



Improving exercise prescription in the management and prevention of sarcopenia

Improving exercise prescription in the management and prevention of Sarcopenia



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Sarcopenia and frailty – why we need to deliver

Professor Miles Witham
Newcastle University



Benchmarking Exercise Programmes for Older People (BEPOP)



A joint AGILE/BGS initiative



Let's start with some definitions

Sarcopenia:

“Age-related loss of muscle mass and strength”

Current European definitions:

Probable sarcopenia:

Grip strength <16kg (F) / <27kg (M)
OR 5x sit to stand >15s

Confirmed sarcopenia:

As above, plus low appendicular skeletal muscle mass
<5.5kg/m² (F) / <7.0kg/m² (M)

Frailty:

“Loss of homeostatic reserve meaning that a minor illness/injury causes major decompensation”

Multiple definitions but can be defined via:

Physical frailty (Fried): 3 of:

Low walk speed, low grip, low activity, exhaustion, weight loss

Or

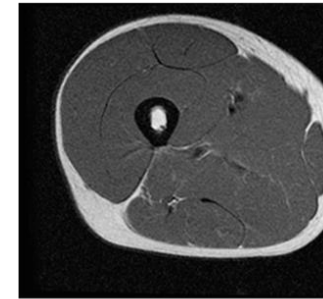
Cumulative deficit of body functions (Rockwood)



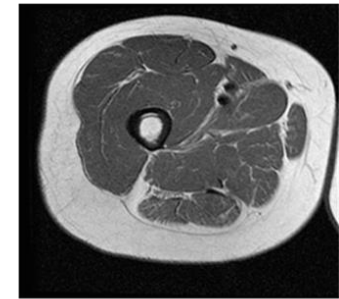
Consequences

Sarcopenia and frailty are **both bad for you...**

- Increased mortality
- Increased risk of hospitalisation
- Prolonged length of stay
- Increased risk of falls
- Increased risk of dependency
- Increased risk of requiring institutional care
- Vicious cycle of decline



Age 25



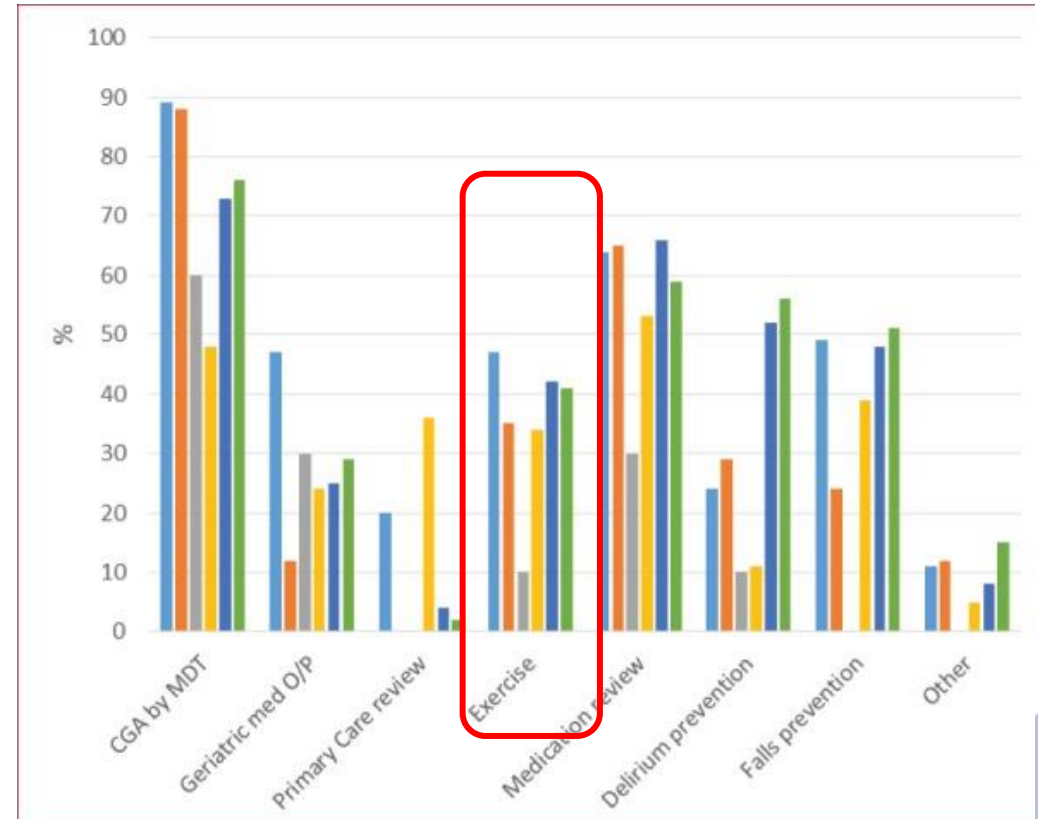
Age 63

Bad for older people, bad for healthcare systems, bad for social care systems



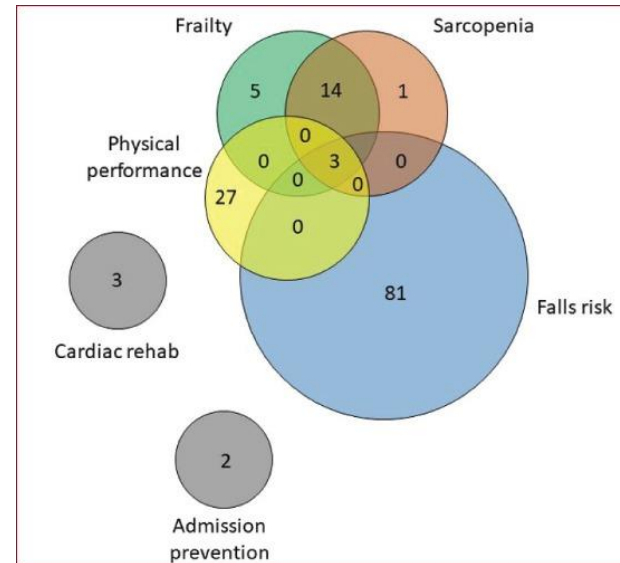
What do we know about diagnosis in practice?

- We are getting better at identifying frailty (esp using the Rockwood CFS)
 - But lots of different tools used – not all of which really measure frailty...
- We are not good at identifying sarcopenia
 - Only half of survey respondents said their organisation identified sarcopenia
 - Only 10% of respondent organisations actually used a diagnostic algorithm and criteria...
- Even where we offer CGA, we don't always offer exercise!



What do we know about treatment in practice

- **Resistance exercise** is the intervention that can improve both sarcopenia and frailty
- Much of the exercise undertaken with older people with sarcopenia or frailty is **not based** on resistance exercise



The rationale for BEPOP

- There is a need to identify and promote best practice in exercise delivery for older people with sarcopenia and frailty
- There are wide differences in what we do
- So it makes sense to identify what works best in practice
- BEPOP aims to do this – by **collecting information** and **feeding back** to practitioners
- By comparing against others (benchmarking), we can all see what works (and what doesn't) and rapidly evolve our practice to optimise outcomes



BEPOP – methods and Initial results

Dr Lorna Caulfield

Specialty Trainee Registrar in Geriatric Medicine



- Survey work undertaken by the BGS Sarcopenia and Frailty research SIG regarding current practice in the delivery of exercise interventions for older people found that:
 - Of services focused upon addressing sarcopenia and frailty, only 65% of programmes included resistance training.
 - Outcome measures related to assessment of muscle strength were reported as being used by fewer than half of respondents.

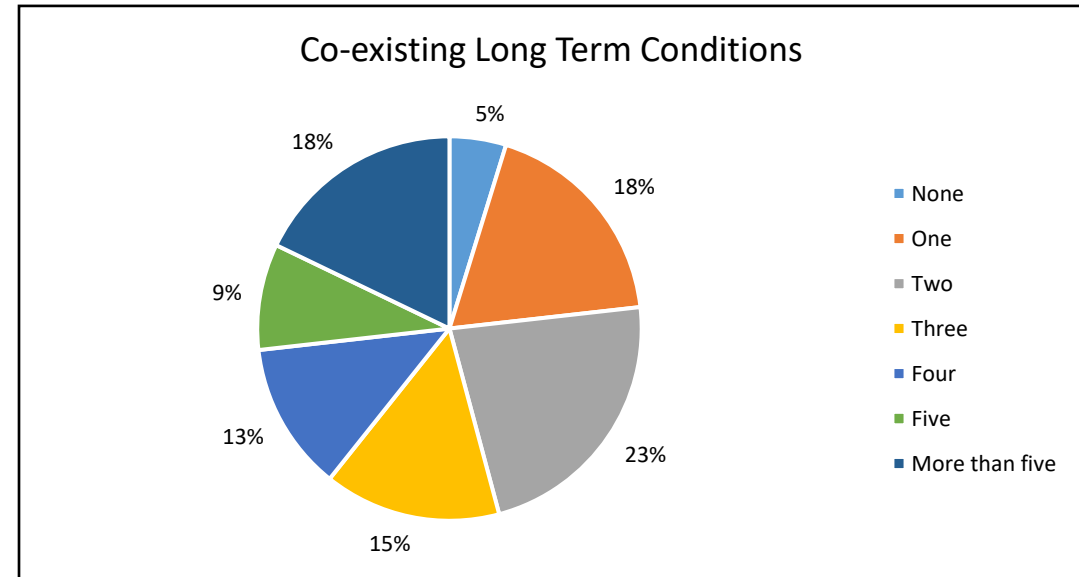
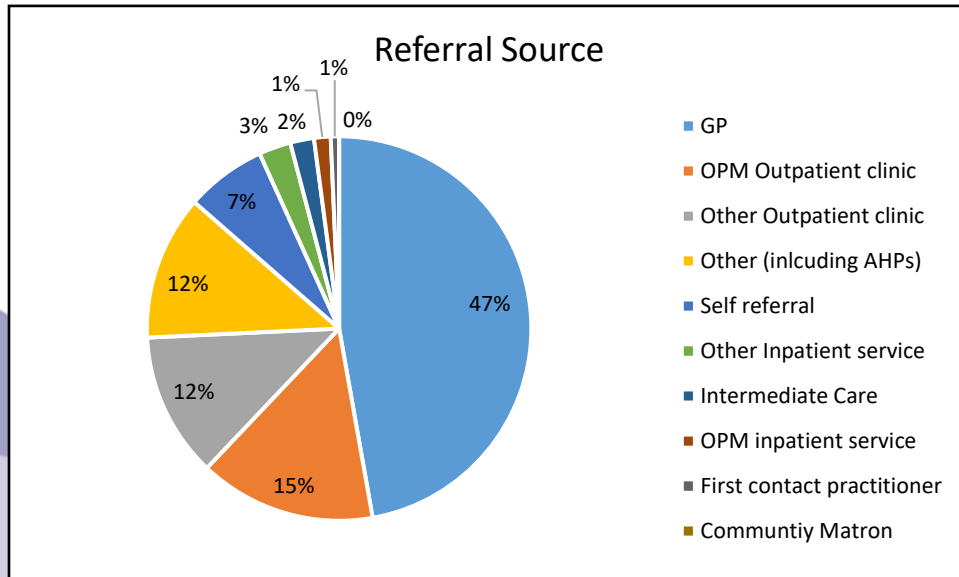
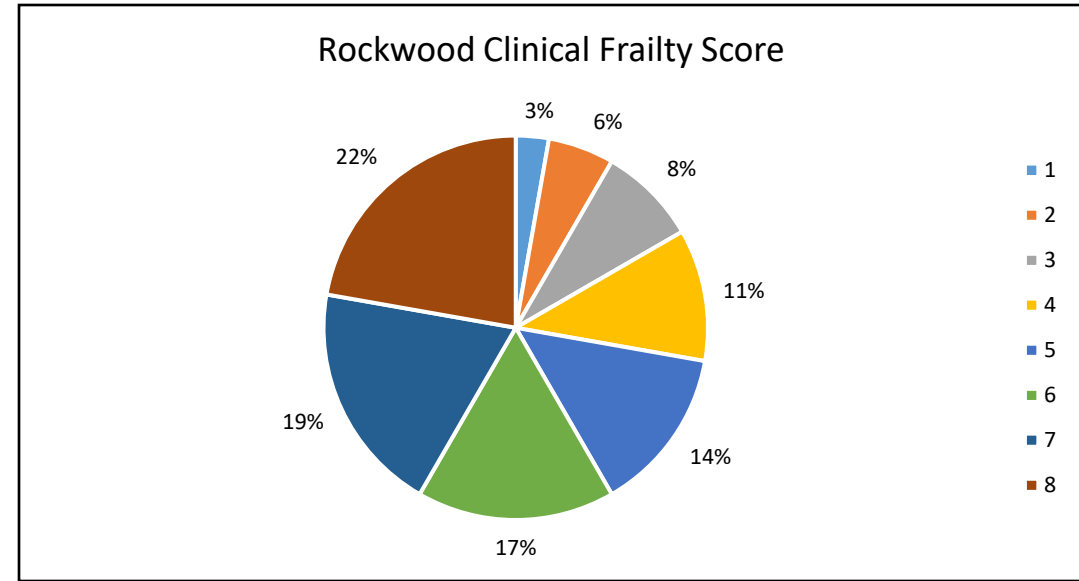


The BEPOP Project

- UK-wide quality improvement initiative
 - 10 sites participated in the first round of data collection
- Data provided on 20 consecutive patients referred to each service
 - Patient demographics
 - Initial assessment and planning of exercise intervention
 - Review and Reassessment
 - Post-intervention assessment

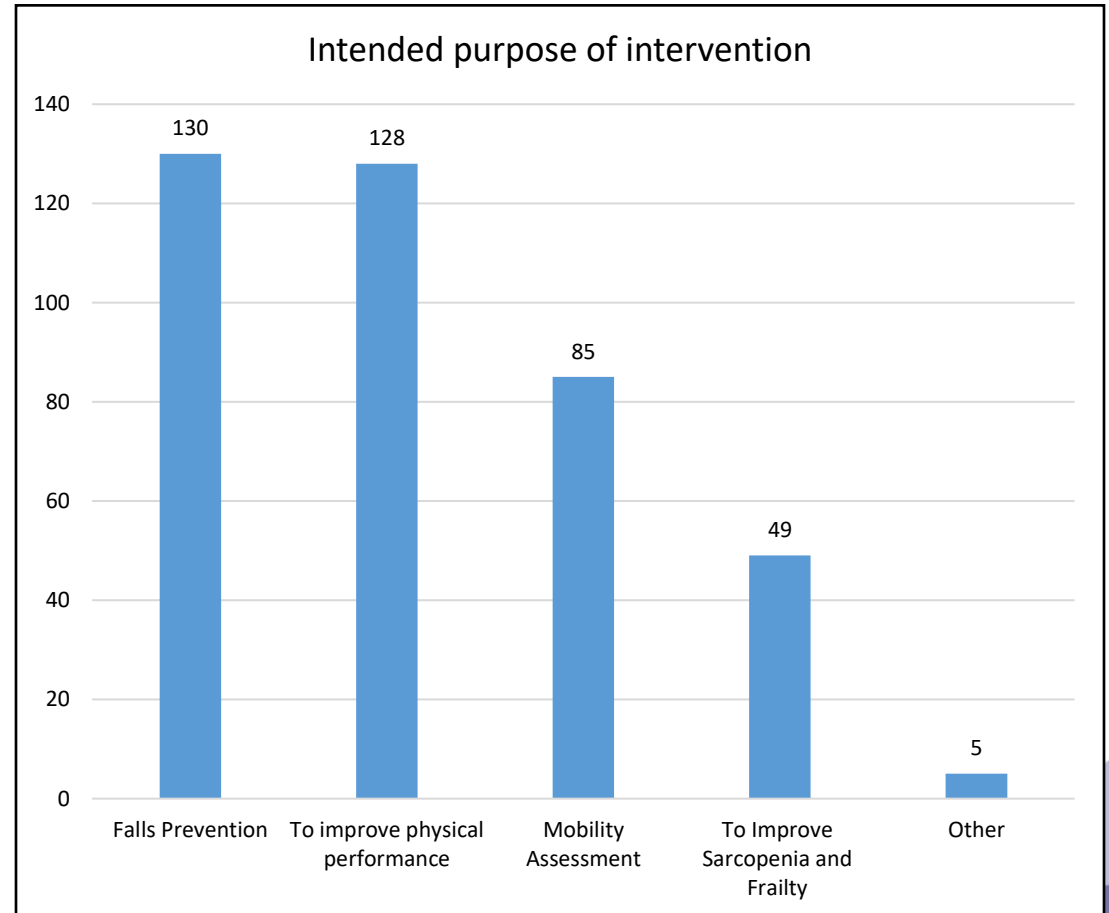
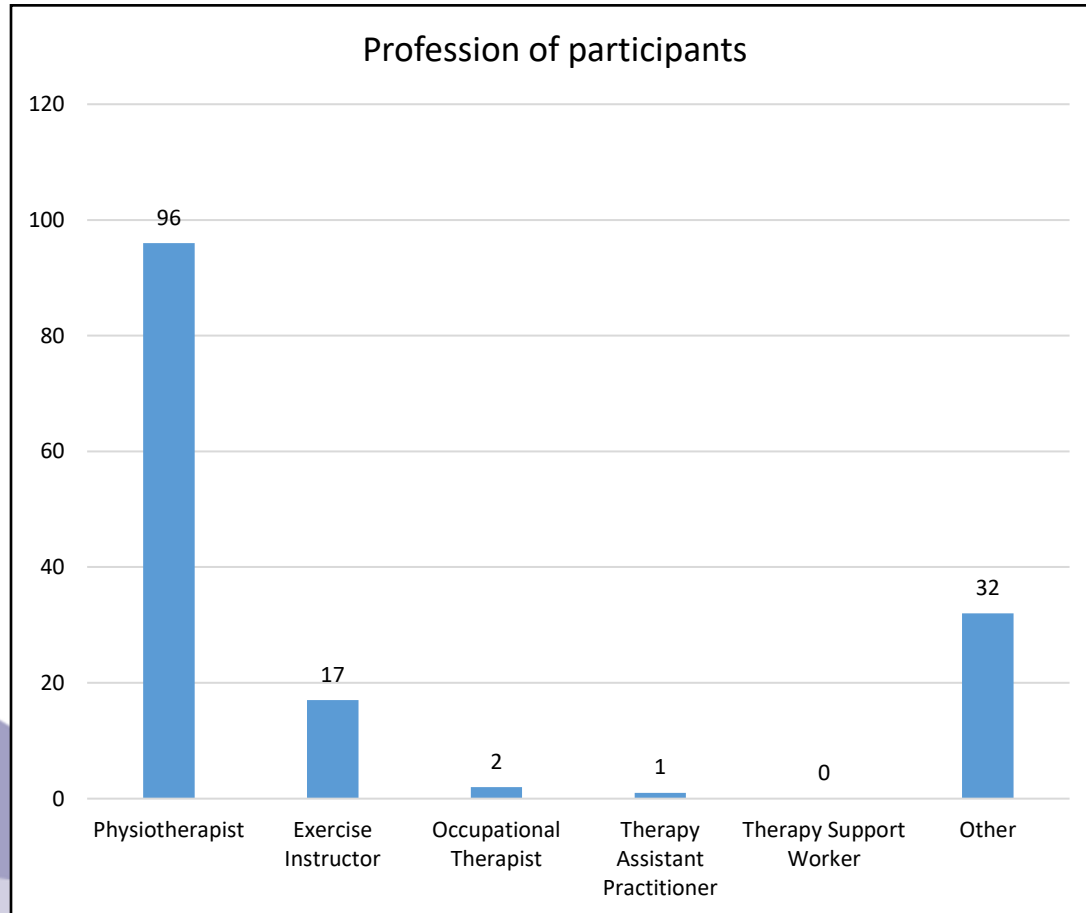


- 168 patients
- Female 59.5%, Male 40.5%
- Average age: 80.4 years (Range 60 to 101 years)
- Residence: 92% living in their own home

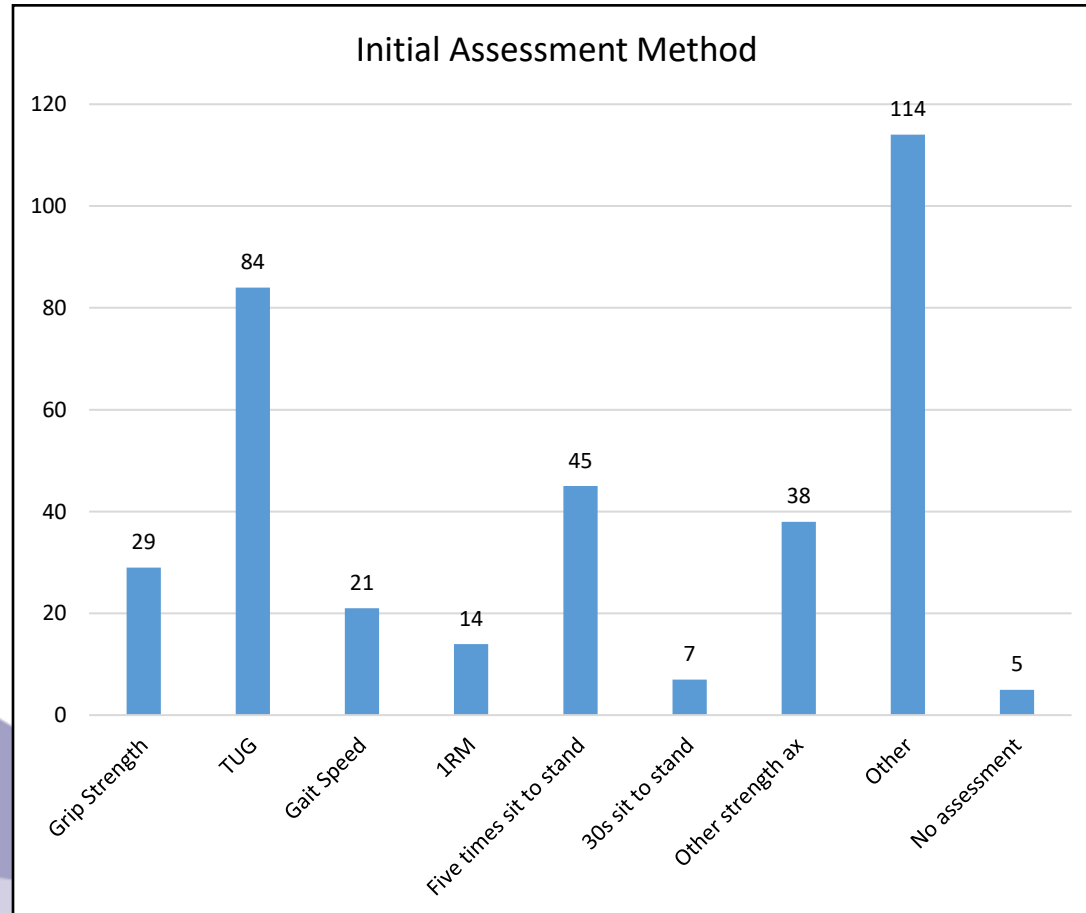


Reasons for referral into services

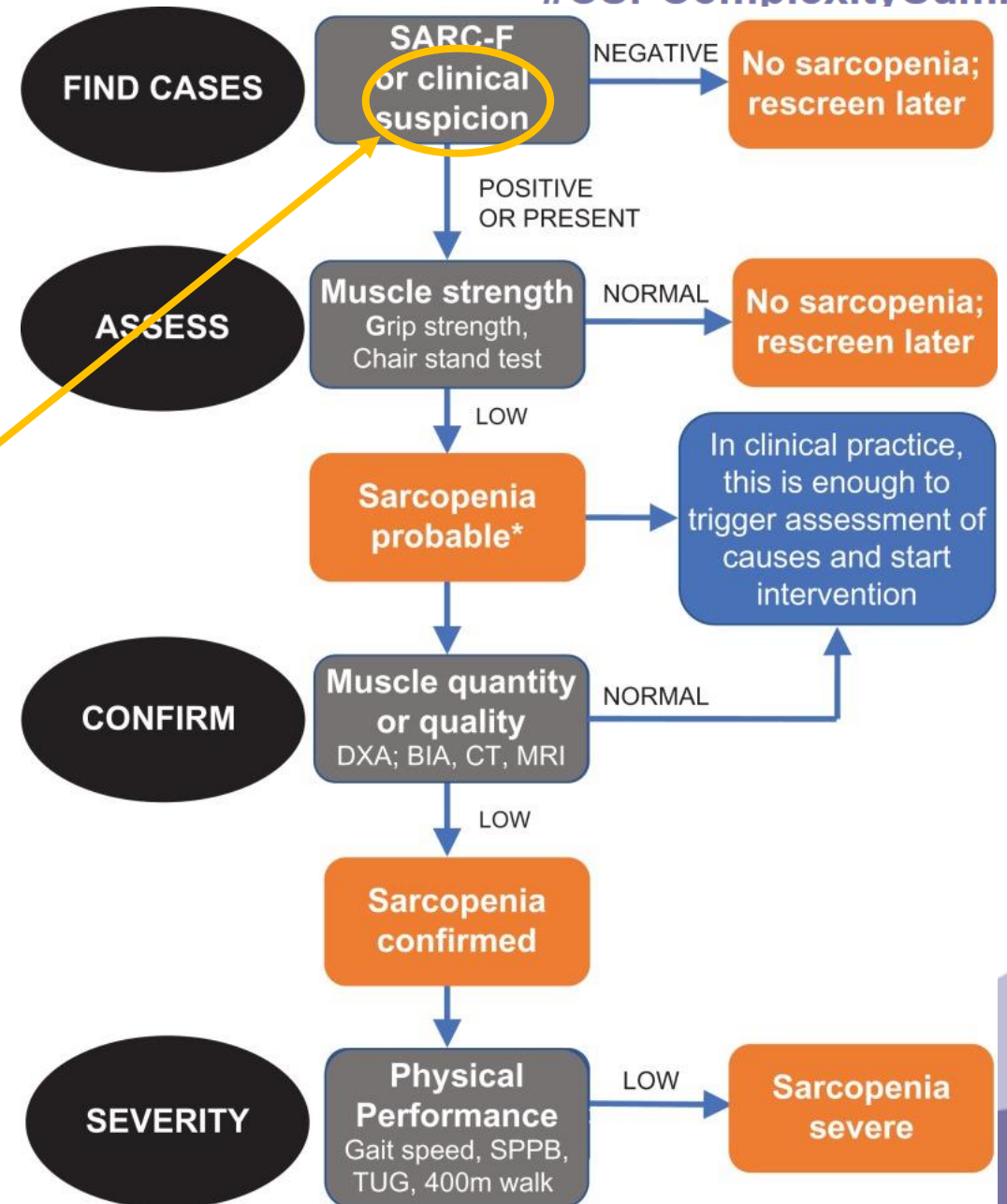
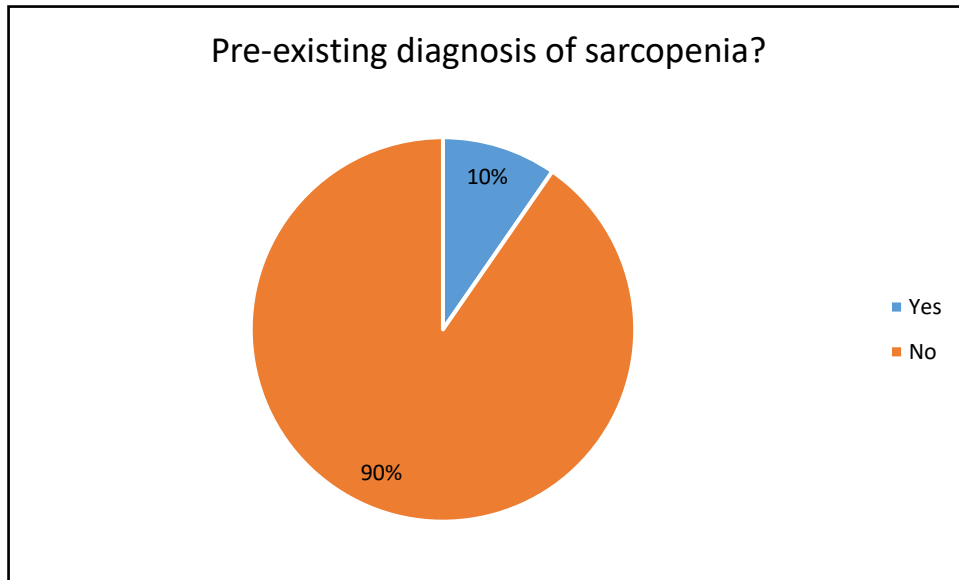




Baseline Assessment Methods



- Variability between participant sites in choice of assessment methods used at baseline assessment.
- Assessment methods focused upon muscle strength were used in 50% or fewer cases.



Initial patient assessment provides an opportunity to identify sarcopenia

- Chair stand test (Five times sit to stand)
 - >15 seconds for 5 rises
- Grip Strength
 - Men <27kg
 - Women <16kg
- Gait speed
 - Marker of low muscle performance
 - <0.8m/sec

Mean Baseline Five Times Sit-To-Stand: 29.03 sec

Mean Grip strength:
Male: 22.2kg
Female: 12.5kg

Mean Baseline Gait Speed:
0.51m/sec



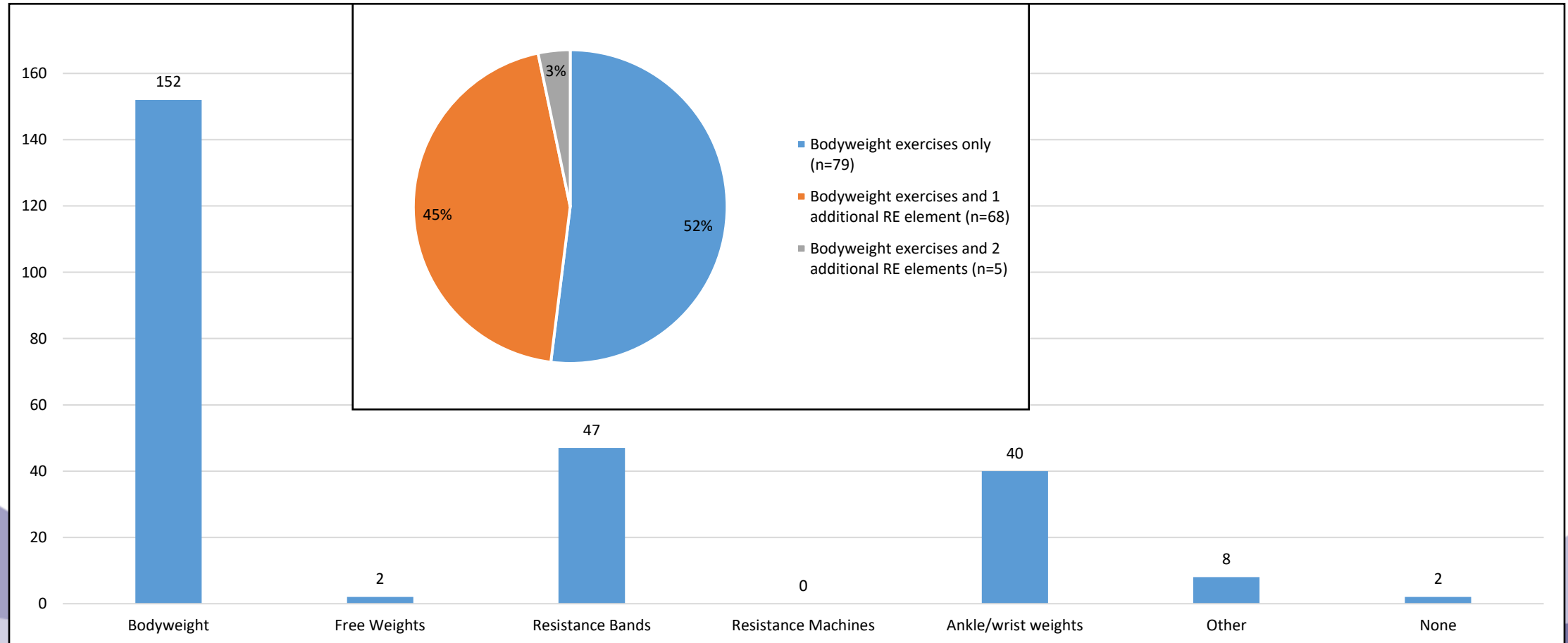
Key findings:

Initial assessments do not evaluate muscle strength in many cases

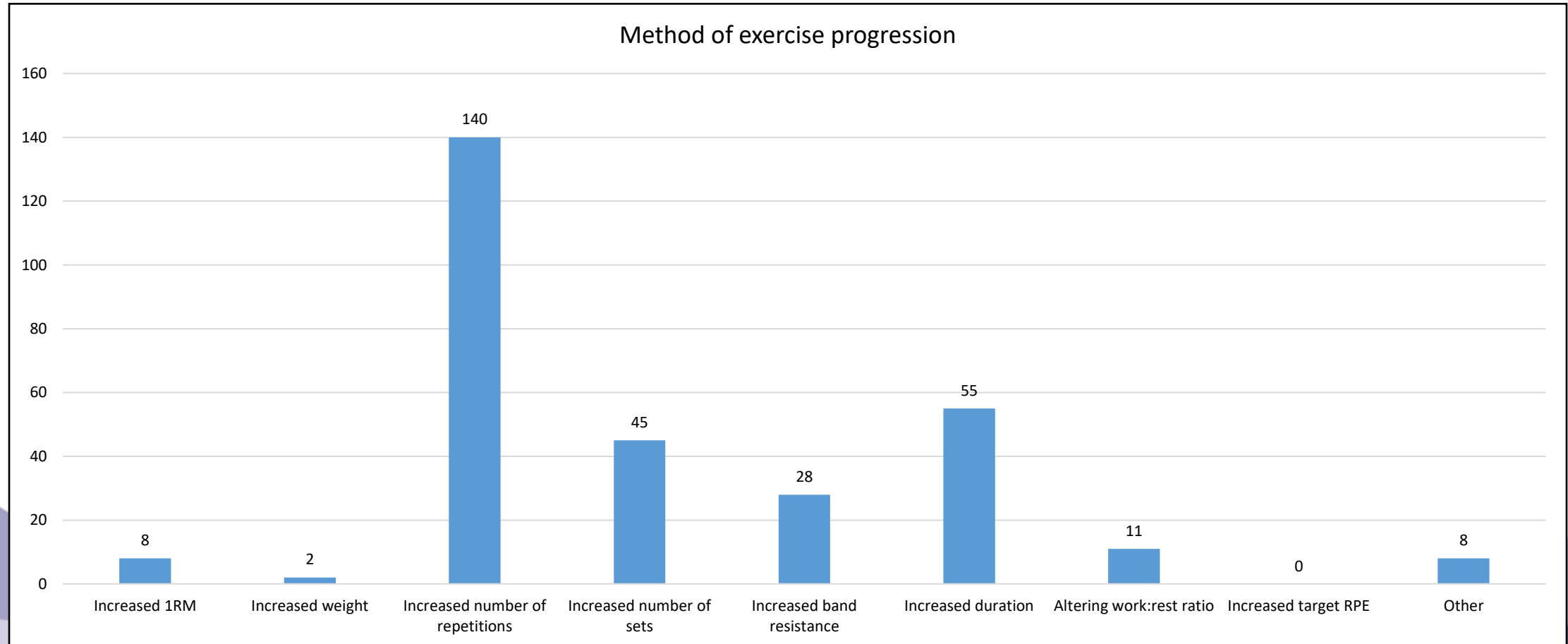
The opportunity to diagnose sarcopenia is missed in many cases



Resistance exercise prescription



Progression of resistance exercises



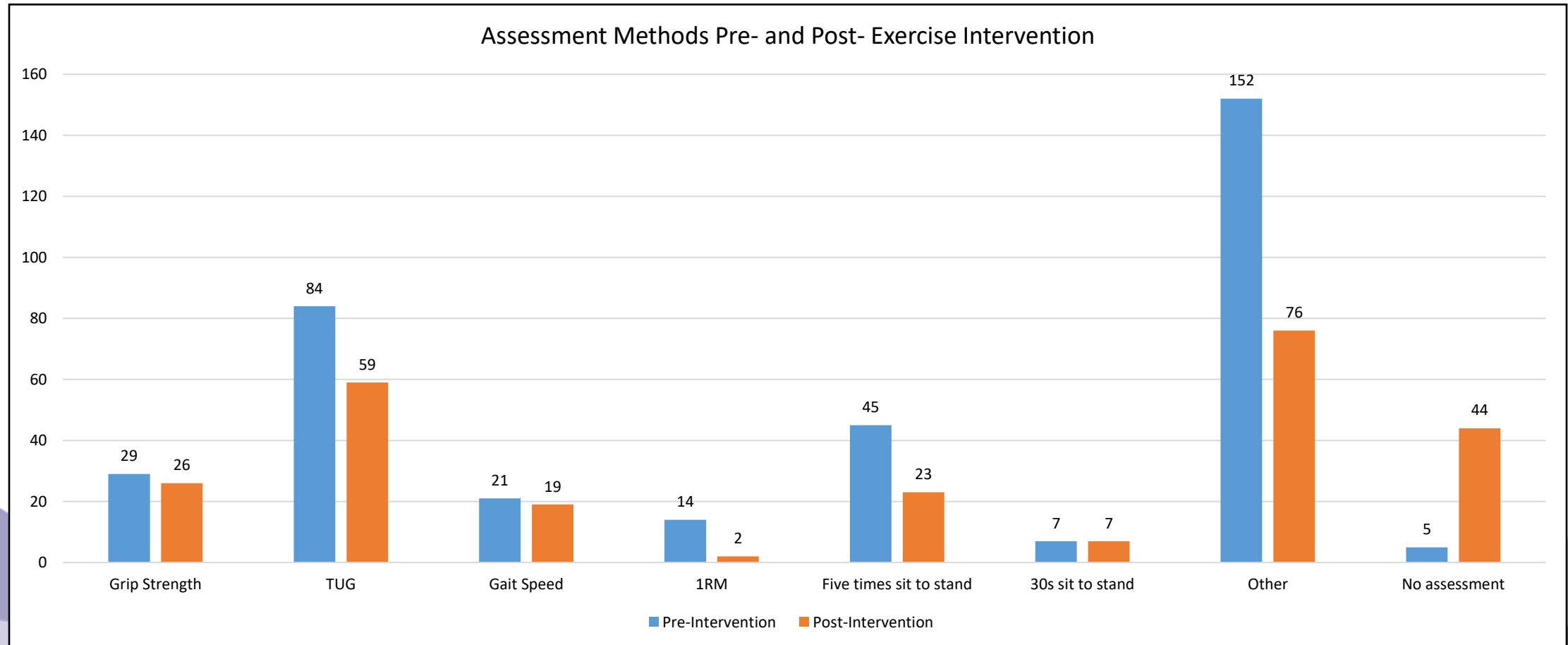
Key findings:

Most prescriptions use bodyweight for resistance, with some use of resistance bands

Resistance exercise prescriptions are being progressed by number of repetitions but not by increased load



Post-Exercise Intervention Assessment



Key findings:

A wide range of measures are used to evaluate outcome of exercise programmes

Not all patients are assessed after completion of exercise programmes



Taking part in the BEPOP project

- An opportunity to demonstrate the effectiveness of your service and to advocate for it.
- Gain feedback on current practice and learn more about practice across the UK.
- Contribute to ongoing quality improvement and help guide service development.
- We are planning future rounds – tell us how BEPOP should evolve...



Key Messages

- We are not always measuring muscle strength in initial assessments – essential to guide the type of exercise and as a baseline to guide progression
- Resistance exercise is not always monitored or progressed optimally
- Evaluation of the outcome of resistance exercise is not always done, and when it is, a wide range of tools are used



Thank you to all our participants in Round 1

- Belsay Unit, Newcastle upon Tyne NHS Foundation Trust
- Torbay and South Devon NHS Foundation Trust
- Shropshire Community Health Trust
- Whitefield Assessment and Rehabilitation Centre
- Southern Health NHS Foundation Trust
- Community Adult Therapy Service, Isle of Man
- Bradford Teaching Hospitals Foundation Trust
- Mansfield Community Hospital
- Integrated Independence Team, London Borough of Hackney
- Armour Complex, Ballymoney
- Warrington and Halton Teaching Hospitals NHS Foundation Trust

BEPOP Process Evaluation

Dr Susanne Arnold

Warwick University

AGILE Chair



BEPOP Process Evaluation

Semi-structured qualitative interviews to explore and understand the participating therapists roles and experiences of being involved in BEPOP



Participants

- 17 participants (staff members) approached for interview from 10 sites
 - 7 agreed to be interviewed
 - 1 declined interview
 - 9 did not respond
- 7 interviews completed from 5 sites
 - 6 individual interviews
 - 1 focus group (2 people)
 - 6 female / 1 male
 - 5 physiotherapists / 2 senior rehabilitation assistants



Participants

- 5 sites
 - Assessment and rehabilitation centre
 - Community hospital
 - Community therapy teams
 - Falls prevention services
 - Strength and balance classes
 - Out-patients
 - Home visits



Data collection

- Semi-structured remote (telephone or video) interviews
 - Mean duration: 30 minutes (range 18 to 38 minutes)
- Verbal consent
- Audio recorded and transcribed verbatim
- Thematic analysis (Braun & Clarke)



Emerging themes/ideas

- Never quite knowing if we are doing the right thing?
- Are we diagnosing sarcopenia?
- We collect a lot of that data anyway
- It has made us think



Never quite knowing if we are doing the right thing?

“We are trying to do the right thing but have no idea if what we are doing is similar, different or anything compared to other services” (PT1)

“Even as physios, a lot of us underestimate how much older people need these sorts of exercises” (PT5)

“Is my job worthwhile... like, is it worthwhile issuing these exercises? Is it beneficial for the patient” (SRA2)

“I just don’t think it is something that we’re terribly good at as physios. Which is bizarre because exercise is supposed to be our thing. But we’re not very well trained in strength training” (PT2)

“I thought it would be interesting to reflect on what I’m providing, you know what my service is doing and how that measures up to the guidance” (PT5)

Are we diagnosing sarcopenia?

“I have never seen a diagnosis of sarcopenia in any patient locally” (PT1)

“Sarcopenia is never given as a diagnosis but I’m sure they have it” (PT4)

“Osteoporosis... or frailty... severe frailty... that’s what is written on the referral form” (SRA1)

“There’s some people I’ve actually ticked that they’ve got sarcopenia... because I know they have... but that’s just because I know they have” (PT2)

“Deconditioning sometimes... or weakness. But sarcopenia is not something that’s ever really mentioned” (PT5)

We collect a lot of that data anyway

“I didn’t really find it any extra work because I needed that information anyway”
(SRA2)

“it’s part of the stuff we do on a normal day-to-day basis...the data we collect, we’re now collecting for BEPOP”
(PT1)

“It’s mostly inputting data that we had collected anyway”
(PT3)

“...but it hasn’t picked up the kind of more subjective stuff. Although I’m putting in Berg’s and TUGTs what’s making the difference to the patient is they can get out of a chair, they can get off the floor”
(PT2)

“One thing that has been difficult to interpret onto the form is the frequency of sessions. There is no option for less than once a week” (PT5)

It has made us think

“...it has highlighted the lack of strength training that we do. And I still think we still don't always prescribe it. I think we're a little too cautious” (PT5)

“Progressing resistance exercises is more in our minds than it was”
(PT4)

“I always do check how they're managing and I do move them up bands but I guess it has added an extra incentive to make sure to ask them how they are doing” (PT2)

“I'd be interested in knowing the other types of exercises that other people do. We have a falls leaflet that tends to be a go to for lots of exercises but there could be other exercises that are really beneficial”
(SRA1)

“... we prescribe an exercise programme and our assistants will do it. We haven't particularly thought about how we're going to progress people” (PT3)

Key messages

- Physios want guidance on best practice and recommendations for managing frailty and sarcopenia.
- There is a need to diagnose and assess sarcopenia and frailty.
- We need to ensure that we are prescribing and **progressing** appropriate resistance exercises.



Prescribing Resistance Exercise for Sarcopenia

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PRESCRIBING EXERCISE FOR SARCOPENIA

Where are we now?

- Physios want guidance on best practice and recommendations for managing frailty and sarcopenia
- There is a need to diagnose and assess sarcopenia and frailty
- We need to ensure that we are prescribing and **progressing** appropriate resistance exercises

HOW, WHAT, WHEN?

Age and Ageing 2022; 1–10
<https://doi.org/10.1093/ageing/afac003>

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REVIEW

Resistance exercise as a treatment for sarcopenia: prescription and delivery

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Abstract

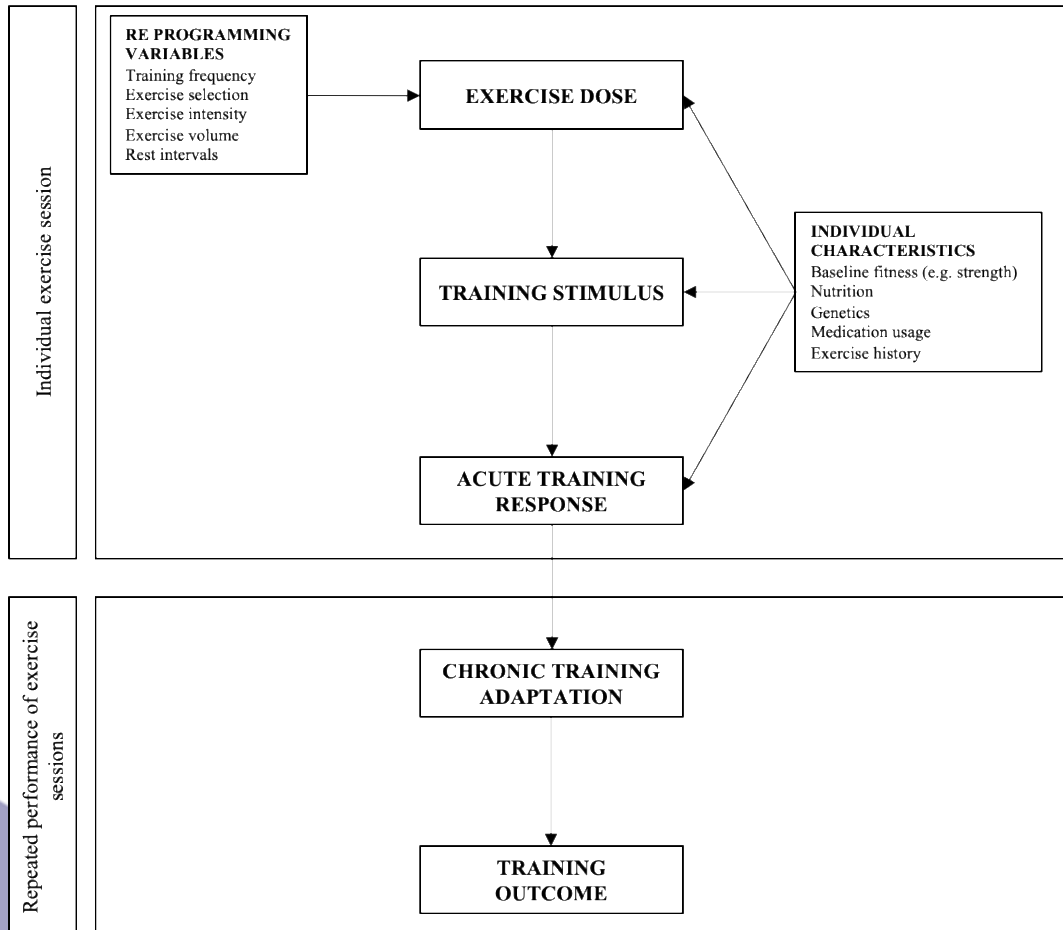
Sarcopenia is a generalised skeletal muscle disorder characterised by reduced muscle strength and mass and associated with a range of negative health outcomes. Currently, resistance exercise (RE) is recommended as the first-line treatment for counteracting the deleterious consequences of sarcopenia in older adults. However, whilst there is considerable evidence demonstrating that RE is an effective intervention for improving muscle strength and function in healthy older adults, much less is known about its benefits in older people living with sarcopenia. Furthermore, evidence for its optimal prescription and delivery is very limited and any potential benefits of RE are unlikely to be realised in the absence of an appropriate exercise dose. We provide a summary of the underlying principles of effective RE prescription (specificity, overload and progression) and discuss the main variables (training frequency, exercise selection, exercise intensity, exercise volume and rest periods) that can be manipulated when designing RE programmes. Following this, we propose that an RE programme that consists of two exercise sessions per week and involves a combination of upper- and lower-body exercises performed with a relatively high degree of effort for 1–3 sets of 6–12 repetitions is appropriate as a treatment for sarcopenia. The principles of RE prescription outlined here and the proposed RE programme presented in this paper provide a useful resource for clinicians and exercise practitioners treating older adults with sarcopenia and will also be of value to researchers for standardising approaches to RE interventions in future sarcopenia studies.

Keywords: sarcopenia, resistance exercise, exercise prescription, muscle strength, physical performance, older people

Key Points

- Resistance exercise is currently recommended as a first-line treatment for sarcopenia.
- The research–practice gap represents a challenge for clinicians and exercise practitioners delivering exercise.
- Resistance exercise programmes should consist of two full-body exercise sessions per week performed with a relatively high degree of effort.

THE FUNDAMENTALS OF EXERCISE PRESCRIPTION



- **SPECIFICITY:** responses to exercise training are specific to the stimulus induced by the exercise dose
- **OVERLOAD:** A greater than habitual stress or load on the body is needed to induce adaptation
- **PROGRESSION:** A gradual and systematic increase in stress placed on the body is necessary to induce continual training adaptation over a period of time

THE COMPLEXITY OF EXERCISE PRESCRIPTION

In order to induce the **desired adaptive response**, we need to control and manipulate the **EXERCISE DOSE** (exercise stimulus) at an individual level

This is achieved by manipulating acute exercise **PROGRAMMING VARIABLES**

Key resistance exercise programming variables

TRAINING FREQUENCY	Number of exercise sessions per week
EXERCISE SELECTION	Exercises performed during the exercise session
EXERCISE INTENSITY	The relative or absolute load lifted
EXERCISE VOLUME	Number of sets and repetitions of each exercise
REST PERIODS	Amount of rest between exercises

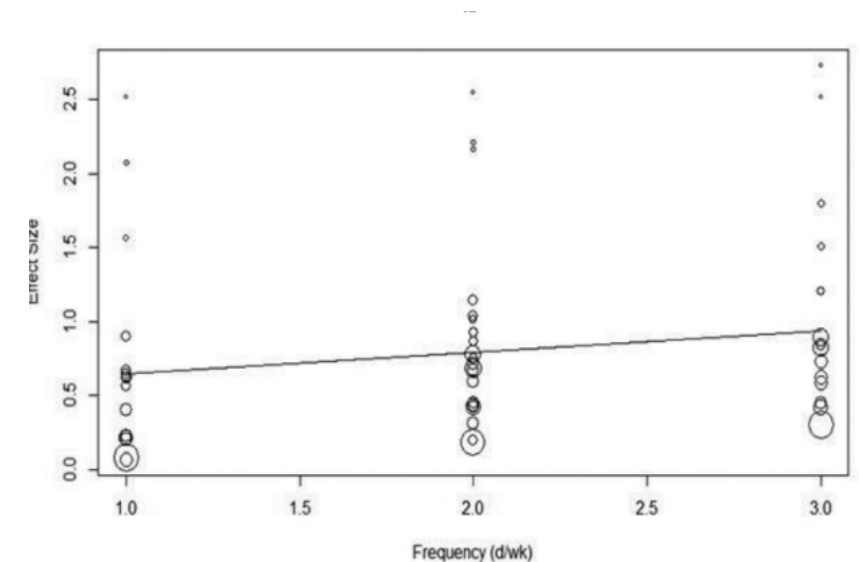
= lots of decisions to be made!!

A PROPOSED RE PRESCRIPTION FOR SARCOPENIA

Training frequency	2 sessions per week	
Exercise selection	<i>Lower body</i> Squat / leg press Knee extension Leg curl Calf raise	<i>Upper body</i> Chest press Seated row Pull down
Exercise intensity	<i>Repetition-continuum based prescription</i> 40-60% 1RM progressing to 70-85% 1RM	<i>RPE based prescription</i> RPE 3-5 on CR10 scale progressing to RPE 6-8
Exercise volume	1-3 sets of 6-12 repetitions	
Rest periods	<i>Within session</i> 60-120 s between sets; 3-5 min between exercises <i>Between sessions</i> At least 48 hours	

EXERCISE PROGRAMMING COMPLEXITY: (1) TRAINING FREQUENCY

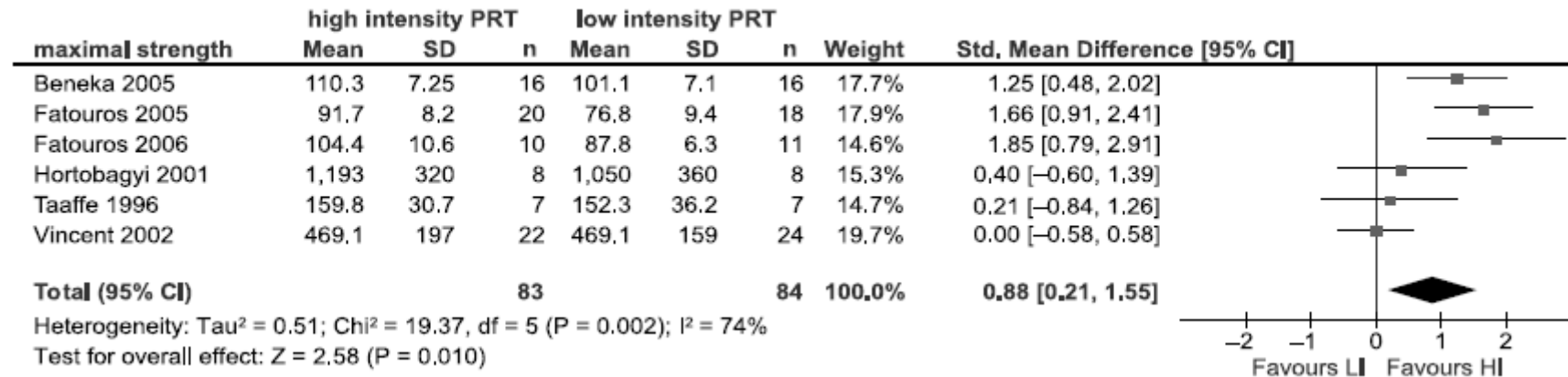
- RE programmes for older adults typically involve 1-3 training sessions per week
- **2 sessions likely better than one**; but three might not provide any meaningful extra benefit
- A single session per week *likely* to be useful particularly in those with sarcopenia



*** **QUALITY > QUANTITY** ***

EXERCISE PROGRAMMING COMPLEXITY: (2) TRAINING INTENSITY

- **Complex picture** – lots of different intensities can increase muscle strength
- However, higher intensity may be more effective – particularly over longer duration



- The most important thing is that **RELATIVE** intensity is **high** (i.e., the patient has to work fairly hard and get tired). RE performed with a **high degree of effort** OR performed until **fatigue** likely to be good enough.

DELIVERY COMPLEXITY

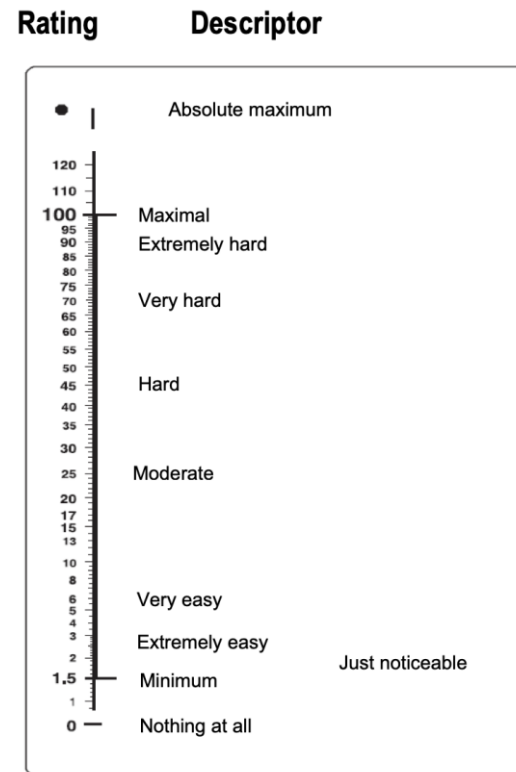
- Patient preference
- Time available
- Equipment / facility availability
- Other training goals – e.g., CV fitness improvement
- Programme duration - programme planning?



MONITORING AND EVALUATING RE PROGRAMMES

MONITORING

1. Why?
2. When?
3. How?



EVALUATING

Need to be aware that...

- Testing protocols that most closely replicate training activities tend to show greater effects
- Some assessments of physical function are **very skill based** (e.g., 1RM testing)
- Repeated assessment of physical performance may be necessary to overcome **learning effects**
- Keep it simple – TUG, sit to stand



WHAT DOES THIS ALL MEAN?

**Resistance exercise is a powerful tool for counteracting sarcopenia
BUT**

**The appropriate type of exercise – *at the correct dose* – needs to be prescribed in order
to maximise potential benefits for patients**

Proposed recommendations:

Routinely using frailty and sarcopenia assessment methods during initial patient assessment provides an opportunity to identify sarcopenia in an at risk patient population and guide exercise prescription.

Adequate progression of resistance exercises is key to delivering effective resistance training to older people.

Re-assessment is important in guiding ongoing exercise prescription and in demonstrating the effectiveness of these interventions and services.

SUPPORTING PHYSIOTHERAPISTS TO ADDRESS COMPLEXITY

Key questions:

1. How do we operationalise exercise prescription to target sarcopenia in people with frailty and multiple LTCs in practice?
2. How do we support physiotherapists to blend resistance exercise for sarcopenia with other exercise prescription requirements linked to the needs of people on their caseloads/local population need?
3. How can we maintain and support upskilling of our physiotherapy workforce so they are confident and competent in exercise prescription throughout their career?





THE COMPLEXITY CHALLENGE

A CSP SUMMIT