Dr Rob Campbell

Sports Physician

Sportsmed Canterbury, Christchurch

Saturday, August 13, 2016 (Room 5)

11:00 - 11:55 WS #92: ACC Concussion Workshop

12:05 - 13:00 WS #103: ACC Concussion Workshop (Repeated)

CONCUSSION & HEAD INJURY

A Clinic-based approach

ACC SportSmart

Written

Date

dd/mm/2016

AN APPROACH TO THE CONDITION

- An overview of Concussion
- Review the consensus statement on concussion
- Advocate a standardised clinic-based approach
- Outline a standardised return to sport/work program

PREVIOUS CONCEPTS REINFORCED

- Concussion is not a benign injury
- Complication rate is low
- No way of predicting which athletes are going to have complications
- Management must be conservative
- Aim at reducing the overall burden of head injury/trauma

CONCUSSION IS...

- A complex pathophysiological process affecting the brain
- Induced by biomechanical forces
- Resulting in largely functional rather than structural injury

"CONCUSSION IS A BRAIN INJURY"

CONSENSUS STATEMENT ON CONCUSSION IN SPORT: THE 4TH INTERNATIONAL CONFERENCE ON CONCUSSION IN SPORT, ZURICH, NOVEMBER 2012, BJSM

CONCUSSION
EPIDEMIOLOGY

- Concussion rate has increased over the past two decades
- Women sustain more concussions
- Greater risk during competition

SPORTS COLLABORATION GROUP

NETBALL NEW ZEALAND

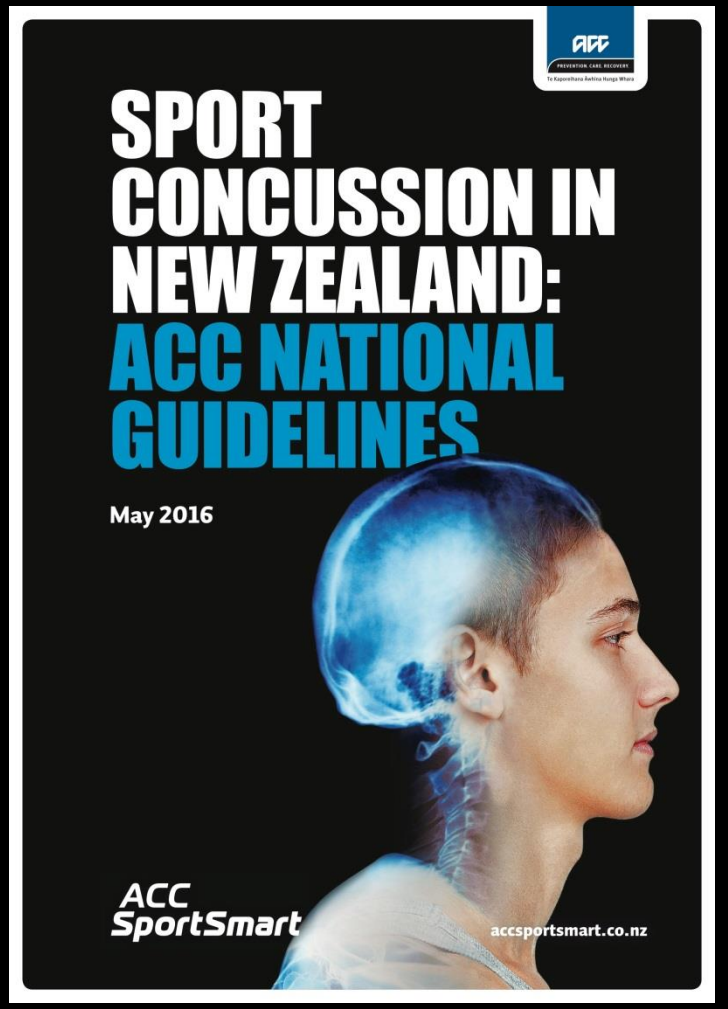
NEW ZEALAND FOOTBALL

ACC

NEW ZEALAND RUGBY

NEW ZEALAND RUGBY LEAGUE®

SPORTS COLLABORATION GROUP



SPORTS COLLABORATION GROUP

- Endorsed the consensus guidelines
- Concussion should be managed by medical doctors
- A standardised approach is needed
- More primary care education needed

A MEDICAL DOCTOR PROBLEM

MEDICAL REVIEW

- At time of injury
- Before returning to activity
- Prior to returning to sport

TOOLS FOR ASSESSMENT

Pocket Concussion Recognition Tool (CRT)

- For non-medical / first responders

SCAT 3

- For use by medical professionals
- Validated for those 13 years of age and older

Child SCAT 3

- For use by medical professionals
- For 5 to 12 year olds

POCKET CRT

Pocket CONCUSSION RECOGNITION TOOL™

To help identify concussion in children, youth and adults

RECOGNIZE & REMOVE

Concussion should be suspected **if one or more** of the following visible clues, signs, symptoms or errors in memory questions are present.

1. Visible clues of suspected concussion

Any one or more of the following visual clues can indicate a possible concussion:

Loss of consciousness or responsiveness
Lying motionless on ground / Slow to get up
Unsteady on feet / Balance problems or falling over / Incoordination
Grabbing / Clutching of head
Dazed, blank or vacant look
Confused / Not aware of plays or events

2. Signs and symptoms of suspected concussion

Presence of any one or more of the following signs & symptoms may suggest a concussion:

- Loss of consciousness
- Seizure or convulsion
- Balance problems
- Nausea or vomiting
- Drowsiness
- More emotional
- Irritability
- Sadness
- Fatigue or low energy
- Nervous or anxious
- "Don't feel right"
- Difficulty remembering
- Headache
- Dizziness
- Confusion
- Feeling slowed down
- "Pressure in head"
- Blurred vision
- Sensitivity to light
- Amnesia
- Feeling like "in a fog"
- Neck pain
- Sensitivity to noise
- Difficulty concentrating

3. Memory function

Failure to answer any of these questions correctly may suggest a concussion.

"What venue are we at today?"
"Which half is it now?"
"Who scored last in this game?"
"What team did you play last week / game?"
"Did your team win the last game?"

Any athlete with a suspected concussion should be IMMEDIATELY REMOVED FROM PLAY, and should not be returned to activity until they are assessed medically. Athletes with a suspected concussion should not be left alone and should not drive a motor vehicle.

It is recommended that, in all cases of suspected concussion, the player is referred to a medical professional for diagnosis and guidance as well as return to play decisions, even if the symptoms resolve.

RED FLAGS

If ANY of the following are reported then the player should be safely and immediately removed from the field. If no qualified medical professional is available, consider transporting by ambulance for urgent medical assessment:

- Athlete complains of neck pain
- Increasing confusion or irritability
- Repeated vomiting
- Seizure or convulsion
- Weakness or tingling / burning in arms or legs
- Deteriorating conscious state
- Severe or increasing headache
- Unusual behaviour change
- Double vision

Remember:

- In all cases, the basic principles of first aid (danger, response, airway, breathing, circulation) should be followed.
- Do not attempt to move the player (other than required for airway support) unless trained to so do.
- Do not remove helmet (if present) unless trained to do so.

from McCrory et. al, Consensus Statement on Concussion in Sport. Br J Sports Med 47 (5), 2013

SCAT 3

SCAT 3

- Assessment
  - Sideline Assessment & Maddocks Score
  - Background information
  - Symptoms
  - Standardised Assessment of Concussion (SAC)
  - Balance Error Scoring System (BESS)
- Instructions
- Athlete / Carer Advice

SCAT 3 – SIDELINE ASSESSMENT

- Emergency Indications
- GCS

Maddocks Score[3]

"I am going to ask you a few questions, please listen carefully and give your best effort."

Modified Maddocks questions (1 point for each correct answer)

What venue are we at today?	0	1
Which half is it now?	0	1
Who scored last in this match?	0	1
What team did you play last week/game?	0	1
Did your team win the last game?	0	1
Maddocks score		of 5

Maddocks score is validated for sideline diagnosis of concussion only and is not used for serial testing.

CLINIC BASED ASSESSMENT

SYMPTOMS

- Variable
- Not always severe
- Not always present when you see them
- Hard to quantify
  - How bad are they?

HISTORY – KEY CONSIDERATIONS

- Don’t need to be knocked out
- Blow does not need to be to the head
- Patient may appear normal
- High index of suspicion

MODIFIERS

Factors	Modifier
Symptoms	• Number • Duration (>10 days) • Severity
Signs	• Prolonged LOC (>1min) • Amnesia
Sequelae	Concussive convulsions
Temporal	• Frequency –repeated concussion over time • Timing – injuries close together • “Recency” – recent concussion or TBI
Threshold	Repeated concussions occurring with progressively less impact force or slower recovery after each successive concussion
Age	Child and adolescent (< 18 years old)
Co and Pre-morbidities	Migraine, depression or other mental health disorders, attention deficit hyperactivity disorder (ADHD), learning disabilities (LD), sleep disorders
Medication	• Psychoactive drugs • Anticoagulants
Behaviour	Dangerous style of play
Sport	• High risk activity • Contact and collision sport • High sporting level

ADOLESCENT ATHLETES

- Developing brains
- Generally require longer to recover
- More likely to have complications
- Be more conservative

SCAT 3 – BACKGROUND

Name: _____ Date: _____

Examiner: _____

Sport/team/school: _____ Date/time of injury: _____

Age: _____ Gender: ☐ M ☐ F

Years of education completed: _____

Dominant hand: ☐ right ☐ left ☐ neither

How many concussions do you think you have had in the past? _____

When was the most recent concussion? _____

How long was your recovery from the most recent concussion? _____

Have you ever been hospitalized or had medical imaging done for a head injury? ☐ Y ☐ N

Have you ever been diagnosed with headaches or migraines? ☐ Y ☐ N

Do you have a learning disability, dyslexia, ADD/ADHD? ☐ Y ☐ N

Have you ever been diagnosed with depression, anxiety or other psychiatric disorder? ☐ Y ☐ N

Has anyone in your family ever been diagnosed with any of these problems? ☐ Y ☐ N

Are you on any medications? If yes, please list: ☐ Y ☐ N

_____

SCAT 3 – SYMPTOMS

How do you feel?

"You should score yourself on the following symptoms, based on how you feel now".

	none	mild		moderate		severe	
Headache	0	1	2	3	4	5	6
"Pressure in head"	0	1	2	3	4	5	6
Neck Pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like "in a fog"	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
Trouble falling asleep	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or Anxious	0	1	2	3	4	5	6

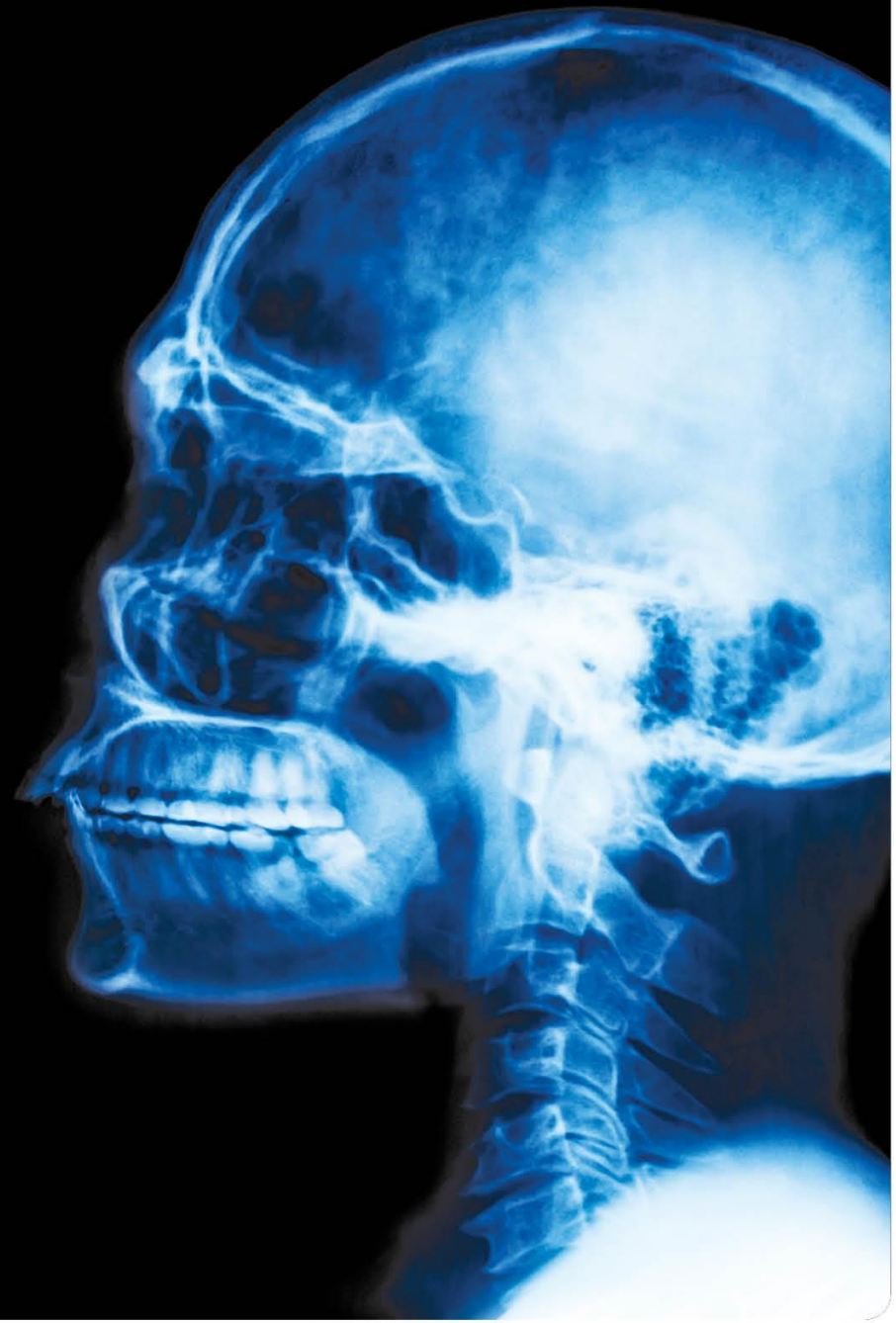
Total number of symptoms (Maximum possible 22)

Symptom severity score (Maximum possible 132)

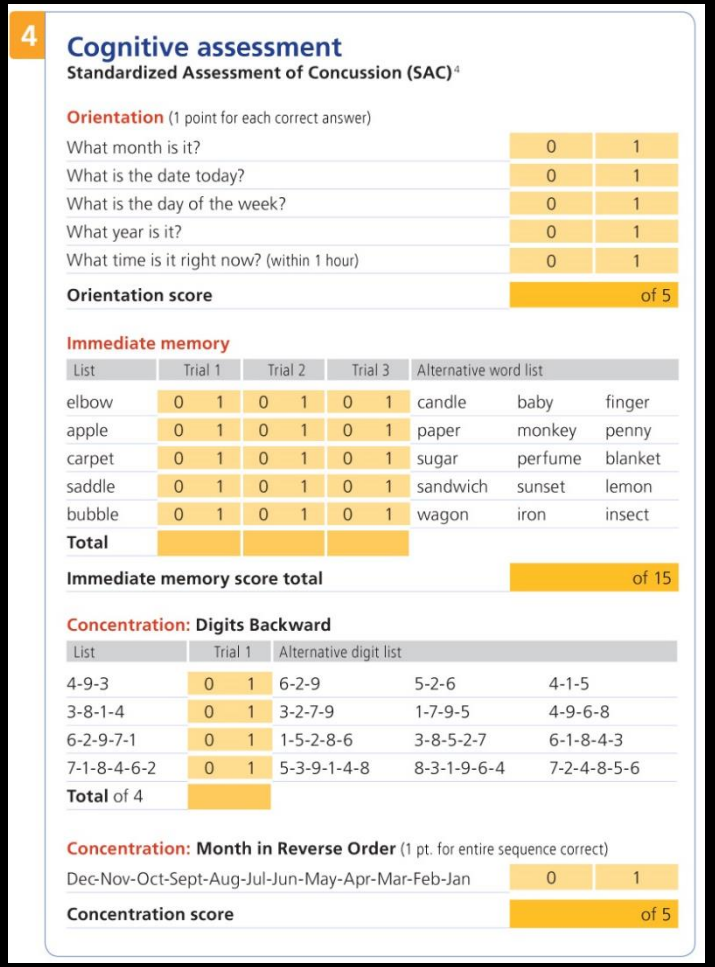
Do the symptoms get worse with physical activity? Y N

Do the symptoms get worse with mental activity? Y N

EXAMINATION



SCAT 3 – SAC



4 Cognitive assessment

Standardized Assessment of Concussion (SAC)[4]

Orientation (1 point for each correct answer)

What month is it?	0	1
What is the date today?	0	1
What is the day of the week?	0	1
What year is it?	0	1
What time is it right now? (within 1 hour)	0	1
Orientation score		of 5

Immediate memory

List	Trial 1	Trial 2	Trial 3	Alternative word list		
elbow	0 1	0 1	0 1	candle	baby	finger
apple	0 1	0 1	0 1	paper	monkey	penny
carpet	0 1	0 1	0 1	sugar	perfume	blanket
saddle	0 1	0 1	0 1	sandwich	sunset	lemon
bubble	0 1	0 1	0 1	wagon	iron	insect
Total						

Immediate memory score total of 15

Concentration: Digits Backward

List	Trial 1	Alternative digit list		
4-9-3	0 1	6-2-9	5-2-6	4-1-5
3-8-1-4	0 1	3-2-7-9	1-7-9-5	4-9-6-8
6-2-9-7-1	0 1	1-5-2-8-6	3-8-5-2-7	6-1-8-4-3
7-1-8-4-6-2	0 1	5-3-9-1-4-8	8-3-1-9-6-4	7-2-4-8-5-6
Total of 4				

Concentration: Month in Reverse Order (1 pt. for entire sequence correct)

Dec-Nov-Oct-Sept-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan	0	1
Concentration score		of 5

5 Neck Examination:

Range of motion Tenderness Upper and lower limb sensation & strength

Findings: _____

6 Balance examination

Do one or both of the following tests.

Footwear (shoes, barefoot, braces, tape, etc.) _____

Modified Balance Error Scoring System (BESS) testing[5]

Which foot was tested (i.e. which is the **non-dominant** foot) Left Right

Testing surface (hard floor, field, etc.) _____

Condition

Double leg stance:	Errors
Single leg stance (non-dominant foot):	Errors
Tandem stance (non-dominant foot at back):	Errors

And / Or

Tandem gait[6,7]

Time (best of 4 trials): _____ seconds

7 Coordination examination

Upper limb coordination

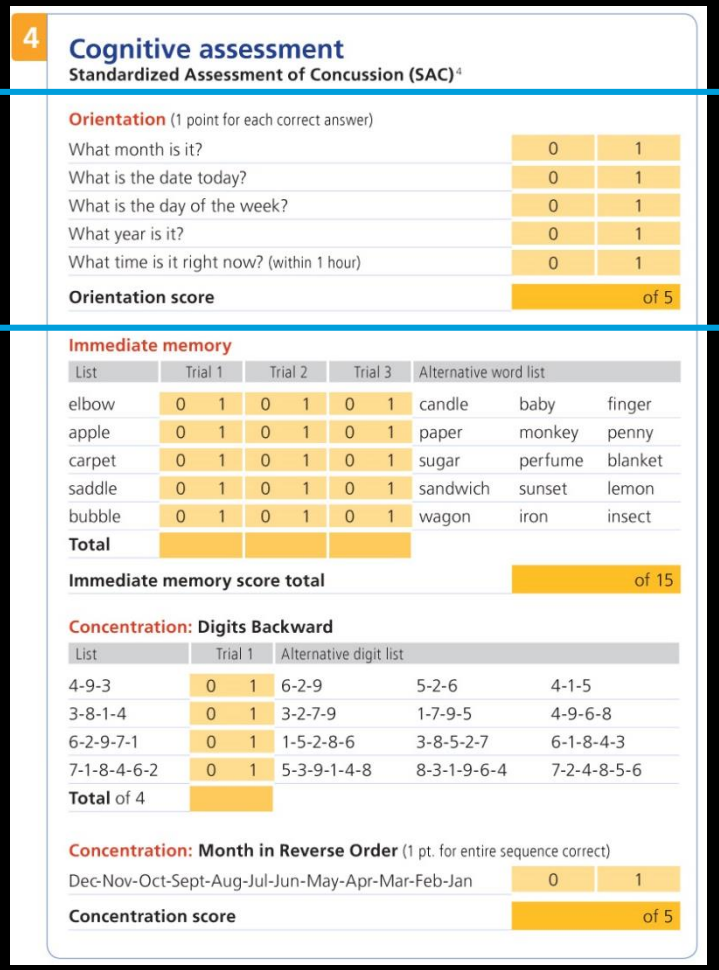
Which arm was tested: Left Right

Coordination score	of 1

8 SAC Delayed Recall[4]

Delayed recall score	of 5

SCAT 3 – SAC



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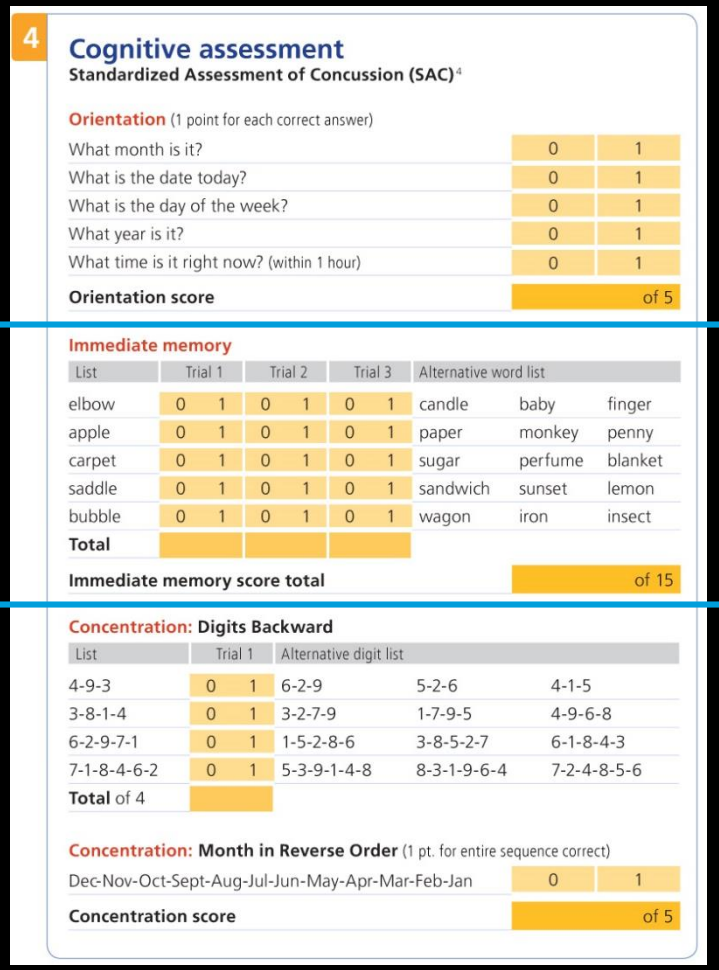

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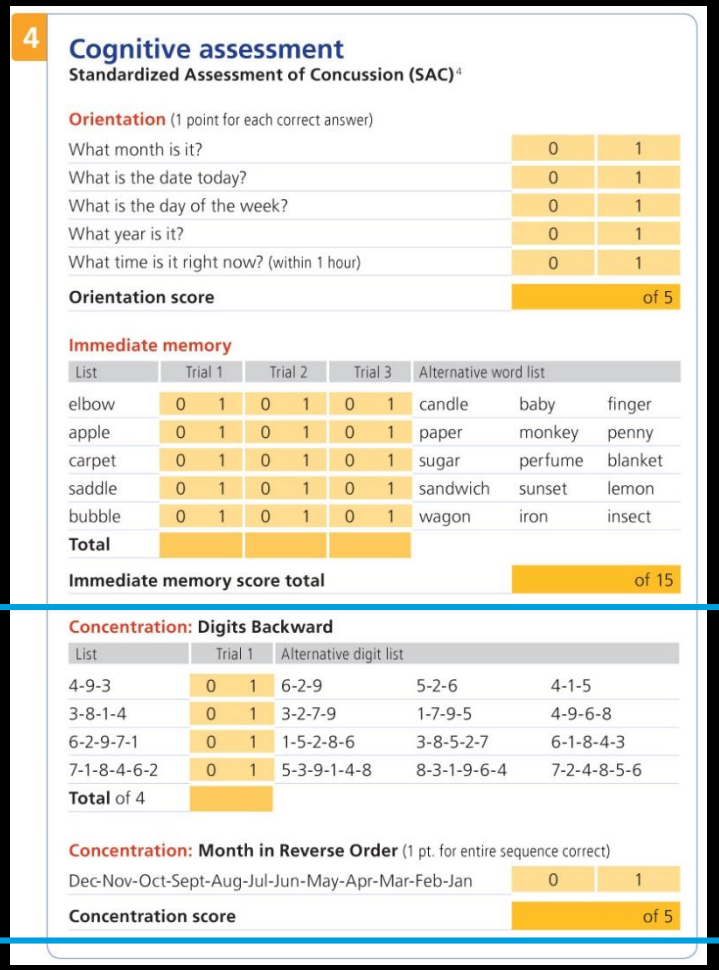

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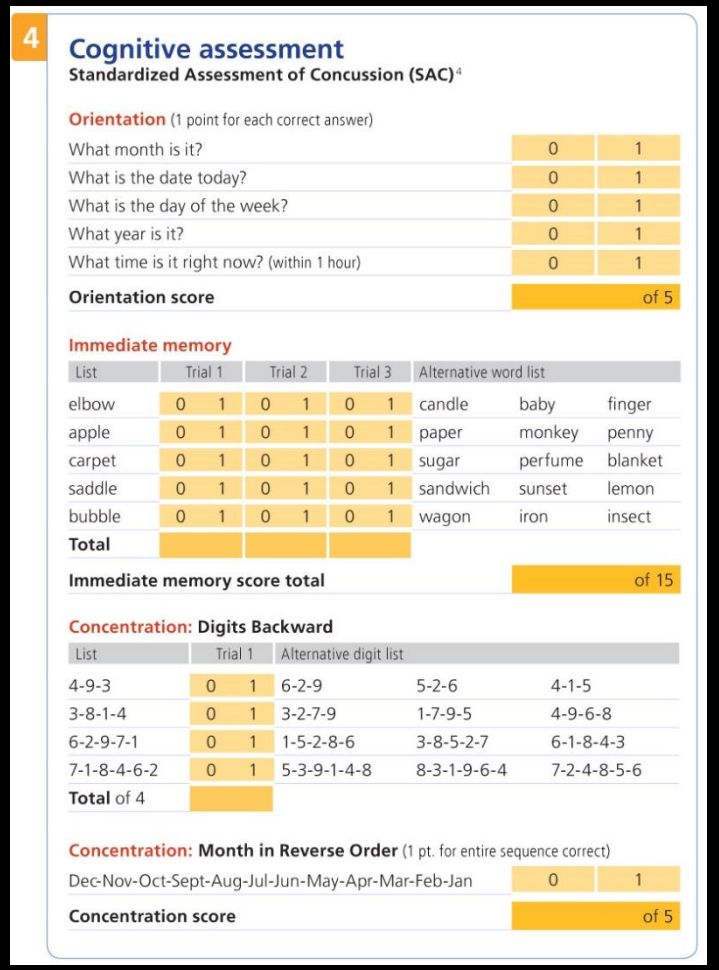

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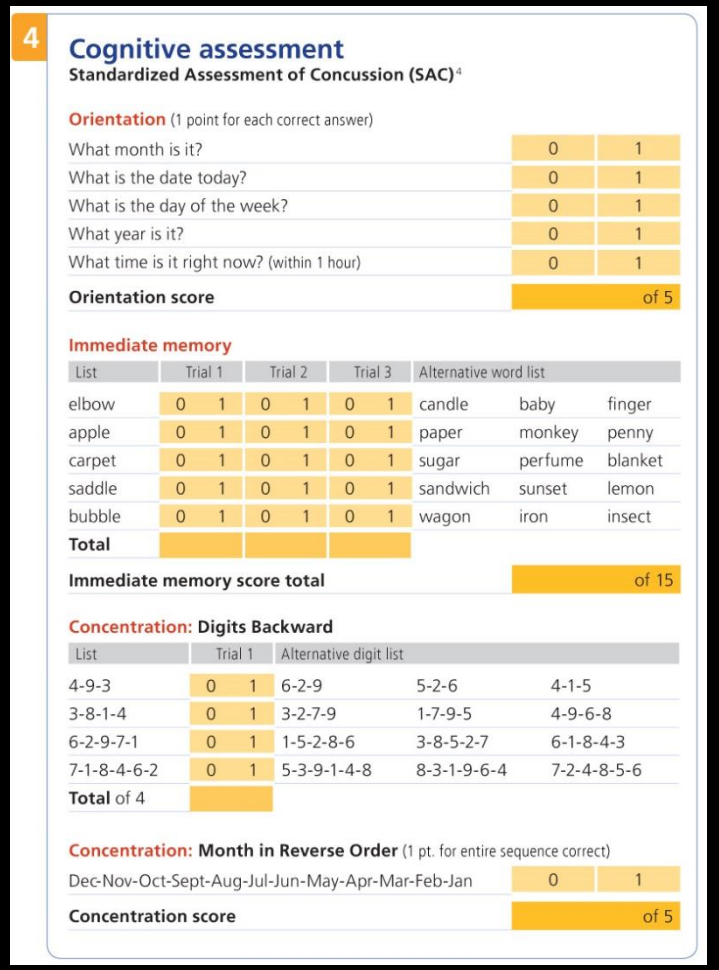
SCAT 3 – SAC



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Upper limb coordination

Which arm was tested: Left Right

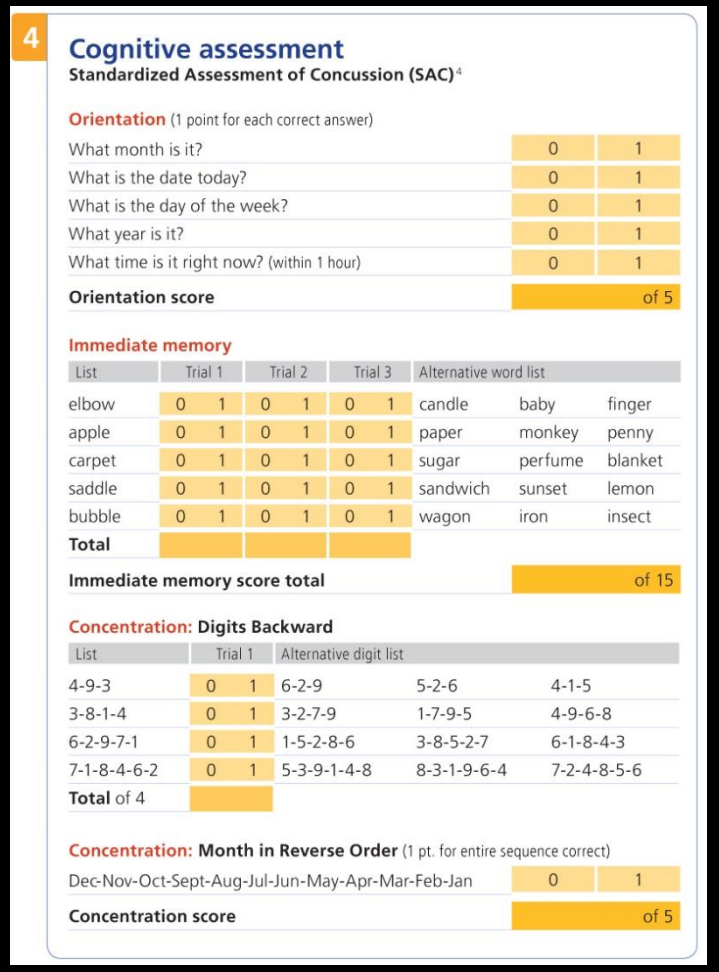
Coordination score of 1

8 SAC Delayed Recall[4]

Delayed recall score of 5

BALANCE ERROR SCORE (BESS)

SCAT 3 – SAC



4 Cognitive assessment

Standardized Assessment of Concussion (SAC)[4]

Orientation (1 point for each correct answer)

What month is it?	0	1
What is the date today?	0	1
What is the day of the week?	0	1
What year is it?	0	1
What time is it right now? (within 1 hour)	0	1
Orientation score		of 5

Immediate memory

List	Trial 1	Trial 2	Trial 3	Alternative word list		
elbow	0 1	0 1	0 1	candle	baby	finger
apple	0 1	0 1	0 1	paper	monkey	penny
carpet	0 1	0 1	0 1	sugar	perfume	blanket
saddle	0 1	0 1	0 1	sandwich	sunset	lemon
bubble	0 1	0 1	0 1	wagon	iron	insect
Total						

Immediate memory score total of 15

Concentration: Digits Backward

List	Trial 1	Alternative digit list		
4-9-3	0 1	6-2-9	5-2-6	4-1-5
3-8-1-4	0 1	3-2-7-9	1-7-9-5	4-9-6-8
6-2-9-7-1	0 1	1-5-2-8-6	3-8-5-2-7	6-1-8-4-3
7-1-8-4-6-2	0 1	5-3-9-1-4-8	8-3-1-9-6-4	7-2-4-8-5-6
Total of 4				

Concentration: Month in Reverse Order (1 pt. for entire sequence correct)

Dec-Nov-Oct-Sept-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan	0	1
Concentration score		of 5

5 Neck Examination:

Range of motion Tenderness Upper and lower limb sensation & strength

Findings: _____

6 Balance examination

Do one or both of the following tests.

Footwear (shoes, barefoot, braces, tape, etc.) _____

Modified Balance Error Scoring System (BESS) testing[5]

Which foot was tested (i.e. which is the **non-dominant** foot) Left Right

Testing surface (hard floor, field, etc.) _____

Condition

Double leg stance:	Errors
Single leg stance (non-dominant foot):	Errors
Tandem stance (non-dominant foot at back):	Errors

And / Or

Tandem gait[6,7]

Time (best of 4 trials): _____ seconds

7 Coordination examination

Upper limb coordination

Which arm was tested: Left Right

Coordination score	of 1

8 SAC Delayed Recall[4]

Delayed recall score	of 5

SAC

STANDARDISED

QUICK TO PERFORM

OBJECTION

- Point of comparison

CHILD
SCAT 3

Sideline Assessment – child-Maddocks Score[3]

"I am going to ask you a few questions, please listen carefully and give your best effort."

Modified Maddocks questions (1 point for each correct answer)

Where are we at now?	0	1
Is it before or after lunch?	0	1
What did you have last lesson/class?	0	1
What is your teacher's name?	0	1
child-Maddocks score		of 4

Child-Maddocks score is for sideline diagnosis of concussion only and is not used for serial testing.

CHILD
SCAT 3

Parent report

The child	never	rarely	sometimes	often
has trouble sustaining attention	0	1	2	3
Is easily distracted	0	1	2	3
has difficulty concentrating	0	1	2	3
has problems remembering what he/she is told	0	1	2	3
has difficulty following directions	0	1	2	3
tends to daydream	0	1	2	3
gets confused	0	1	2	3
is forgetful	0	1	2	3
has difficulty completeing tasks	0	1	2	3
has poor problem solving skills	0	1	2	3
has problems learning	0	1	2	3
has headaches	0	1	2	3
feels dizzy	0	1	2	3
has a feeling that the room is spinning	0	1	2	3
feels faint	0	1	2	3
has blurred vision	0	1	2	3
has double vision	0	1	2	3
experiences nausea	0	1	2	3
gets tired a lot	0	1	2	3
gets tired easily	0	1	2	3

Total number of symptoms (Maximum possible 20)

Symptom severity score (Maximum possible 20 x 3 = 60)

Do the symptoms get worse with physical activity? Y N

Do the symptoms get worse with mental activity? Y N

parent self rated | clinician interview | parent self rated and clinician monitored

Overall rating for parent/teacher/coach/carer to answer.
How different is the child acting compared to his/her usual self?

Please circle one response:

no different	very different	unsure	N/A

Name of person completing Parent-report: _____

Relationship to child of person completing Parent-report: _____

Child report

Name: _____	never	rarely	sometimes	often
I have trouble paying attention	0	1	2	3
I get distracted easily	0	1	2	3
I have a hard time concentrating	0	1	2	3
I have problems remembering what people tell me	0	1	2	3
I have problems following directions	0	1	2	3
I daydream too much	0	1	2	3
I get confused	0	1	2	3
I forget things	0	1	2	3
I have problems finishing things	0	1	2	3
I have trouble figuring things out	0	1	2	3
It's hard for me to learn new things	0	1	2	3
I have headaches	0	1	2	3
I feel dizzy	0	1	2	3
I feel like the room is spinning	0	1	2	3
I feel like I'm going to faint	0	1	2	3
Things are blurry when I look at them	0	1	2	3
I see double	0	1	2	3
I feel sick to my stomach	0	1	2	3
I get tired a lot	0	1	2	3
I get tired easily	0	1	2	3

Total number of symptoms (Maximum possible 20)

Symptom severity score (Maximum possible 20 x 3 = 60)

self rated | clinician interview | self rated and clinician monitored

SCAT 3 – NORMATIVE SCORES

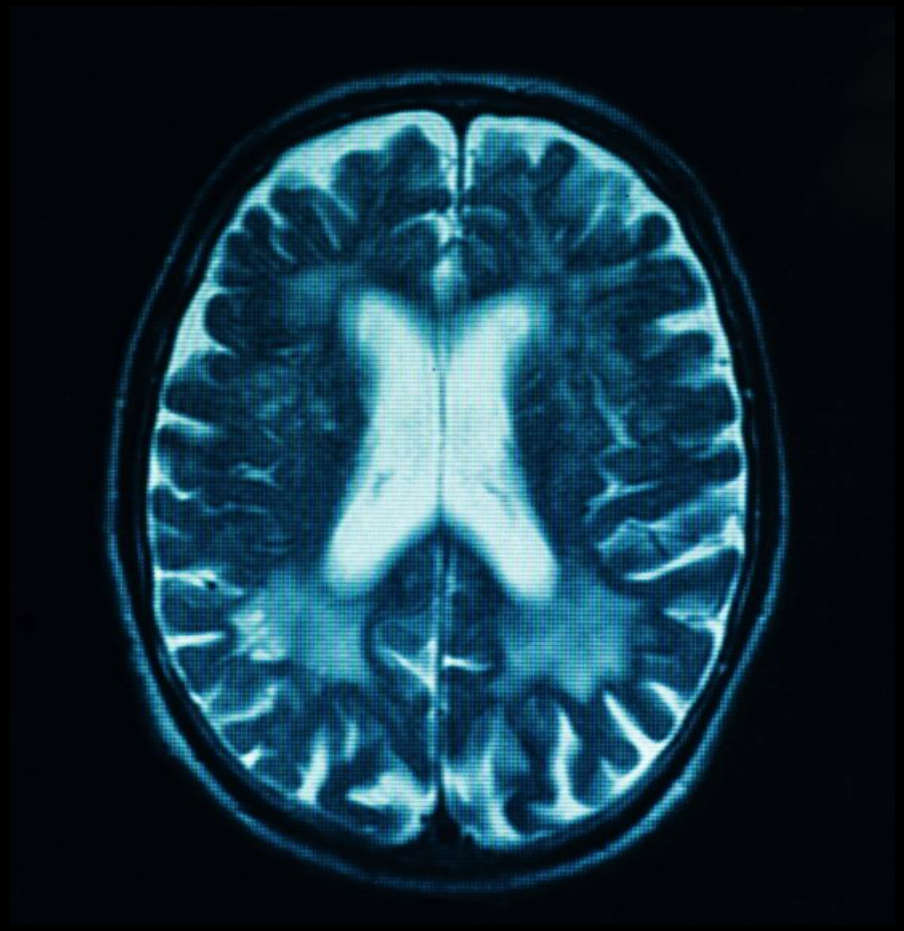
SCAT 3 baseline data:

- Average No. of symptoms = 1.3
- Average Symptom Score = 2.2
- Average SAC / 30 = 26.1

Brookes et al, *Br J Sports Med 2014;**48:573-574***

IMAGING

- True concussion has no imaging findings
- Acute CT if intracranial lesion suspected
- fMRI



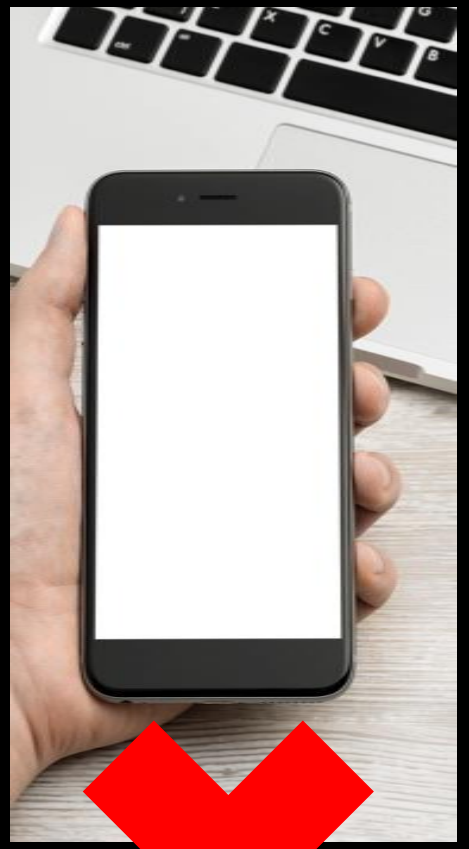
MANAGEMENT – THE FIRST 24 HOURS

- Don’t leave the athlete/patient alone
- No driving or alcohol
- Simple analgesia and rest
- Information and action plan (SCAT3)
- Neurological observation or further investigation

MENTAL & PHYSICAL REST

- Not just sport…
- School commitments
  - Time off
  - Exam and assignments
- Employment

MENTAL AND PHYSICAL REST



RESETTING EXPECTATIONS

0.03%

0.08%

0.09%

RESETTING EXPECTATIONS

200 contracts in NZ

600 contracts in NZ and Australia

RESETTING EXPECTATIONS

NEW ZEALAND SECONDARY SCHOOLS

60%

ITM CUP (NPC)

33%

SUPER RUGBY

$200,000

NRL UNDER 20 COMPETITION

NRL

AVERAGE 43 GAME CAREER

$100,000

RETURN TO ACTIVITY DECISIONS

- 90% resolve within seven days
- Symptom free
- Graduated return to sport and activity
- Neuro-psychological testing
- Often difficult and pressured decisions

RETURN TO ACTIVITY

Rehabilitation Stage	Functional Exercise at Each Stage of Rehabilitation	Objective of Each Stage
No activity	Complete physical and cognitive rest	Recovery
Light aerobic exercise	Walking. swimming, or stationary cycling, keeping intensity to <70% of maximum predicted heart rate; no resistance training	Increase heart rate
Sport·specific exercise	Skating drills in ice hockey, running drills in soccer. no head impact activities	Add movement
Non-contact training drills	Progression to more complex training drills, e.g. passing drills In football and ice hockey; may start progressive resistance training	Exercise, coordination, and cognitive load
Full-contact practice	Following medical clearance, participate in normal training activities	Restore athlete's confidence; coaching staff assesses functional skills
Return to play	Normal game play	

RETURN TO ACTIVITY

- Need to be asymptomatic for 24 hours at each phase
- Any symptoms
  - Rest for a further 24 hours
  - Resume at the earlier level
  - Need medical review before returning to sport

RETURN TO LEARN AND PLAY

- **CLASSROOM ➔ PLAYING FIELD**
  - Mental and physical rest

- **Subtle variations in guidelines**
  - Between codes
  - Between countries
  - Between governing bodies

RETURN TO PLAY

Mental and physical rest till asymptomatic

Light aerobic exercise

Sport-specific exercise

Non-contact drills and resistance training

Full contact – FOLLOWING MEDICAL CLEARANCE

RETURN TO PLAY

RETURN TO PLAY

14 DAYS	Mental and physical rest till asymptomatic
1 DAY	Light aerobic exercise
1 DAY	Sport-specific exercise
1 DAY	Non-contact drills and resistance training
1 DAY	Full contact – FOLLOWING MEDICAL CLEARANCE
0	RETURN TO PLAY – APPROXIMATELY 3 WEEKS

RETURN TO PLAY

NZ RUGBY

14 DAYS	Mental and physical rest till asymptomatic
2 DAYS	Light aerobic exercise
2 DAYS	Sport-specific exercise
2 DAYS	Non-contact drills and resistance training
2 DAYS	Full contact – FOLLOWING MEDICAL CLEARANCE
0	RETURN TO PLAY

RETURN TO PLAY

PLANNER NZ RUGBY

DAY 1	Mental and physical rest till asymptomatic
DAY 15	Light aerobic exercise
DAY 17	Sport-specific exercise
DAY 19	Non-contact drills and resistance training
DAY 21	Full contact – FOLLOWING MEDICAL CLEARANCE
DAY 23	RETURN TO PLAY – APPROXIMATELY 3 WEEKS

PROBLEMS WITH AN EARLY RTA

- Impaired Performance
- Increased risk of MSK injury
- Repeat Concussion
- Post-Concussion Syndrome
- Second Impact Syndrome

NEUROPSYCHOLOGICAL TESTS

- Symptoms may resolve before injury has resolved
- Aim of these tests are to identify any persisting deficits
- ImPACT and CogState Sport

NEUROPSYCHOLOGICAL TESTS

- Comparison to normal
  - Wide population variation
  - Normal data not available for women and adolescents
- Comparison to baseline
- Test when symptoms resolved
- Is only part of the assessment

SAME DAY
RETURN TO PLAY

- **A concussed athlete should not return to play**
- In some situations may appear to occur
  - Elite Sport
  - Time needed to assess the athlete
  - Experienced clinicians required
  - If not felt to be concussed can return

MULTIPLE CONCUSSIONS

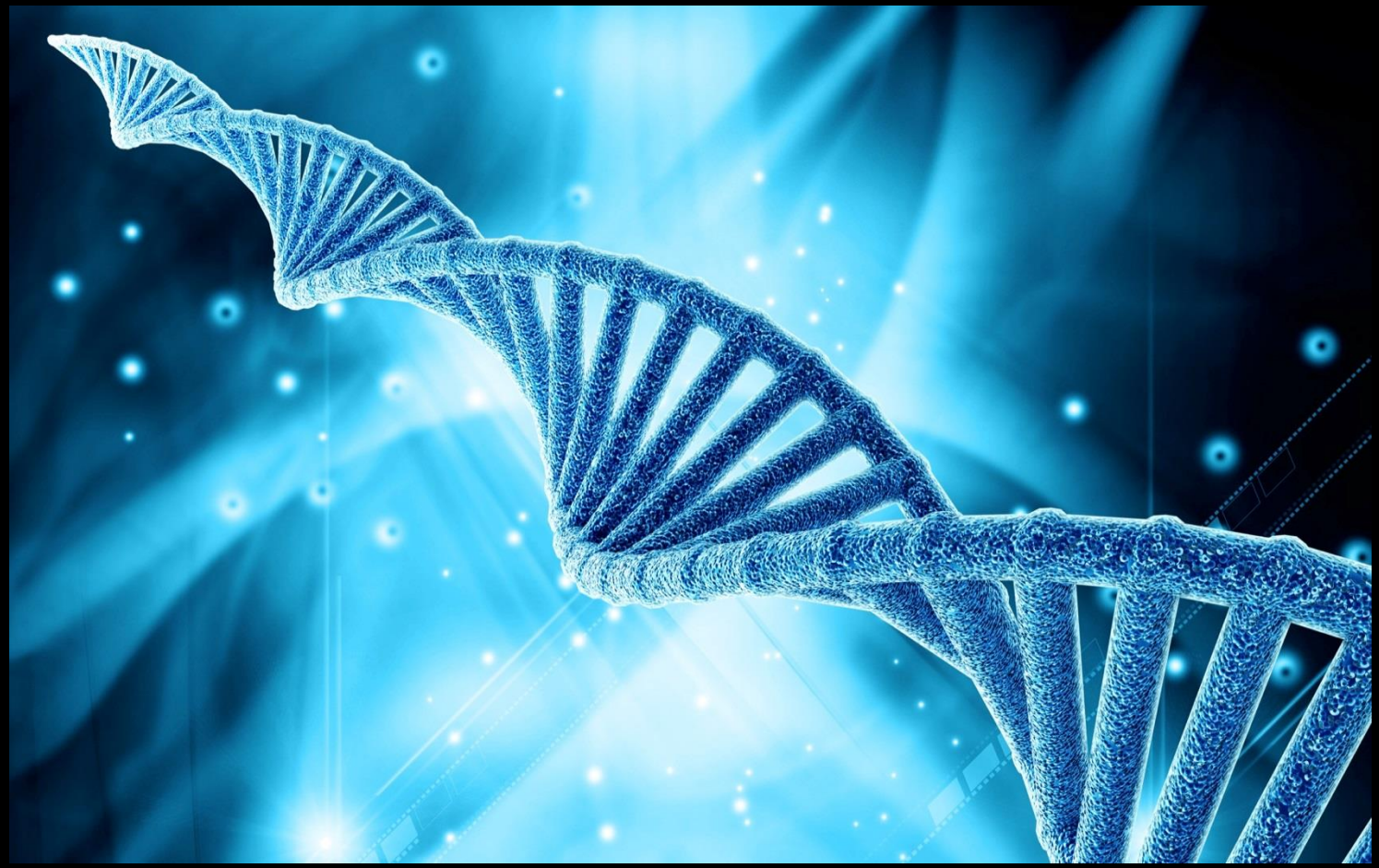
- Current consensus is that there may be long-term effects
- No rules and individualised decisions about participation
  - Increasing frequency
  - Less force
  - Longer recovery

PREVENTION

- Headgear and Helmets
- Mouth-guards
- Neck Strengthening
- Shoulder Pads
- Rule Changes

GENETICS

- Relationship is unclear
- Apo E4/Tau Polymerase/ APO Promoter Gene
- Delayed recovery after concussion?
- Modest increase in concussion incidence in those who are ApoE4 positive



TAKE HOME MESSAGES

- Concussion is a medical problem
- Head injuries are complex
- Concussion is a functional injury which resolves spontaneously
- Majority of athletes recover uneventfully within 7-10 days
- A graduated return to sport when symptom free is important

LINKS

SCAT 3

http://bjsm.bmj.com/content/47/5/259.full.pdf

4th Consensus Statement

http://bjsm.bmj.com/content/47/5/250.full

ACC Guidelines

http://www.acc.co.nz/PRD_EXT_CSMP/groups/external_communications/documents/reference_tools/wpc136118.pdf

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