

Falls and Balance – From Research to Practice



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Outline

- Are falls a problem for PWH?
- Balance dysfunction for PWH
- Effectiveness of balance training exercise program
- Clinical relevance



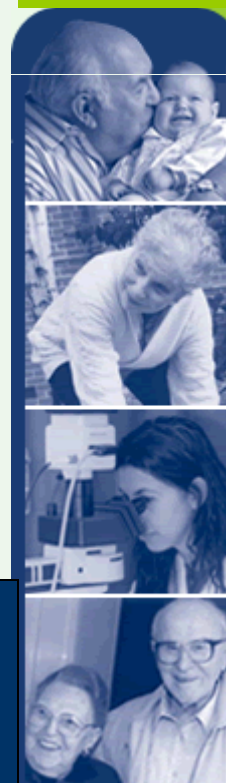
Are falls a problem for PWH?

- Staff at Ronald Sawers Haemophilia Centre identified that a number of haemophilia clients had falls, and in some cases with moderate injuries
- Osteoarthritis of lower limbs linked with reduced balance and increased chance of falling
- No previous research identified reporting:
 - Balance impairment
 - Falls prevalence
 - Consequences, or
 - Management/preventionfor people with haemophilia

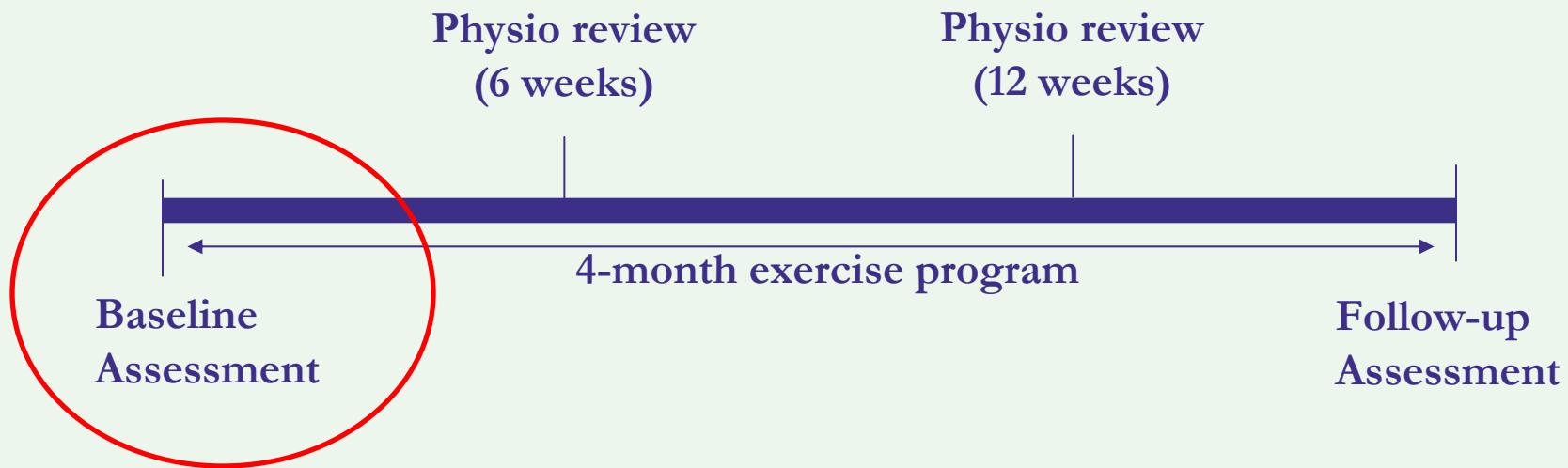


Balance dysfunction for PWH

- Collaborative project undertaken by NARI and Ronald Sawers Haemophilia Centre (Alison Street, Leonie Mudge, Penny McCarthy, Cath Walsh, Megan Walsh)
- Project funded by Haemophilia Foundation Australia
- 20 PWH and 20 age and gender matched controls

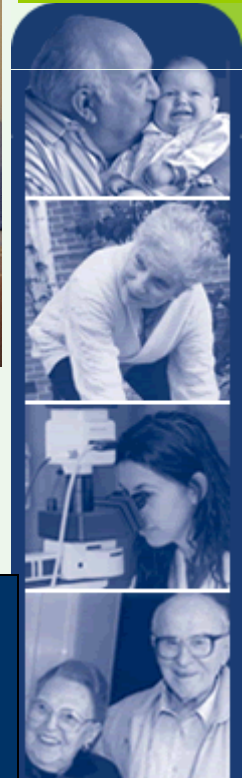


Procedure



Assessments (1)

- Comprehensive balance and walking assessment using a computerised force platform (Neurocom Balance Master – long plate):
 - Modified Clinical Test of Sensory Integration of Balance
 - Limits of Stability
 - Walking test
 - Step / turn test
 - Sit to stand test



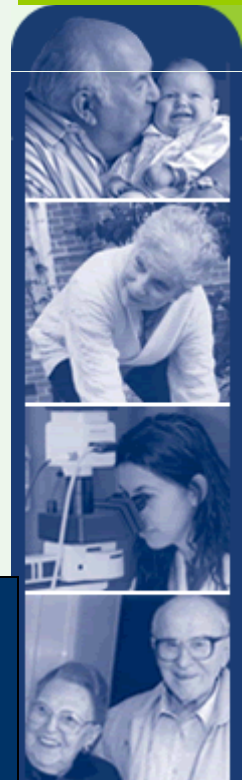
Assessments (2)

- **Clinical balance measures**
 - Step test
 - Timed Up and Go
 - Functional Reach
- **Timed Chair Stand (leg strength)**
- **Surveys:**
 - Activity level (Human Activity Profile)
 - Confidence in mobility (Modified Falls Efficacy Scale)
 - Pain (visual analogue scale)
 - Falls in previous 12 months
- **Lord's Physiological Profile Assessment (abbreviated)**

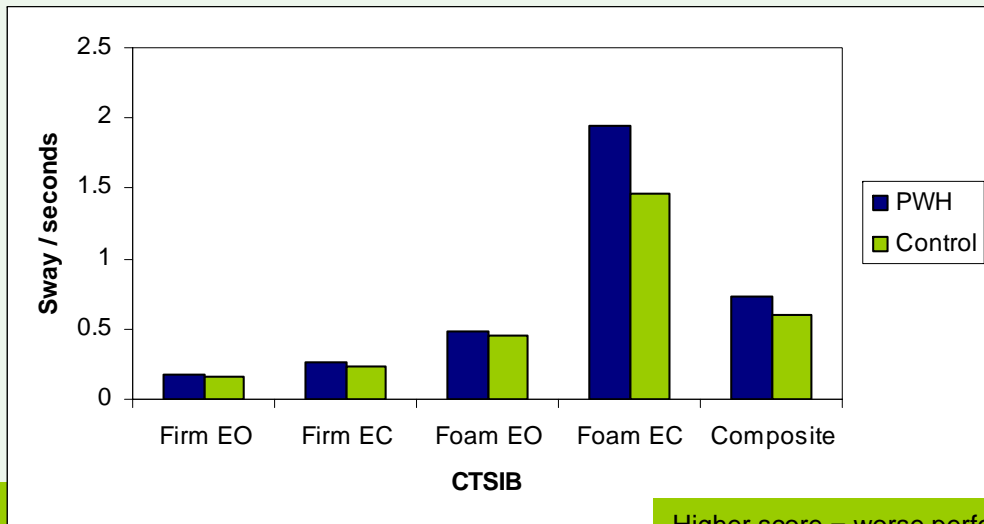


Participants

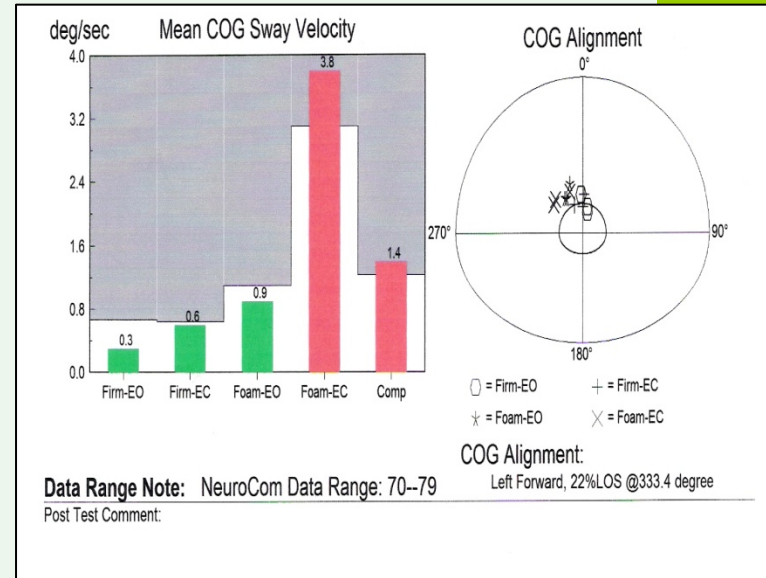
	PWH	Controls	P value
Age – mean (SD)	39.4 (12.3)	40.3 (12.7)	0.821
Height (cm) – mean (SD)	177.9 (7.6)	178.5 (7.8)	0.807
Proportion participants having fall in past 12 months (%)	50%	10%	
Type of bleeding disorder – n (%)			
- Haemophilia A	18 (90%)		
- Haemophilia B	1 (5%)		
- Haemophilia A and von Willebrand	1 (5%)		
Severity of bleeding disorder – n (%)			
- mild (5-50%)	2 (10%)		
- moderate (1-5%)	4 (20%)		
- severe (<1%)	14 (70%)		



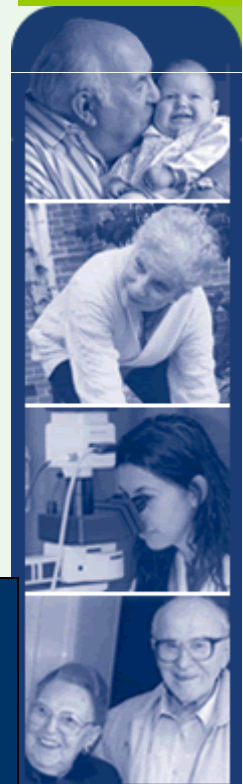
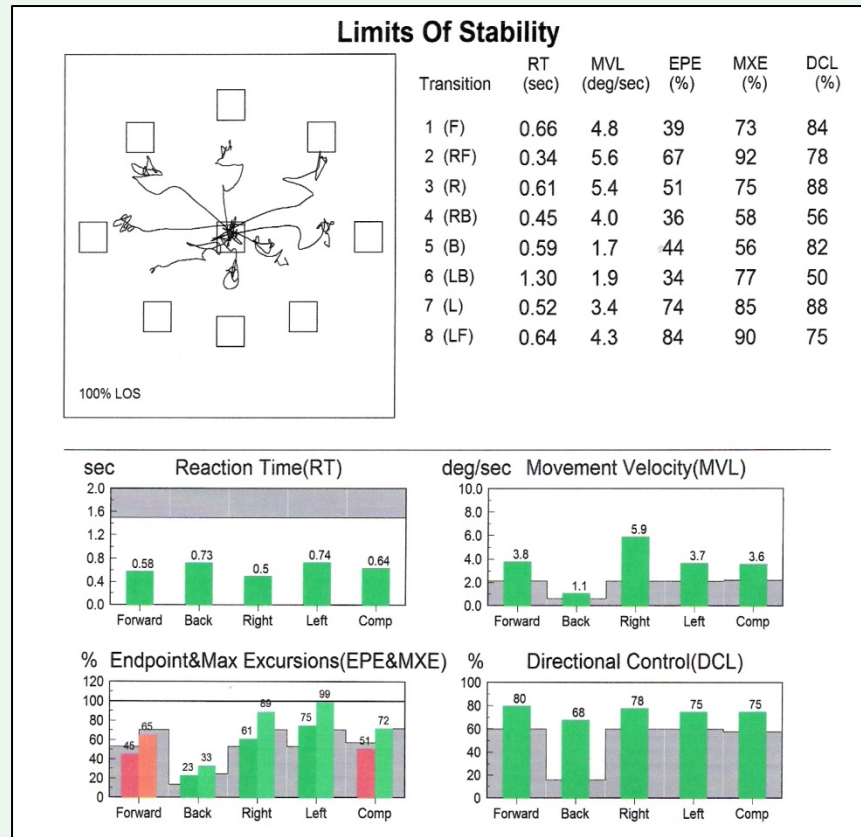
Balance dysfunction – modified CTSIB



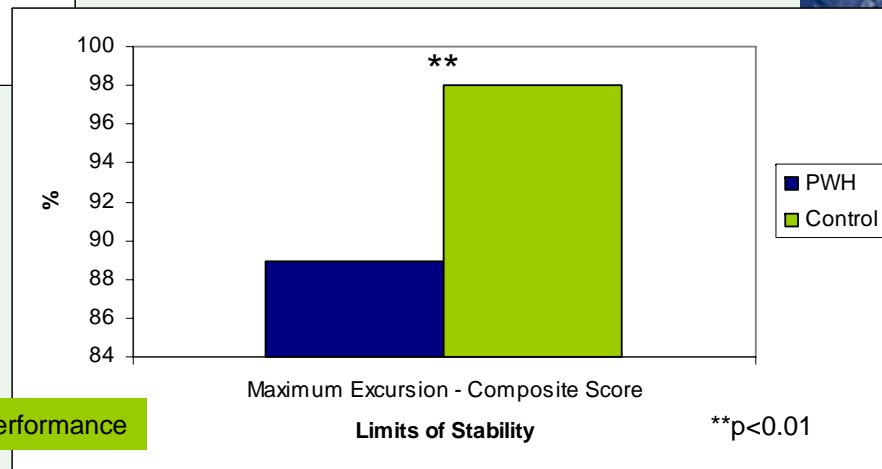
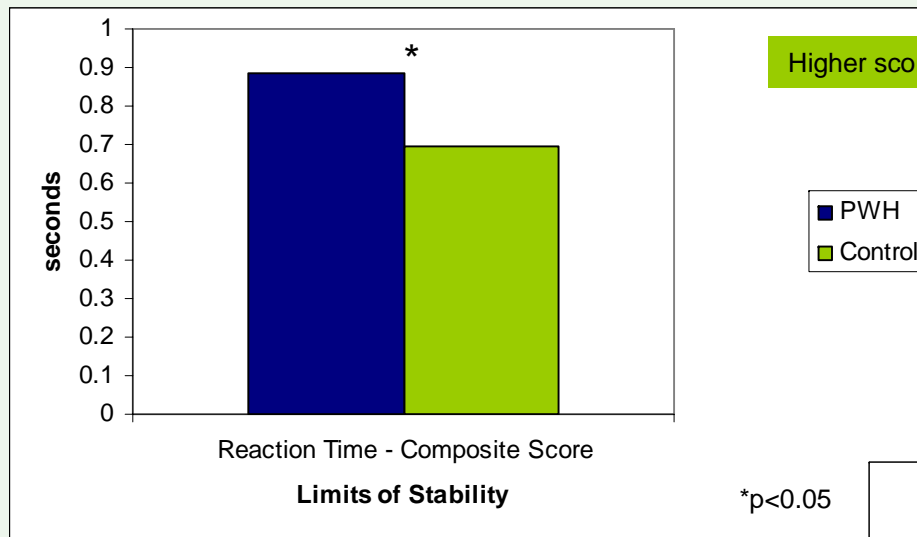
Higher score = worse performance



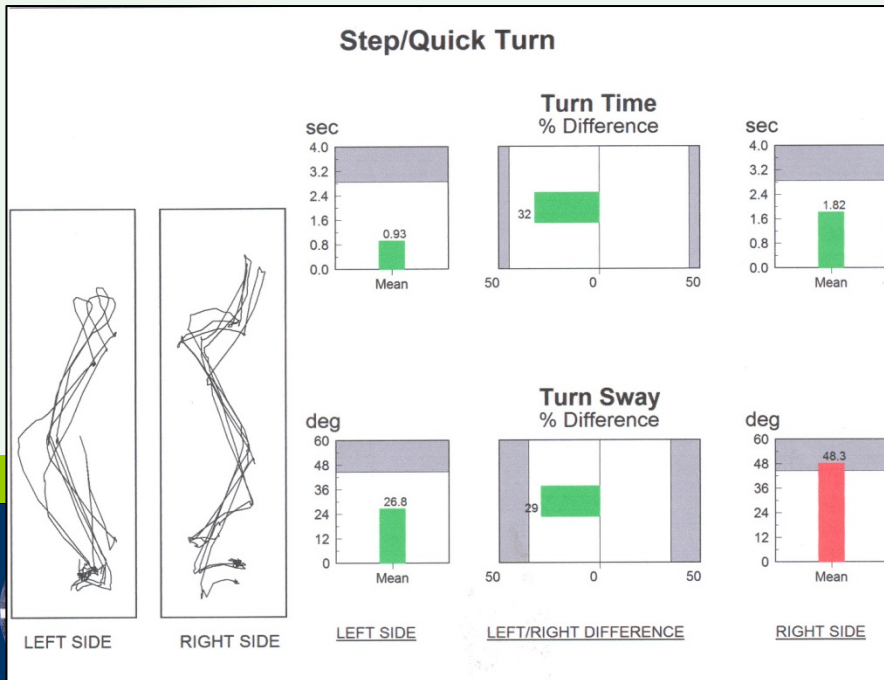
Balance dysfunction – Limits of Stability



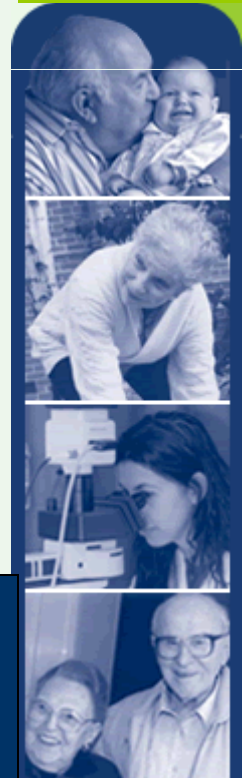
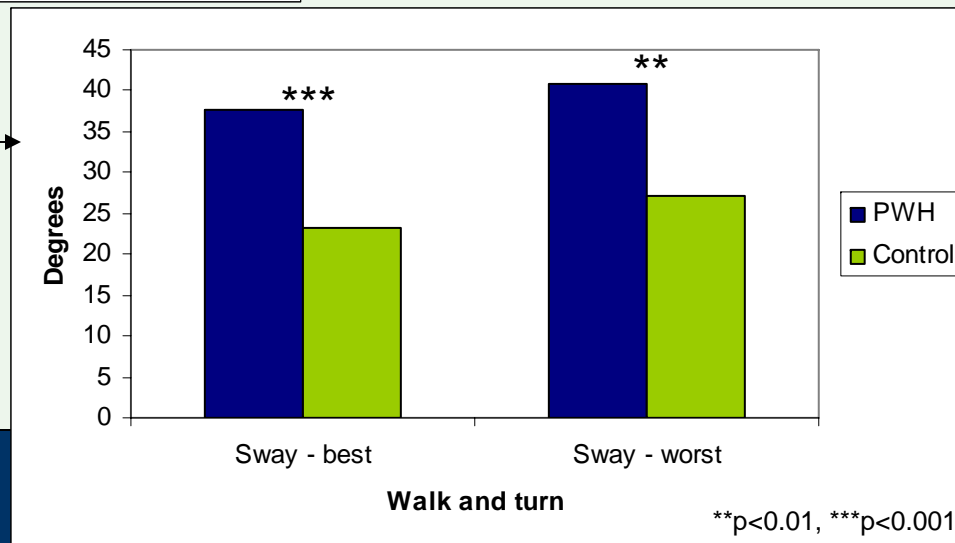
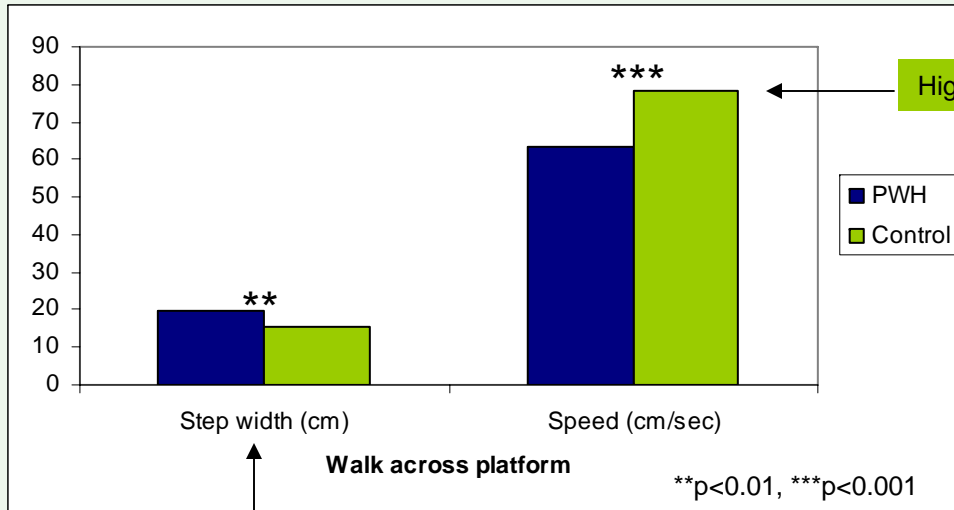
Balance dysfunction – Limits of Stability



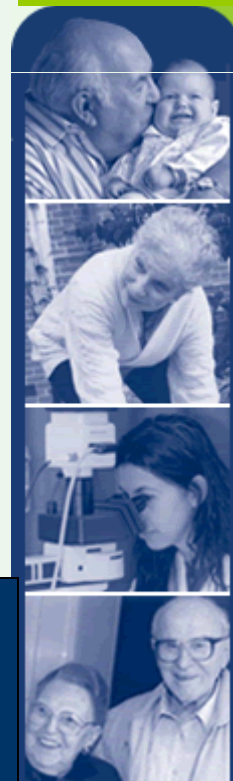
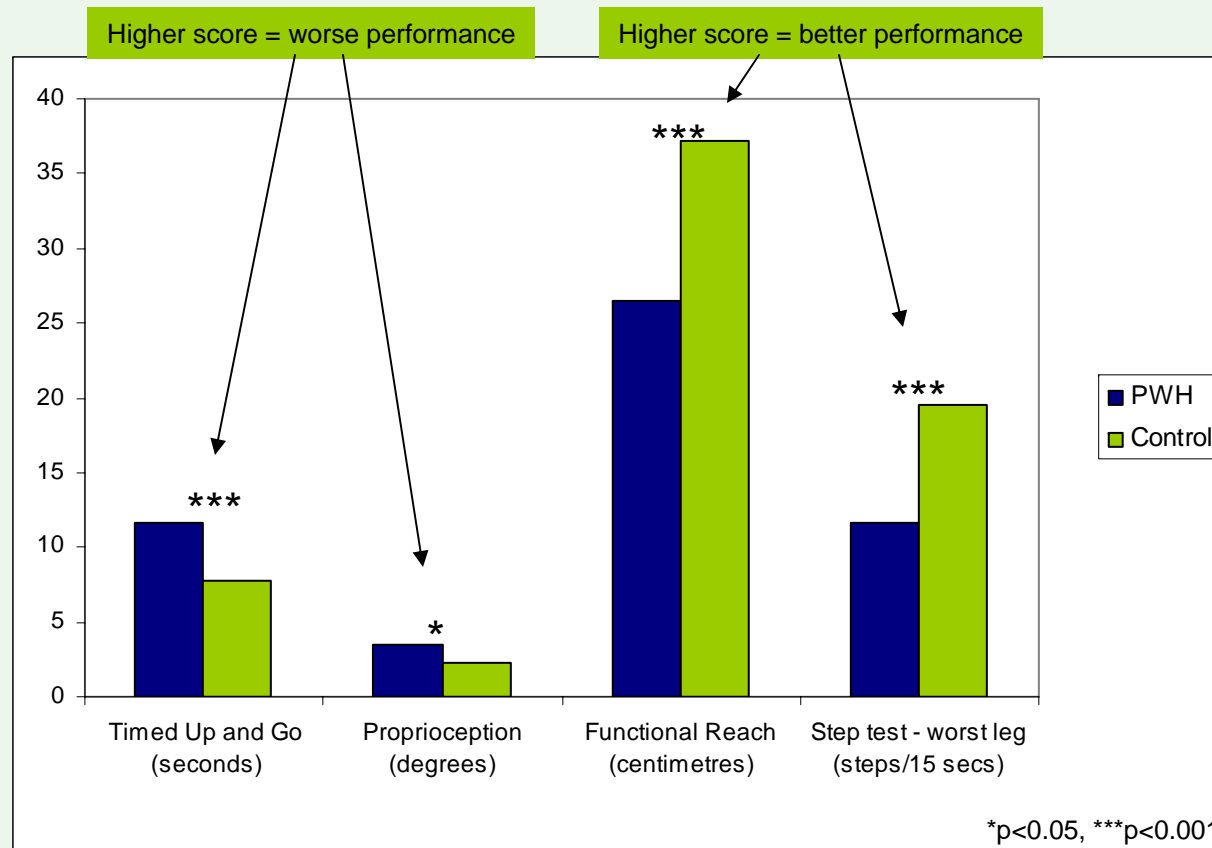
Balance dysfunction – Walking & Turning



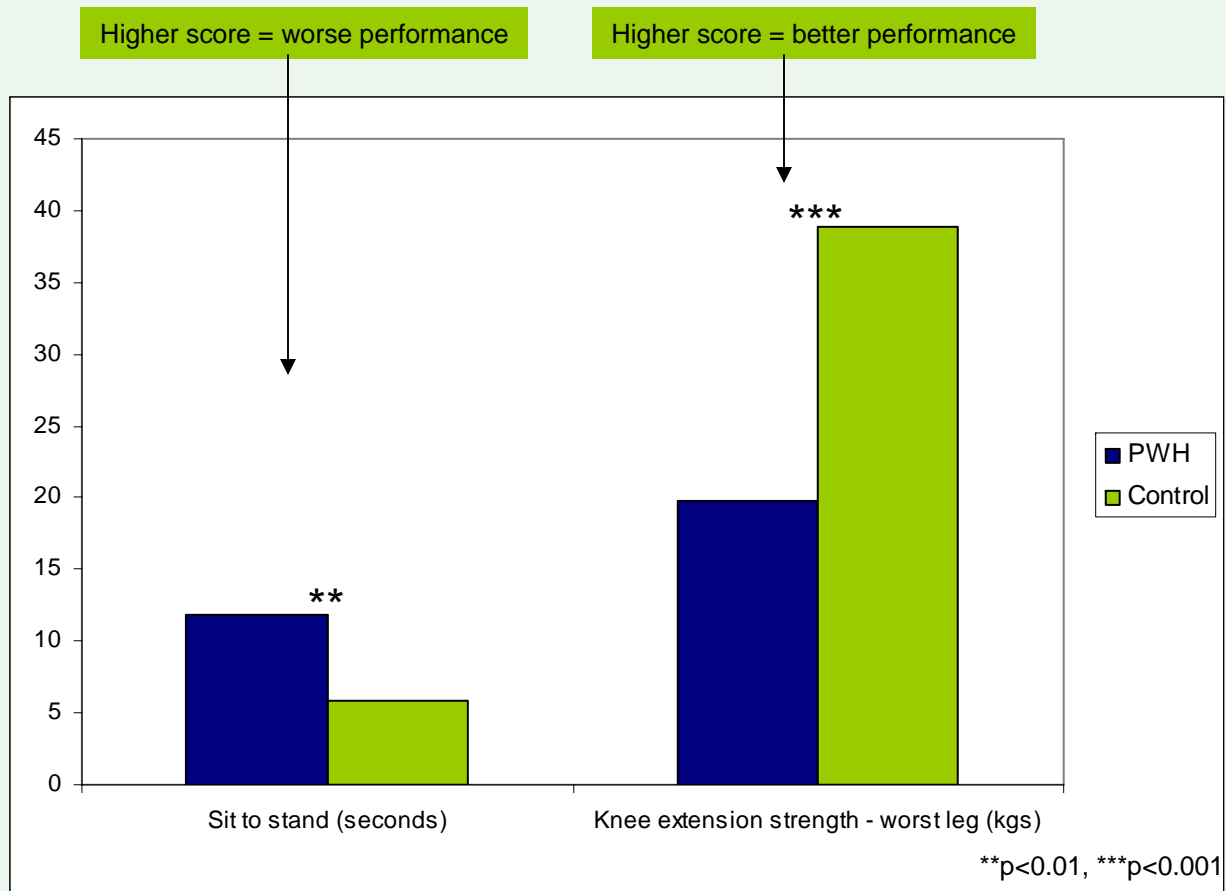
Balance dysfunction – Walking & Turning



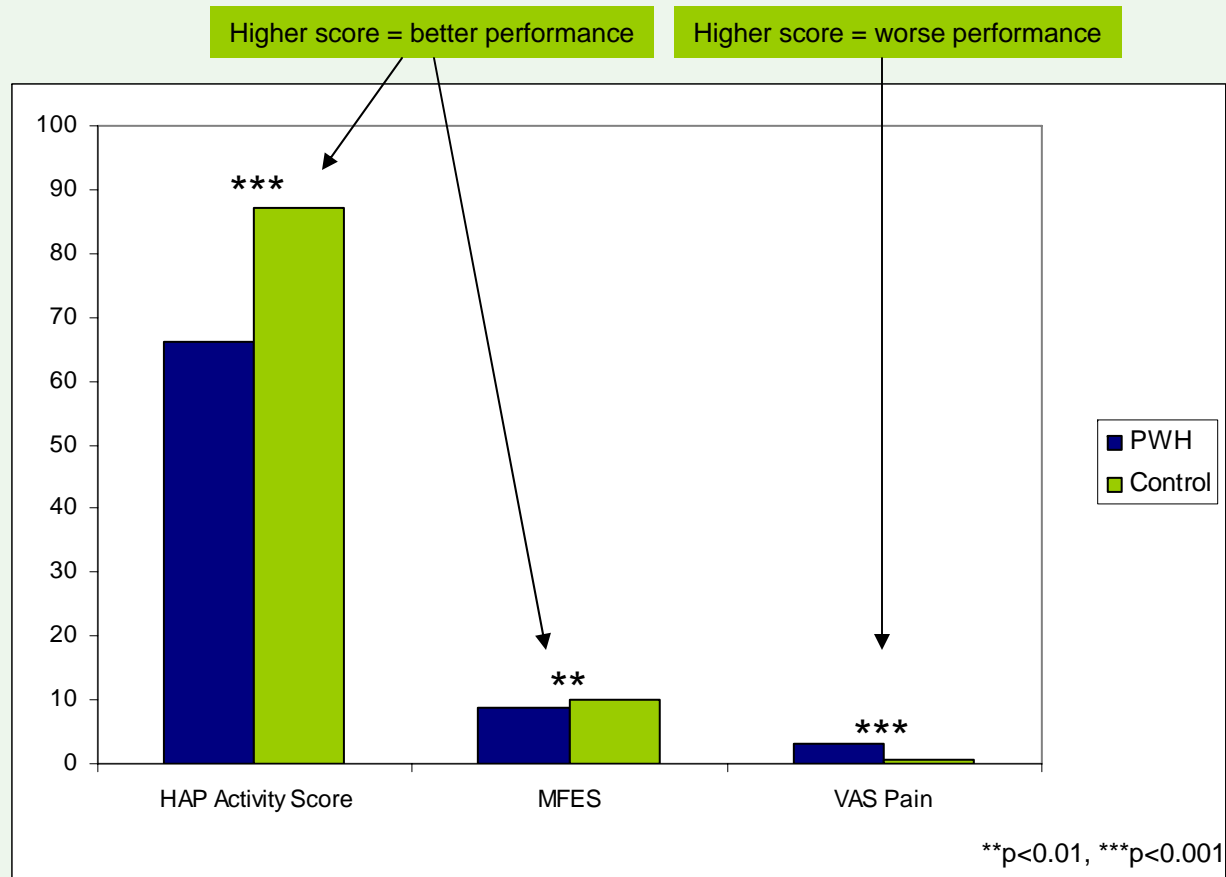
Balance dysfunction – Clinical balance / sensory tests



Muscle strength



Activity level, fear of falling & pain

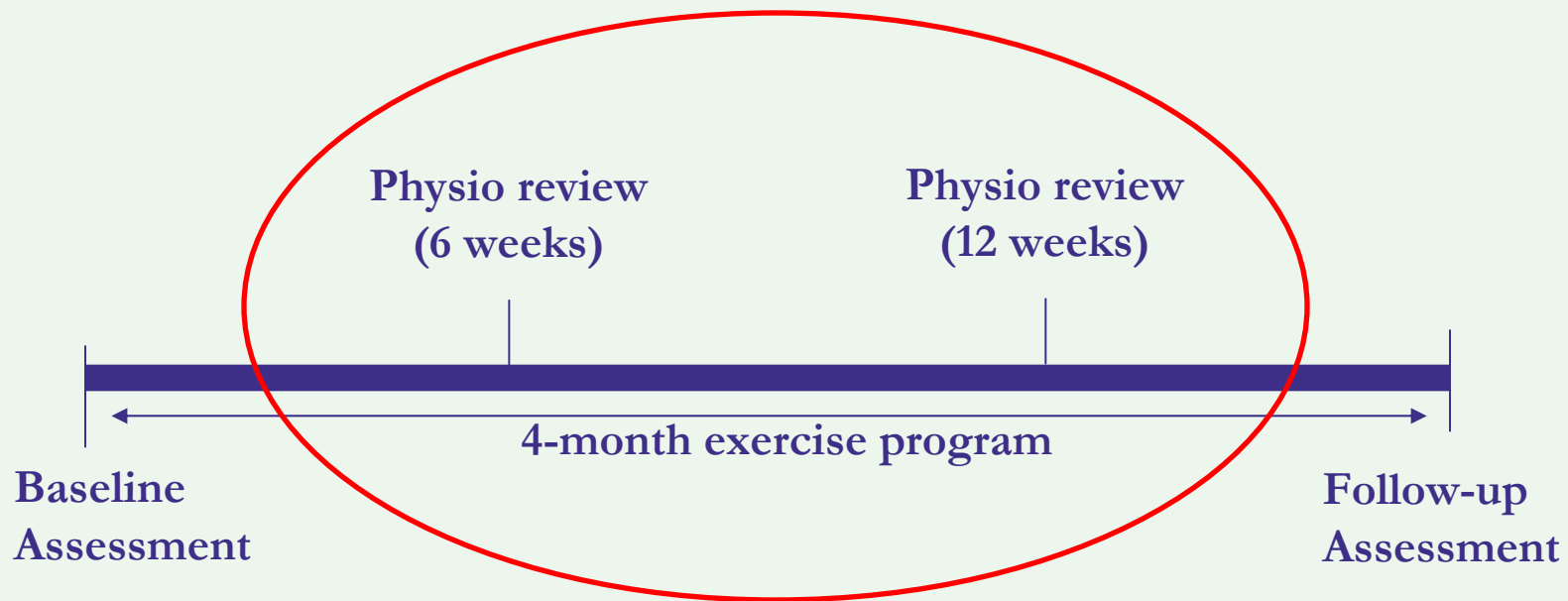


Balance dysfunction for PWH

- Results of this study suggest that PWH do have moderate levels of balance dysfunction
- Can balance training exercises help improve this?

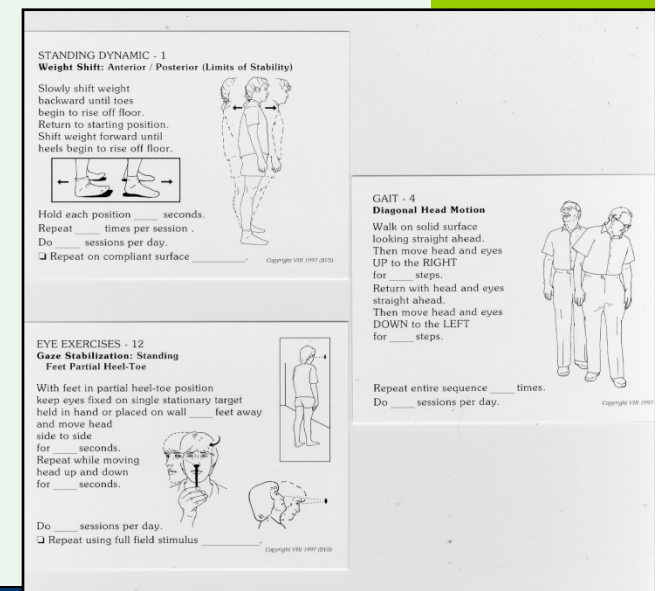
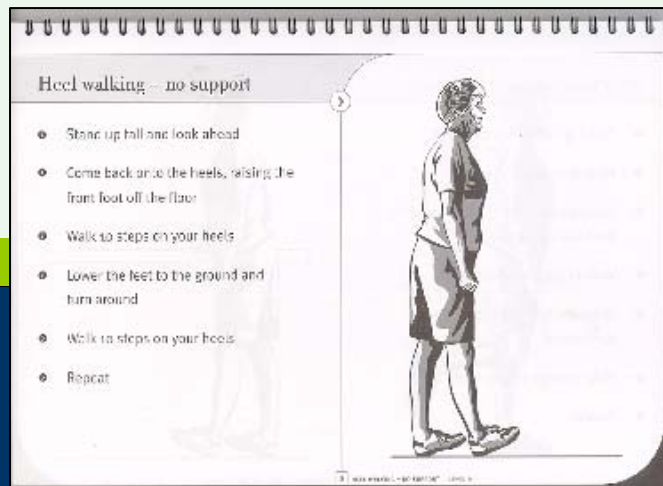


Procedure



Exercise prescription

- Review of baseline assessment results by a physiotherapist
- Development of individualised home exercise program (focussing on balance), based on:
 - Otago exercise program
 - Health Promotion Resources Balance & Vestibular Exercise Set (computerised)



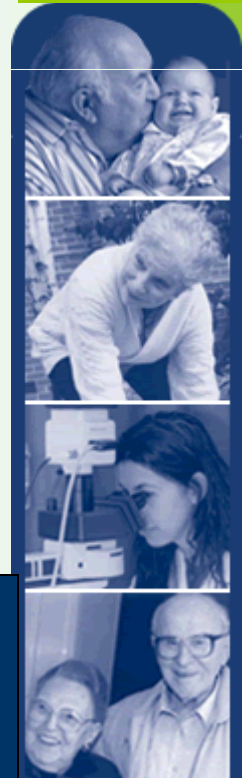
Exercise Program

- 12 participants (60%) completed the 4-month home exercise program
- Exercises undertaken 62% of time (range 8.5%-99.7%)
- Reasons for not completing the program:
 - Lack of time
 - Co-morbidities / other illnesses
 - Lack of motivation

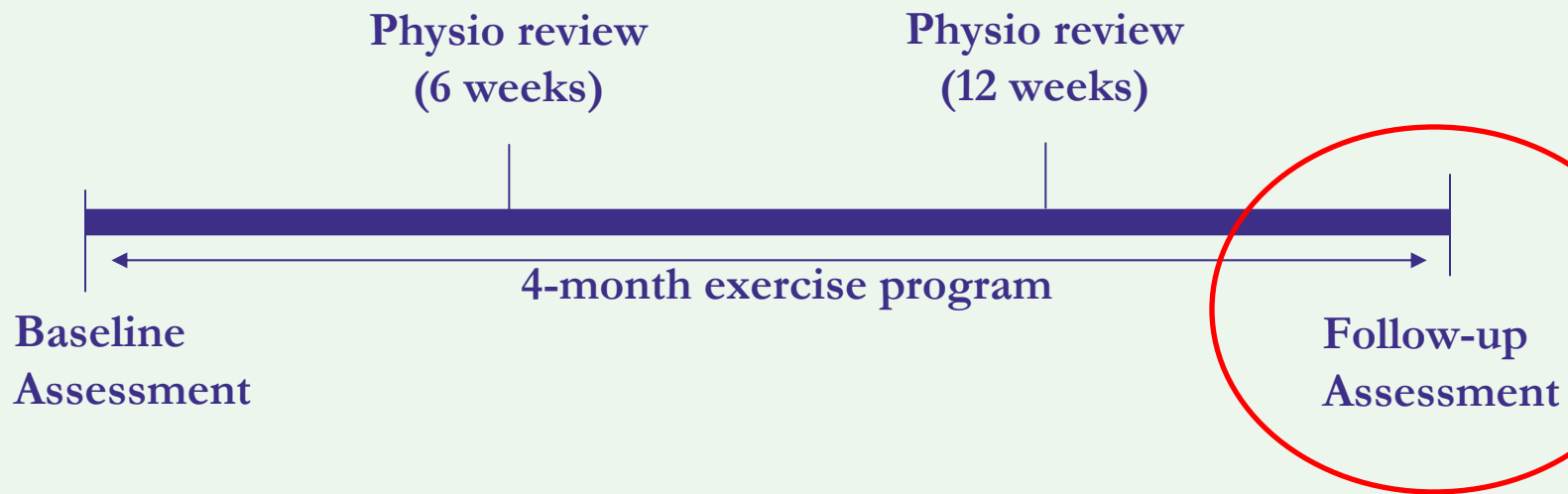


Exercise Program

Possible baseline balance & mobility findings	Exercise Options	Options utilised for modification & progression of each exercise
<ul style="list-style-type: none"> • Decreased stability in standing • Decreased control & coordination of movement • Decreased weight shift (directional) • Slow gait, short steps, step width variance • Increased time and sway with turning • Difficulty in standing from sitting • Decreased stability with stepping • Decreased lower limb strength 	<ul style="list-style-type: none"> • Warm up exercises (e.g. joint mobility) • Balance exercises <ul style="list-style-type: none"> – Stability exercises (e.g. calf raises, toe raises, tandem stance, single leg stance) – Control & coordination exercises – Weight shift exercises (e.g. backwards walk, anterior posterior weight shift, tandem walk, reaching, alternate stepping, marching) – Turning exercises • Sit to stand exercises • Strengthening exercises (with or without weights) • Walking exercise 	<ul style="list-style-type: none"> • +/- vision (eyes open, eyes closed) • +/- visual fixation • +/- head movements • +/- arm movements • +/- trunk movements • Stance surface (stable or mobile, compliant or not) • Speed variations • Dosage changes • Frequency changes • Resistance – use of weights • Foot placement • Use of support • Chair height • Holding times • Strategy use – ankle, hip, stepping, protective



Procedure

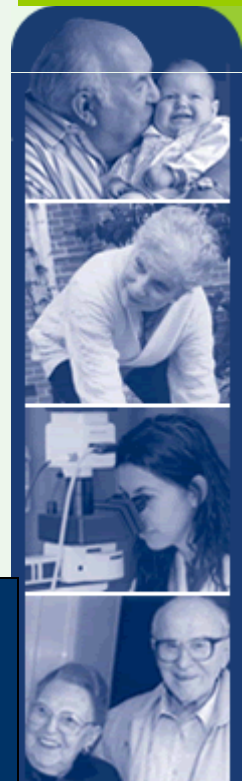


Responses to Exercise Program (1)

Test	Baseline mean	% change
Modified CTSIB		
- Firm EO (sway – degrees/second)	0.18	30.5% *
- Firm EC (sway – degrees/second)	0.28	22.2% *
- Foam EO (sway – degrees/second)	0.45	16.3%
- Foam EC (sway – degrees/second)	2.08	26.3% *
- Composite (sway – degrees/second)	0.76	19.2% *
Limits of Stability		
- Reaction Time (seconds)	0.92	12.1%
- Maximum Excursion (%)	89.92	-1.3%
Walking		
- Step width (cm)	18.48	-2.3%
- Step speed (cm/second)	64.62	-0.4%
Walking and turning		
- Turn sway worst leg (degrees)	39.98	5.6%
- Turn sway best leg (degrees)	35.81	1.5%

-ve score denotes deterioration in performance

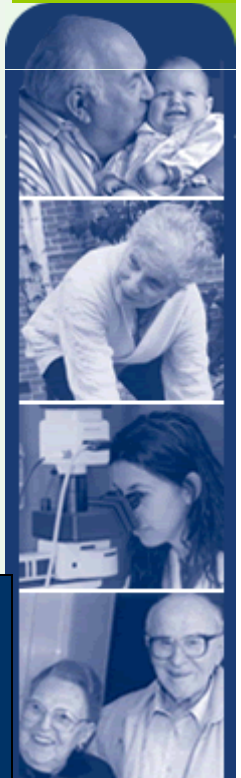
*p<0.05



Responses to Exercise Program (2)

Test	Baseline mean	% change
Timed Up and Go (seconds)	12.11	11.7%
Functional Reach test (cm)	27.79	-3.5%
Step test – worst leg (steps/15 sec)	11.25	8.2%
Knee extension strength – worst leg (kg)	19.25	6.5%
Sit to stand test (seconds)	13.29	19.9%
HAP Activity Score	65.67	6%
MFES	8.69	5.6%

-ve score denotes deterioration in performance



Responses to Exercise Program (3) - feedback

"Hi Keith and Marcia,

Just thought I would "check in" with a progress report.

I moved up to the 1 kg weight times 5 as of today.

Had a 2 day "lay off" over the weekend due to a left shoulder bleed which is nearly resolved.

Over the past few weeks when we have had some hot days I went on my walk before the exercises. Not only was this of help re the heat but I also found it better all round. Would it be OK if I did it this way all the time?

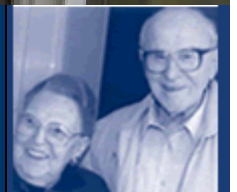
All the other exercises are going well.

I have suffered tendonitis in my left leg (between calf and ankle) for several years. Since being on this program I haven't had a sign of it!!

Keep you eyes peeled-you may see me in the triathlon at the Commonwealth Games!!!

Cheers,

K"



Practical implications: assessment of balance performance

- Mix of simple, quick balance and mobility measures provide comprehensive picture of balance impairment, and can inform exercise prescription:
 - Step Test
 - Functional Reach
 - Timed Up and Go
 - Timed chair stands
 - Gait speed and stride length

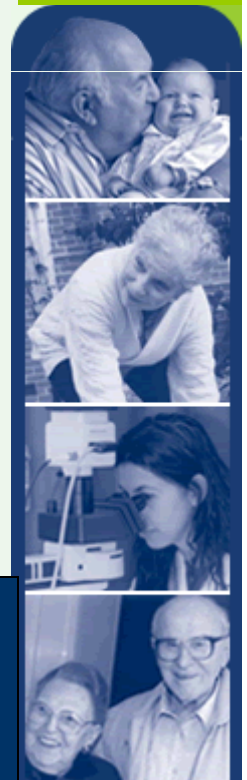
Approximately 5 minutes to complete



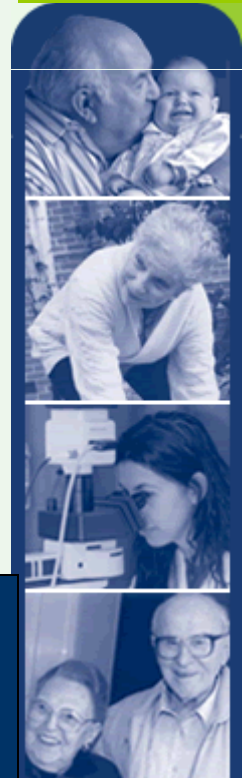
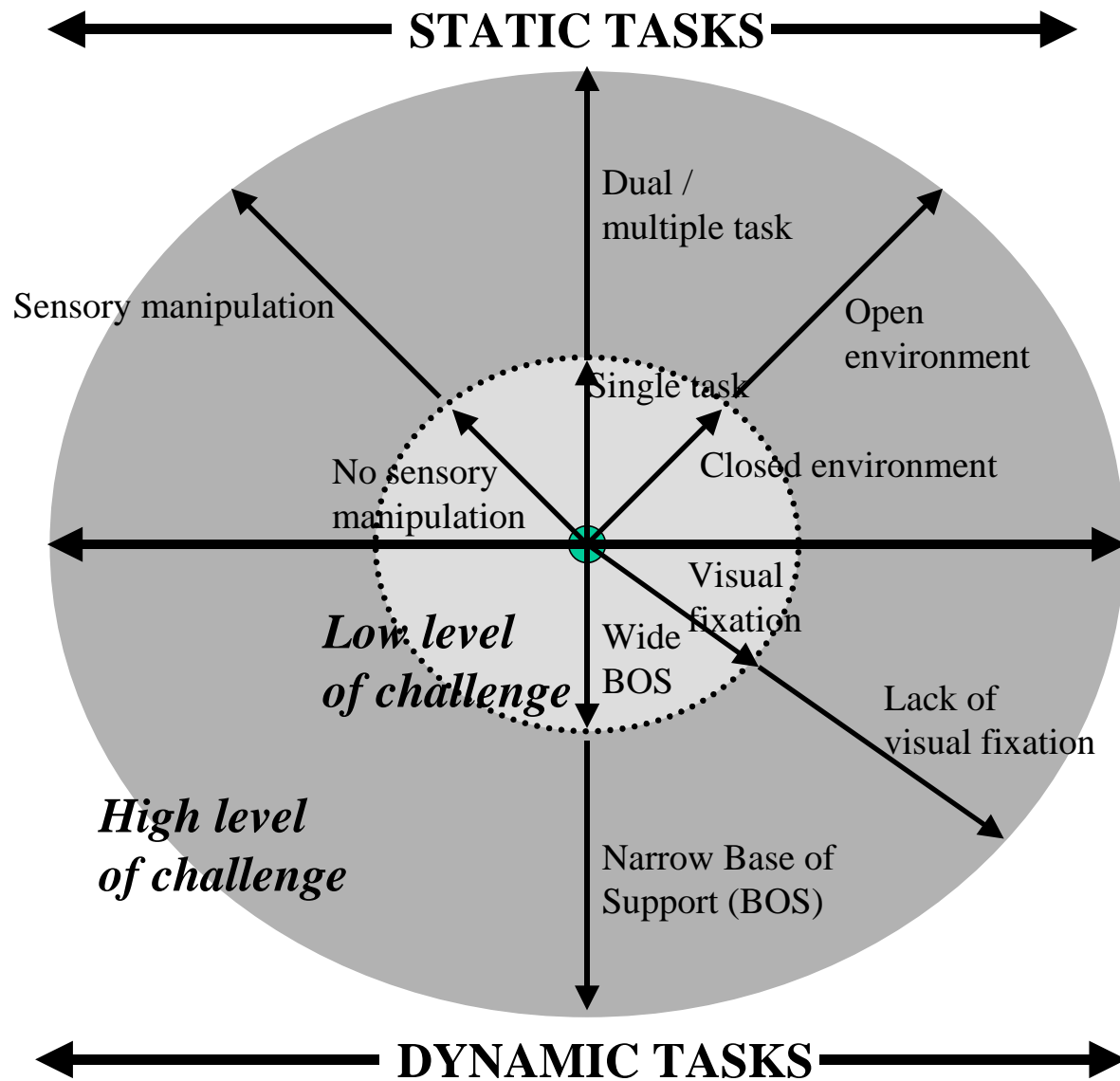
Principles of exercise selection

- select mix of exercises to challenge identified balance problems
- include variety of exercises
- consider joint involvement / pain, minimise demands on worst joints initially (eg worst leg in front for sharpened romberg stance), progress gradually

–Challenging to ensure that exercises were appropriate for individual level of joint pathology and balance dysfunction
–Many needed modifying within first couple weeks



Principles of exercise selection



Example of exercise selection and progression

- **Standing, golf swing**
 - reduce base of support
 - feet apart
 - feet together
 - step stance
 - sharpened romberg
 - small amplitude swing to larger amplitude
 - head stable to eyes following hands



Summary

- **Moderate balance impairments in people with haemophilia identified across most balance measures**
 - Need to consider the impact other musculoskeletal problems (such as joint contracture / fusion; muscle weakness) may have on balance
- **Home exercise balance programs appears to achieve positive outcomes (both according to the balance measures and anecdotally) BUT requires care and individualisation**

