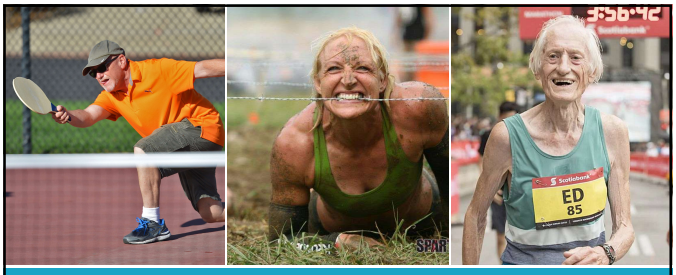


Bridging the gap

Return to Play Assessment

for adult fitness warriors

Housekeeping

No disclosures

Part of your personal learning network

Mbutulis@gmail.com

IG: Dr.MeredithButulis

Linked In | Facebook: Meredith Butulis

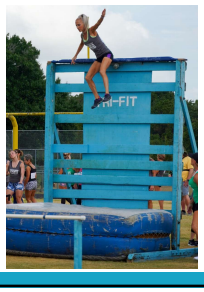
YouTube access

Use your outline to take notes

Interactive!

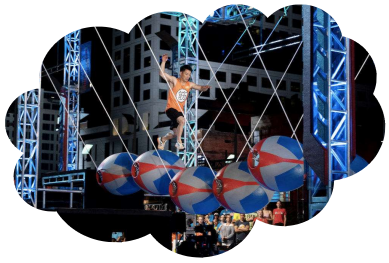
Q/A at end

Hello



- Physical Therapist
  - DPT
  - MSPT
  - OCS
  - CIMT
- Exercise Physiologist
  - ACSM CEP
- Personal Trainer
  - NSCA CSCS
  - NASM CPT, CES, PES, BCS
- Pilates/Yoga
- Performer
  - Tri Fitness Champion 2021, 2018

What will we accomplish?

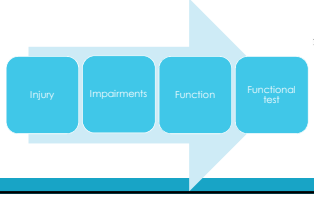


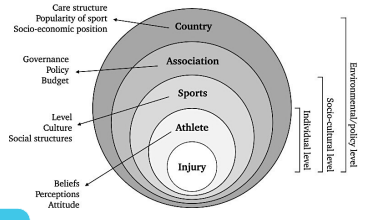
Can I _____?

Competence

Confidence

Paradigm shift





Bolling, et al 2018

What will we accomplish?

Interactive journey

1. **Assess sport-specific demands** for return to play.
2. **Identify assessments** to **participate.**
3. **Discuss** how **age-related** changes **and co-morbidities impact** decision making.

How will we leave with an efficient system today?

- Assess the game
- Assess the RTP gap
- Physiological modifications
- Bridge the gap – program design

Accessible framework

What we will **not** do today

1. Physiology lesson
2. PT baseline knowledge
3. How to do each assessment
4. Program design
5. Documentation & billing*

Analyze the game

Step 1

Question what you think you know

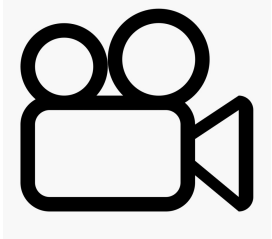
Today's game: meet Amy

6 Steps to analyze the game

- Movement patterns
- Cardiovascular demand
- Muscular demand
- Skill
- Landscape
- Injury prevalence

1ST 3 STEPS

- Same level as your athlete
- Same position as your athlete
- Same environment as your athlete



1 Analyze the game: movement patterns

Lower body	Upper body
Squat	Push
Bend to extend	Pull
Lunge	Hang
Step	Carry
Gait	Crawl

Force transfer through core

Plane of motion
Speed
Load
Frequency
Complexity

https://youtu.be/jXsv5RDoKlc

Taking inventory

Movement pattern	Time
Climb	:04 x 2
Landing (R leg dominant, forward head)	x2
Monkey bars	:06
Flip w/ sustained grip	:02
Hurdle (forward head)	x3
Leap	X1
Crouch (frontal → transverse → sagittal)	X1
Punch off feet	X1
Dive roll	X1
Run/continuous max intensity (forward head)	1:00

2 Analyze the game: cardiovascular demand

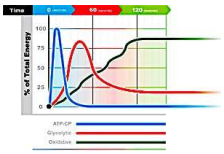
- Intensity | Speed
  - MET level
  - %HR Reserve | Karvonen
  - %VO2max
  - **RPE**
  - **Relative to estimated anaerobic threshold**
- Duration
- Work: rest ratio

Intensity: Relative to anaerobic threshold

- Estimation:
  - Anaerobic threshold = 180 – age
  - + 10 for advanced
  - - 10 for deconditioned

Maffetone 2015

Why cardiovascular demand matters: duration



DURATION (in seconds)	CLASSIFICATION	ENERGY SUPPLIED BY
1 - 4	ATP-CP	ATP (muscles)
4 - 10	ATP-CP	ATP + CP
10 - 45	Anaerobic	ATP + CP + Muscle Glycogen
45 - 120	Anaerobic	Muscle Glycogen
120 - 240	Anaerobic + Aerobic	Muscle Glycogen + Lactic Acid
240 - 340	Aerobic + Anaerobic	Muscle Glycogen + Fatty Acids
340+	Aerobic + Anaerobic	Fatty Acids + Muscle Glycogen

Why cardiovascular demand matters: rest

Recovery time	% ATP replenished
30 sec	50%
1 min	75%
90 sec	87%
2 min	93%
2 min 30 sec	97%
3 min	98.5%

Beginners 1 work : 4 recovery

Advanced 1 work : 1 recovery

Elite Shorten recovery to challenge working in fatigue

Haff & Triplett

3 Analyze the game: muscular demand

Endurance → Hypertrophy → Strength → Power




Why muscular demand matters

GOAL:	Endurance	Hypertrophy	Strength	Power
Energy system	Oxidative	Glycolytic	Glycolytic	ATP-PC
Primary ms fiber type	I	IIA	IIA	IIX
Time under tension	180 sec 20+ reps	30-90 sec 8-12 reps	10-30 sec 3-6 reps	1-10 sec 1-2 reps
Recovery between sets	0-30 sec	30-90 sec	2-5 min	5+ min

Metabolic ↔ Neural

Choose the goal
Simultaneous = mess

Haff & Triplett

4 Analyze the game: what kind of skill?

Lower body	Upper body	Environment
Jumping	Throwing	Collision
Landing	Catching	Aquatic
Deceleration	Gripping	Terrain
Agility		Altitude
Kicking		Temperature
		Equipment/clothing

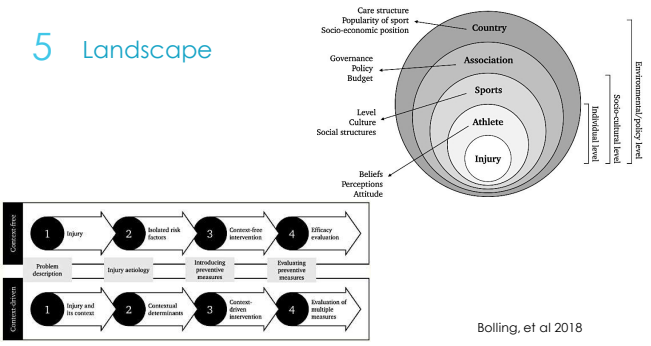
Analyze the game: what kind of assessments do I need so far?

- **Movement patterns**
  - Climb
  - Land
  - Run
  - Hang
  - Direction change
  - Hurdle
  - Crouch
  - Dive
  - Dynamic balance
  - Grip
- **Cardiovascular**
  - Anaerobic endurance 1-3 minutes
- **Muscular**
  - Muscular endurance tests for total body
  - Muscle power tests, primarily lower body

5 Analyze the game landscape

- # of competitive seasons & competitions
- Length of a competitive season
- Tournaments: how many games per day?
- How many training days/week?
- Contents of the training week?
- Coaching expectations?

5 Landscape



Bolling, et al 2018

6 Where's the evidence?

Favorite journal search engine (i.e. PubMed)

Injury _____ in _____

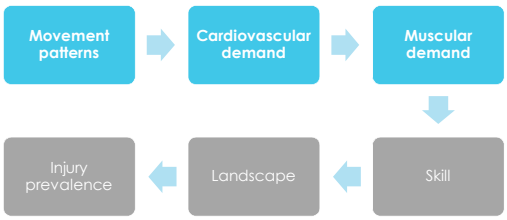
First blank
- Incidence
- Prevalence
- Risk
- Prevention

Second blank
- Specify the sport/game/training method
- Filter for age, gender, (country)

What gets injured?

Why? *Components*

6 Steps to analyze the game

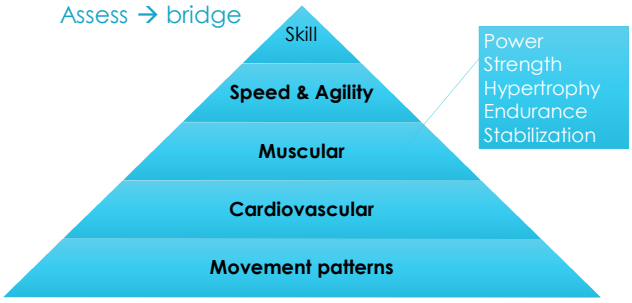


Assess the gap

Step 2

Can change what you can measure

Assess → bridge



Power
Strength
Hypertrophy
Endurance
Stabilization

Analyze the individual: movement patterns ***for the game***

Lower body	Upper body	Skill
Squat	Push	**Climb**
Bend to extend	**Pull**	**Landing**
Lunge	**Hang**	**Roll**
Step	Carry	
Gait	Crawl	

Without compensation or provocation

Plane of motion
Speed
Load
Frequency

Stability

Assessment	Time	Equipment	Goals	Resource
Y balance	< 2 min	Y balance kit	CKC UE or LE	Pilsky 2009
Star Excursion Balance Test (SEBT)	2 min	Tape Goniometer Tape measure	CKC LE	Kinzey 1998
Modified upper quarter balance test	< 2 min	Tape Goniometer Tape measure Sliders	CKC UE	Cramer 2017
Closed Kinetic Chain UE Stability Test "Davies"	< 2 min	Tape 36 inches Timer for 15 sec	CKC UE with agility	Cramer 2017
BESTest	30 min 10 min for mini	Chair, slant board, timer	ID underlying problem	Mancini 2010
BESS	< 5 min	2" foam	Static stable and unstable	Iverson 2013

Analyze the individual: aerobic capacity

Assessment	Time	Equipment	Goals	Resource
12 minute walk run	12 minutes	Treadmill or track	Walking, running, linear weight bearing	Dwyer 2005
McArdle/ Queens College step test	3 minutes	16.25 in step Metronome 96 bpm men 88 bpm women Stop watch for pulse	Level changes, hiking	Dwyer 2005
Yo yo/20 m shuttle	15 minutes	25 m	Running, direction changes	Mayorga-Vega 2015

Analyze the individual: anaerobic capacity

Assessment	Time	Equipment	Goals	Resource
300 yard (274 m) shuttle	< 2 min	25 yards of space + buffer	Anaerobic capacity	Grier 2017

Speed

Assessment	Time	Equipment	Goals	Resources
Straight line sprint 10 m, 20 m, 37m (40 yd), 40 m	< 15 sec	Stopwatch Linear distance or track	Linear speed	Haff 2016

Agility

Assessment	Time	Equipment	Goals	Resources
Pro agility/20 yard shuttle	< 1 minute	10 yards Cones Stopwatch	LE agility	Haff 2016
T test	< 1 minute	10 yards x 10 yards Cones Stop watch	LE agility	Haff 2016

Muscle endurance

Assessment	Time	Equipment	Goals	Resources
Push up*	< 2 min	none	Upper quarter endurance CKC	Dwyer 2005
YMCA bench press		35 lb barbell women 80 lb barbell men metronome 60 bpm spotter	Upper quarter endurance OKC	Dwyer 2005
Curl up*	< 2 min	2 markers 8 cm apart Metronome 40 bpm	Anterior core endurance	Dwyer 2005
Back extensor	< 2 min	Plinth & stabilizers	Lumbar extensor endurance	Tuff 2020
3 way plank or OKC variation	Up to 6 min	Stopwatch Roman chair	Trunk endurance	Tuff 2020

Muscle strength

Assessment	Time	Equipment	Goals	Resources
1 RM or 10 RM Bench press Bench pull Back squat	Up to 15 min	Bench Barbell w/ safety locks Plates	Low speed max strength	Haff 2016
Grip strength	< 1 min	Grip dynamometer	Grip strength	Dynamometer manual

Muscle power

Assessment	Time	Equipment	Goals	Resources
Standing long jump	< 5 sec	20 feet/6 m Tape measure Starting line	B LE power	Haff 2016
Vertical jump	< 5 sec	Vertec OR Wall + chalk Ceiling clearance	B LE power	Haff 2016
Single leg hop	< 1 min	Tape measure	U LE power	Hegedus 2015
Singe leg crossover hop	< 1 min	Tape measure	U LE power	Hegedus 2015
Seated med ball throw test	< 1 min	Tape measure	U UE power	Harris 2011

Landing

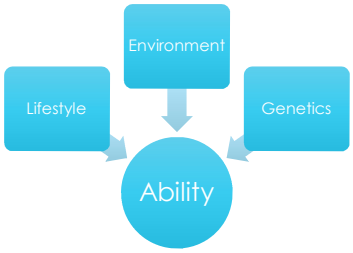
Assessment	Time	Equipment	Goals	Resources
LESS	5 min	12 inch box Video camera/device	Landing alignment safety	Hanzlíková 2020

Physiological modifications

Step 3

Is age "just a number"?

Is age just a number?



Analyze the individual

Your PT evaluation

Condition side effects, risks, long-term changes

Medication effects on exercise

Age related A& P

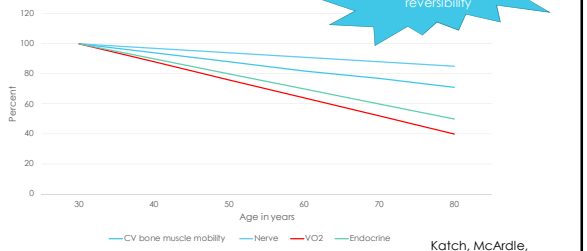
Baseline: PAR-Q & risk stratification

Patient motivations

Can't
vs
I need to learn how

Age related changes

Exercise Rx is the language of reversibility



Katch, McArdle, Katch

Cardiovascular & pulmonary

A & P [1, 2]	Relevance	Impact to assessment & exercise [1, 3]	Solutions
Central Decreased Q, HR, SV	Lower VO2/high intensity capacity	UE exercise ~ 10 bpm higher	Build a base then progress to scaled HIIT [4]
Increased lung ERV, decreased VC	Neck breathing	Adjust HR monitoring (180-age)	
Increased RR		Posture impacts VO2	Postural exercise & diaphragmatic breathing
Peripheral Increased resistance/afterload	Medications: Beta blockers Statins	BP > 200/115 = do not start RPE vs HR goals Muscle weakness	Build a base then progress to scaled HIIT [4]
Decreased capillary permeability	Decreased stamina	Adjust expectations	Avoid prolonged head below heart exercise [3]

(1) Arc-Chagnaud 2019 (2) Katch & McArdle 2010 (3)Moore 2016 (4) Weston 2014

Before you HIIT, PAR-Q

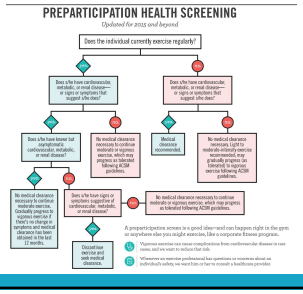
PHYSICAL ACTIVITY READINESS QUESTIONNAIRE (PAR-Q)

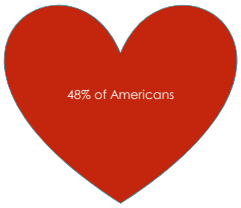
	Questions	Yes	No
1	Has your doctor ever said that you have a heart condition and that you should only perform physical activity recommended by a doctor?		
2	Do you feel pain in your chest when you perform physical activity?		
3	In the past month, have you had chest pain when you were not performing any physical activity?		
4	Do you lose your balance because of dizziness or do you ever lose consciousness?		
5	Do you have a bone or joint problem that could be made worse by a change in your physical activity?		
6	Is your doctor currently prescribing any medication for your blood pressure or for a heart condition?		
7	Do you know of any other reason why you should not engage in physical activity?		

If you have answered "Yes" to one or more of the above questions, consult your physician before engaging in physical activity. Tell your physician which questions you answered "Yes" to. After a medical evaluation, seek advice from your physician on what type of activity is suitable for your current condition.

ACSM, NASM

ACSM Risk Stratification





ACSM 2018, 2015, Emelia 2019

Muscle atrophy

A & P [1]	Relevance [1]	Impact on assessment & exercise	Solutions
Cross sectional area # ms fibers Fatty infiltration	Decreased force Catabolic > anabolic	Low speed 1 RM or 10 RM	Min 60% est 1 RM load [2] ✓Bike HIIT vs. Ø running [3] Nutrition BFR (not for CV compromised) [4]
Type IIA/X	Decreased speed, power, agility	Power lifts, Olympic lifts, sprints	PNF max alternating isometrics [5]
Tendon less contractile	Decreased landing absorption	Landing safety	SL hopping > adaptation than SL eccentrics [6]

(1) Arc-Chagnaud 2019 (2) Wembom 2007 (3) Tavoian 2019 (4) Gronfeldt 2020, Oliveira 2020 (5) Kofotolis 2004 (6) Bohm 2014, Epro 2017, Stenroth 1985

Nervous system decline

A & P [1]	Relevance [1]	Impact on assessment & exercise	Solutions
Central [1] Basal ganglia Alpha motor neurons	Motor initiation & panning Motor response	Explicit focus—is this a sequence or a dual task; level of complexity	Explicit instruction for attention in dual task conditions [2] Unstable surface resistance training [3]
Peripheral [1] Orphan type II re-innervated by type I motor neurons Demyelination	Decreased speed	Slower	Age brackets for sport
Sensory organs	Decreased balance	Balance: eyes, vestibular, somatosensorial	Specificity with balance training

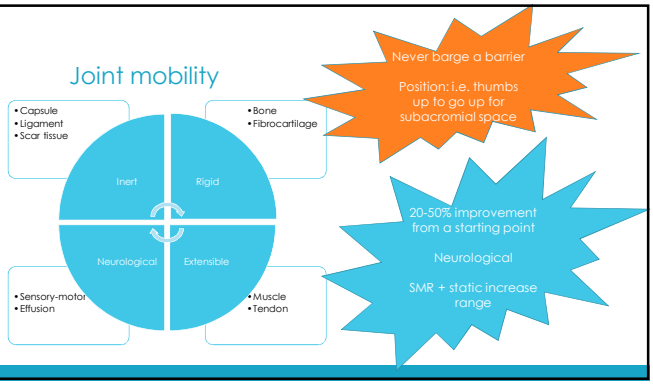
(1) Arc-Chagnaud 2019 (2) Silsupadol 2009 (3) Eckardt 2020

Bone

A & P	Relevance [1, 2]	Impact on assessment & exercise [1, 2]	Solutions [1, 2]
Osteopenia [1]	Micro damage accumulates Decreased density Change in bone shape	Fracture & fall risk Avoid flexion & twisting of spine No jumping for T score above -3	Novel multi-directional movement Higher intensity, lower reps, longer rest 75%+ 1 RM 2 x 8-10 Joint specific load
Osteoarthritis [2]	Mobility loss Muscle atrophy from disuse Slower gait/CV	Guarding Weakness, especially in extensors Lower VO2	Warm up Strengthen core, extensors, balance Find a modality

(1) Petit 2008 (2) Moore 2016

Joint mobility

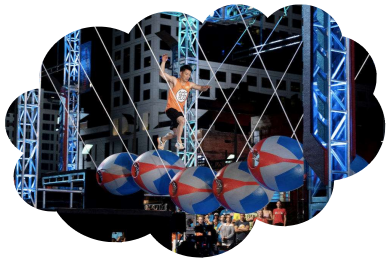


Bridge the gap

Step 4

Program design

Next time your athlete asks

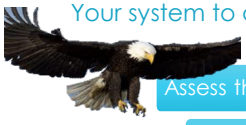


Can I _____?

Competence

Confidence

Your system to answer the question



Assess the game

Assess gap

Physiological modifications

Bridge the gap

Accessible framework

What have we accomplished?

1. **Assess sport-specific demands** for return to play.
2. **Identify assessments** to **participate.**
3. **Discuss** how **age-related** changes **and co-morbidities impact** decision making.