesiology, basic mechanics and developments in notational analysis.

6. LEARNING OUTCOMES:

Students will be able to:

- (1) Explain the movement capabilities and limitations of the human musculoskeletal system.
- (2) Appreciate the basic mechanical laws which govern human movement.
- (3) Discuss the uses of notational analysis methods in sport.

7. CONTENT:

- (1) Developmental overview of notational analysis.
- (2) Key components of analysis systems.
- (3) Qualitative and Quantitative Analysis.
- (4) The uses of analysis; technical, tactical, behavioural, fitness evaluation, coach effectiveness.
- (5) Kinesiological description of human movement.
- (6) Muscular function.
- (7) Lever Systems.
- (8) Newtons Laws of Motion.
- (9) Centre of Gravity and Stability.
- (10) Basic mechanics of angular motion.

8. METHODS OF PRESENTATION: Introductory lectures, demonstrations and practical workshops.

9 INDICATIVE READING: Alderson, J. and Brackenridge, C. (1984)
Match Analysis Occasional NCF

Alderson, J., Treadwell, P., Fuller, N., & Sharp B. (1990) State of the Art Review, NCF Hughes, M., & Franks, I. (Eds) (1991)

Kirby, R., & Roberts, J.A. (1985)

Simonian, C. (1981)

Wirhed, R. (1984)

Notational Analysis in Sport, E & F Spon

Introductory Biomechanics Mouvement Publications, New York

Fundamentals of Sports Biomechanics Prentice Hall, Englewood Cliffs.

Athletic Ability and the Anatomy of Motion Wolfe, London

BIOMECHANICS AND MOVEMENT ANALYSIS REVISION SESSION

15 May 1992

Good morning! In our brief time together this morning I want to:

- Apologise in interfering in your attempt to "catch some rays".
- 2. Focus on two issues for revision within the context of the course.

During our time together I have tried to stress the potential of:

Disciplined observation

Educational technology

To facilitate the flourishing of sport and its participants (players, coaches, referees, administrators). To this end I have encouraged you to see notational analysis as a creative tool for understanding sporting performance.

Because of our limited but nonetheless remarkable ability to remember events, I have encouraged you to compare and contrast:

real time analysis

lapsed time analysis

hand notation

computer notation

as means of stimulating recall. It is not an attempt to have intrusive sports science it is rather a commitment to development.

Notational analysis has a large ethical problem to resolve. I hope by sharing the positive aspects we can really go places ...

Perhaps even back to the sun!!

Keith Lyons 15 May 1992

SPORT SOCIOLOGY II SUMMER TERM 1992

1. Introduction

Welcome back to College and the Sociology course. Our focus this term will be to pull together the strands of your course and to look forward to the exam!

In our first term together, I wanted to explore with you TWO very basic concepts:

IDENTITY

PERSPECTIVE

Sociology offers perspectives on how identity is created, developed and maintained in society. Sociology of sport does the same for our involvement in sport.

Early sociologists of sport were criticised for restricting their sociological analysis to WITHIN sport and for failing to locate sport in a wider social and cultural context. We have considered a number of perspectives.

This term I want to encourage you to try to make critical use of your knowledge of perspectives.

By the end of the course I hope you will be aware of the sociological significance of sport in society.

We will need to recap the importance of the following sociological terms:

social processes
social institutions
social status
social interaction
social norms
socialisation
culture
'normal' behaviour
'deviant' behaviour

Do you remember that these were terms in your course outline and were included in some notes for our first meeting in the Spring Term. Do you also recall the suggestion Peter Berger and Thomas Luckmann made in their book <u>The Social Construction of Reality</u> (Penguin University Books, 1971) that: The man in the street does not ordinarily trouble himself about what is real to him and about what he knows unless he is stopped short by some sort of problem. He takes his reality and his knowledge for granted. The sociologist cannot do this if only because of his systematic awareness of the fact that men in the street take quite different realities for granted as between one society and another. (1971:14)

They argue that 'reality' is socially constructed and that sociology must analyse the process in which this occurs.

In this year's sociology of sport course the learning outcomes are intended to be:

to understand the micro social systems which help and hinder sports participation

to understand and explain the role and importance of sport as a social institution

to debate ethical and social issues surrounding sport

Today, I want to encourage you/us to reflect on how such learning outcomes can be addressed by reflecting on your poster work. I would like to discuss the concepts of:

self society personal troubles public issues consciousness a sociological framework concepts and theories evidence explanation and understanding

I enjoyed your poster presentations and I was impressed by the way you invested effort into your chosen topic. If the process of that experience can be used to further a general understanding of the sociology of sport then the learning objectives/outcomes for the course can be addressed.

Perhaps we can conclude with the following points:

- 1. The language of sociology
- 2. The methods of sociology
- 3. Concepts, theories and paradigms
- 4. Empirical investigation/enquiry/research
- 5. Bisociation

Keith Lyons 29 April 1992 SPORT SOCIOLOGY I SUMMER TERM 1992 Wednesday, 6 May 1992

Welcome back to the Sociology course. In our next few meetings I want to prepare you for your examination. Today I want to have a look at the work we have covered in the past two terms and to identify the distinctively <u>sociological</u> nature of our work.

I also want to return the assignment.

During your holiday, I wonder if you saw sports events in a different light. Each day in the media it seems to me that there are numerous examples of topics we have discussed. It will be a considerable break through if you recognise that our awareness of such events is <u>mediated</u>.

Since we last met:

you have had a break/holiday of sorts

there has been a change of government structure for sport

German athletes have been cleared of drugs charges

Arthur Ashe has announced he has Aids

End of season fixtures are being completed in association football and rugby

England has been announced as the venue for the 1996 European Soccer Championship

the Ebbw Vale Garden Festival has opened

people have died at a football game in France

These are <u>visible</u>, <u>mediated</u> events. The <u>everyday</u> business of your lives has gone on but is also possibly changing. The <u>values and</u> <u>expectations</u> you have may be changing and the way you relate to or <u>interact</u> with others may thus be changing.

The sociology of sport offers a range of perspectives on your <u>situatedness</u> in the daily business of living. Last week you were involved in a programme of events that possibly contrasted with the 'normal routine' of work here. As sociologists you might want to think about last week in a particular kind of way. You might focus, for example, on the <u>social context</u> of the week and the <u>kinds of knowledge</u> you used or redefined.

At its best sport sociology encourages you to make the familiar strange and the strange familiar. It does so from a disciplined perspective that can be described as social scientific. In the jargon of sociology, it should enable you to locate <u>personal</u> <u>biography</u> in a <u>social structure</u>.

As sport sociologists you can be reflexive about the everyday.

BIOMECHANICS AND MOVEMENT ANALYSIS Friday 27 March 1992

1. INTRODUCTION

During our time together I have tried to show a range of activities on video but because of the topicality of the subject I have tended to use tapes of rugby union football. I hope to develop your interest in movement analysis by looking at a range of activities.

Some weeks ago, I suggested that Analysis can be used in:

gymnastic sports

athletic sports

games sports

Another way of categorising activities is to focus on the nature of individual performance. Thus sports can be categorised as:

individual

co-active

team

The kind of classification we develop for analysis can be called a TAXONOMY and as students of movement analysis you ought to be aware of such structures. Having a sense of the GENERIC character of an activity might enable careful analysis. For example, what are the essential similarities and differences in the following sports:

gymnastics, trampolining, swimming, diving, athletics, dance

tennis, badminton, squash, volleyball

basketball, netball, handball

soccer, rugby, American football, Australian Rules, Gaelic football

hockey, hurling, lacrosse, cricket

Do you think that the kind of analysis you can do is structured by the sport itself? What kind of information can you gather from these sports?

Remember that we suggested some weeks ago that movement analysis aims to move from DESCRIPTION to MODELLING to PREDICTION. I also want to remind you about the observational skills you require to do this. What kind of evidence do you need?

a permanent record (video or film)? a carefully prepared data collection system?

2. VIEWING AS AN ACTIVE PROCESS

Our use of video in 1992 is linked to developments in photography and cinematography that date back to the early nineteenth century. These include:

- i) the principle of the persistence of vision
- ii) the photographic image
- iii) projection

In 1872, for example, Eadweard Muybridge demonstrated that a horse sometimes has all four feet off the ground when trotting. A French physiologist Etienne-Jules Marey refined this work and developed a camera in 1881 that could take 12 pictures per second and then in 1885 a 100 pictures per second. Video technology has moved from a black and white reel to reel system in 1958 to a portable camcorder using electronic chips as imaging devices.

At Cardiff, we have the means to analyse video and high speed film and any project or dissertation you consider ought to at least recognise the availability of such technology.

I regard video as an excellent resource for movement analysis. Celia Brackenridge and John Alderson (1985), amongst others, have noted that such analysis aims to move from DESCRIPTION to MODELLING to PREDICTION.

Analysis is an active process. What can be observed depends on whether you observe a real time event or a lapsed time event. The latter implies you have a recording of the event that you can play and replay.

As a practical example of this process, I would like to use two videos of court games. The first game is netball and the second game is handball. I will play the tapes through twice - first time to give you a visual reminder, the second time to give you a chance to analyse the action.

Both are court games, based on passing and scoring.

Remember that we have also suggested in previous weeks that:

- * Analysis is regarded as an OBJECTIVE process and is thought to exhibit some of the features of SCIENTIFIC ENDEAVOUR.
 * Analysis can be PURE or APPLIED.
- * QUANTITATIVE or QUALITATIVE.

For an early account of Notational Analysis see:

Brackenridge, C & (1985) <u>Match Analysis</u>, NCF, Leeds Alderson, J

For other examples: Lyons, K (1988)

The Use of Video in Sport, Springfield Books, Huddersfield

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BIOMECHANICS AND MOVEMENT ANALYSIS YEAR ONE Friday 8 May 1992

SPORTS TECHNOLOGY, OBSERVATION AND ANALYSIS

1. INTRODUCTION

Good morning! It seems such a long time since we last met. In today's talk I would like to discuss some issues linked to the rationale of this course and their long term implications for your work. Since early October you have met two tutors on this course. Our intention has been to share with you our experience of sport in a practical context.

Today, I want to consider the significance of <u>TECHNOLOGY</u> for your development as students of human movement. By the end of this morning's talk I hope to have encouraged you to think about the links between technology, observation and analysis. The kind of work you will be able to do in biomechanics and movement analysis should build upon these links. The term <u>EDUCATIONAL TECHNOLOGY</u> is important in this context.

2. EDUCATIONAL TECHNOLOGY

In a newsletter in 1986, the Council for Educational Technology (CET) observed that:

Learning is at the very basis of all the work of educational technology, but there has been a tendency for people to link these words with equipment which is merely a delivery system, rather than remember that it is the improvement of learning itself that is at the heart of our aims.

The CET was formed in 1973 to promote the application and development of educational technology in all sectors of educational training. The CET define educational technology as:

a rational, problem-solving approach to education and training based on a systematic application of the growing body of knowledge about the learning process and on the appropriate use of communications technology.

If you would like to follow up some of these issues, you might like to have a look at:

Derek Rowntree (1982) <u>Educational Technology in Curriculum</u> <u>Development</u>, Harper Row, London

O Zuber-Skerritt (ed)(1984)<u>Video in Higher Education</u>, Kogan Page, London

As you ponder these quotations here are two more !!

In 1979, the headmistress of a Suffolk school asked a group of 22 children aged between 8 and 11 to write down in 15 minutes the titles of all the television programmes they liked. Between them they named 242 programmes, many of which they had not seen for some time. Of the titles in that list only one was a schools television programme. (R Moss, Video: The Educational Challenge, 1983:87)

There is an important difference between just superficially looking at yourself and really doing so. It would appear that the average person probably 'keeps his distance' when casually viewing himself, whereas the videotape presents an 'uncensored' confrontation. (P Dowrick (ed), <u>Using Video</u>, 1983:101).

I want to encourage you to think about how a first year course can meet some of these educational technology points. Some weeks ago, I showed a video tape to trigger a discussion about technology, observation and analysis. In the tape, you saw:

Swimming

Biomechanical Analysis

Dance

Team Games

I selected a range of images from videos. My aim was to produce a teaching resource that covered a range of activities. We have the facility to edit images and I wanted to use the video also as an example of the process of making and using a resource.

Educational technology encourages teachers and learners to be <u>reflexive</u> about teaching and learning. Hopefully both groups can be sensitive to David Warren's suggestion made almost twenty years ago that:

Although sophisticated equipment can increase the potential of what may be taught, it does not of itself guarantee that more is learned. (unpublished SDU paper, 'Media and Educational Technology Units', 1973:8)

Biomechanical analysis and notational analysis make use of records of performance. Video and computers make it possible to have permanent records for <u>LAPSED-TIME</u> retrieval of information. Increasingly the kind of work we will be able to do is limited by our imagination and the availability of equipment. This and subsequent courses is intended to identify what the possibilities might be!

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BOW HAND ANCHOR (DATUM) . DRAWING ARM AND HAND POSITIONS PREP LINE - D.F.L.	BODY POSTURE FEET POSITION BOW CANT AND MOVEMENT HEAD POSITION AND MOVEMENT FOLLOW THROUGH ARROW FLIGHT BODY POSITION BOW SHOULDER BOW ARM	3 3 CLAN VIEW ON A RIGHT-HANDED ARCHER
	3 BOBY POSITION PRAWING ARM ELBOW POSITION PROPPING OF BOW ARM ARROW CREEP BOW SHOULDER DRAW SHOULDER	 CZOUCHED INSIDE OF DRAWING HAND AT FULL DRAW BOW ARM AND BOW HAND POSITION WHETHER BOW CANT IS CAUSED BY BOW ARM OR HAND BOW HAND DRAWING HAND WRIST STABILISER MOVEMENT BOW MOVEMENT CAUSED BY TORQUE
CONSISTENT - YES NO TENSION - YES NO WEIGHT ON } YES NO SHOULDERS } YES NO	BOW GRIP - TIGHT/LOOSE/ERABS	(1) BODY FEET ON SOLARE OFFICE SOW CANT - HONE / RIGHT / LEFT HEAD - STILL/MOVES / PEEKS FOLLOW STRAIGHT - GOOD / BAD ARROW AT FULL DRAW - BENT/ STRAIGHT - GOOD / BAD ARROW AT FULL DRAW - BENT/ STRAIGHT - STRAIGHT / LEFT STRAIGHT / DOWN BOW ARM - STRAIGHT / BENT/ RELAXED BOW HAND - TENSE / RELAXED
	BOW CANT WITH ARM OR HAND BOW CANT WITH ARM OR HAND BOW HAND - TENSE (RELAXE) DRAW (VERTICAL/TWISTED HAND (STRAIGHT/CURLED DRAW HAND - FLAT /YES / NC STABILISER (FORWARD / DOWN/ MOVEMENT (UP/LEFT / RIGHT BOW MOVEMENT OUE TO TORQUE - YES / NO	(3) BODY POSITION (A) CRAW BOW ARM LOOSES - FORWARD /U/ BOW SHOULDER - UP (DOWN / BACK / STILL) BOW SHOULDER - UP (DOWN / BACK / UP ARROW CREEPS - VES / NO ARROW CREEPS - YES / NO ARROW CREEPS - YES / NO BOW SHOULDER - DOWN & BACK / USE BOW SHOULDER - DOWN & BACK / UP & OUT BOW SHOULDER - DOWN & BACK / UP & OUT BOW SHOULDER - DOWN & BACK

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BIOMECHANICS AND MOVEMENT ANALYSIS Friday 21 February 1992

1. INTRODUCTION

In our first meeting, I tried to show a range of activities on video. Movement analysis aims to move from DESCRIPTION to MODELLING to PREDICTION.

In today's talk I want to encourage you to think about the observational skills you require to do this. What kind of evidence do you need?

It seems to me that the ability to identify patterns and regularities is something we all have to work on. Because of the limitations of our own memory, video technology has become an important tool in the analysis process.

2. VIEWING AS AN ACTIVE PROCESS

Analysis is an active process. What can be observed depends on whether you observe a real time event or a lapsed time event. The latter implies you have a recording of the event that you can play and replay.

Analysis is often regarded as an OBJECTIVE process and is thought to exhibit some of the features of SCIENTIFIC ENDEAVOUR. We must also contrast analysis that might be described as PURE and that which can be described as APPLIED.

We might also distinguish between QUANTITATIVE and QUALITATIVE approaches.

In my part of the course we will focus on MATCH ANALYSIS. It is evident that with a different lecturer you might focus on different concerns. For example, a review of analysis in sport (Alderson 1990), noted the significance of:

exercise physiology

biomechanics

motor/sports psychology

for the development of objective preparation and coaching programmes.

Analysis can be used in:

gymnastic sports

athletic sports

games sports

In subsequent courses I hope we can develop strategies for analysis that recognise the differences in these kinds of sports.

You should be aware of the current interest in analysis. There are journals and books that publish more and more material about it. Three years ago I wrote a book about how video was contributing to some of this. The book is called <u>The Use of Video</u> in <u>Sport</u> and provides a number of examples of how people have used video to investigate sport.

In pre-video days, analysts used HAND NOTATION systems. Rudolph Laban's work to record dance movement is an excellent example of such notation. Dance notation was the precursor of today's notational analysis in sport and still provides an example of the potential of skilled observation.

In this country some of the early notation systems focused on football and squash. Workers at Liverpool Polytechnic did much to develop these.

We ought to distinguish between HAND NOTATION and COMPUTER NOTATION. Depending on which method is chosen there are implications here for DATA COLLECTION and DATA HANDLING.

I would regard our time together as the start of conversations about these matters.

NOTATIONAL ANALYSIS seeks to inform player and coach effectiveness. Notational analysis is also a field of enquiry that is developing as an academic area of study. At this College we now have courses in all three years that address analysis and this year there are some twenty students writing dissertations in the area of analysis.

In the time remaining this morning, I would like to raise some questions about the process of observation that forms the basis of analysis.

Ian Franks and Gary Miller (1985) in an article in <u>Journal of</u> <u>Sport Behaviour</u> noted that very little research had been conducted into observational accuracy of teachers and coaches. They sought to compare some of the available evidence about eyewitness testimony in criminal situations to the process of observation in coaching.

Whilst I want you to be aware of Ian Franks' work, I want to use an earlier piece of work by Darren Newtson (1976) published in the <u>Journal of Human Movement Studies</u> to focus our attention today.

REFERENCES mentioned in today's talk:

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In 1872, for example, Eadweard Muybridge demonstrated that a horse sometimes has all four feet off the ground when trotting. A French physiologist Etienne-Jules Marey refined this work and developed a camera in 1881 that could take 12 pictures per second and then in 1885 a 100 pictures per second. Video technology has moved from a black and white reel to reel system in 1958 to a portable camcorder using electronic chips as imaging devices.

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The Use of Video in Sport, Springfield Books, Huddersfield SPORTS TECHNOLOGY Monday 24 February 1992

1. INTRODUCTION

In our first meeting, I tried to show a range of activities on video tape. My intention was to introduce some of the TECHNICAL and OPERATIONAL aspects of video as an educational technology medium. The purpose of the practical video use sessions was to encourage you to think about video as a local resource. In doing so I wanted you to be aware of the limits of DOMESTIC video equipment.

Our use of video in 1992 is linked to developments in photography and cinematography that date back to the early nineteenth century. The Museum of the Moving Image on London's South Bank has an interesting display of materials that relate to:

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In pre-video days, analysts used HAND NOTATION systems. Rudolph Laban's work to record dance movement is an excellent example of such notation. Dance notation was the precursor of today's notational analysis in sport and still provides an example of the potential of skilled observation.

In this country some of the early notation systems focused on football and squash. Workers at Liverpool Polytechnic did much to develop these.

We ought to distinguish between HAND NOTATION and COMPUTER NOTATION. Depending on which method is chosen there are implications here for DATA COLLECTION and DATA HANDLING.

I would regard our time together as the start of conversations about these matters.

NOTATIONAL ANALYSIS seeks to inform player and coach effectiveness. Notational analysis is also a field of enquiry that is developing as an academic area of study. At this College we now have courses in all three years that address analysis and this year there are some twenty students writing dissertations in the area of analysis.

In the time remaining this morning, I would like to raise some questions about the process of observation that forms the basis of analysis.

Ian Franks and Gary Miller (1985) in an article in <u>Journal of</u> <u>Sport Behaviour</u> noted that very little research had been conducted into observational accuracy of teachers and coaches. They sought to compare some of the available evidence about eyewitness testimony in criminal situations to the process of observation in coaching.

Whilst I want you to be aware of Ian Franks' work, I want to use an earlier piece of work by Darren Newtson (1976) published in the <u>Journal of Human Movement Studies</u> to focus our attention today.

REFERENCES mentioned in today's talk:

Alderson, J et al	(1990)	<u>Match Analysis in Sport</u> , Sheffield
Brackenridge, C & Alderson, J	(1985)	<u>Match Analysis in Sport</u> , NCF,Leeds
Franks, I & Miller,	G(1985)	'Eyewitness Testimony in Sport', Journal of Sport Behaviour, 38–45
Lyons, K	(1988)	<u>The Use of Video in Sport,</u> Springfield Books, Huddersfield
Newtson, D	(1976)	'The Process of Movement Observation', <u>Journal of Human</u> <u>Movement Studies</u> , 114–122.

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