



Falls
Prevention





Introduction

Falls are a common and often shocking problem among older persons, causing a considerable amount of morbidity, mortality, and use of health care services including premature nursing home admissions. In addition, falls are frightening experiences and can cause individuals to lose confidence in their ability to function safely, which, in turn, can lead to loss of independence.

The HUR falls prevention concept integrates science-based research findings with the experience and knowledge gained through 30 years of working with the aged.

The HUR falls prevention concept helps the health care and rehabilitation professionals to provide the best practice of exercise as medicine based on the latest international preventive and treatment guidelines.

The primary objective of the HUR Falls prevention concept is to help people to reach and maintain a level of physical functioning at which falls can be prevented altogether, or, should a person slip, trip or otherwise begin to fall, balance can be regained.



Contents

Falls prevention concept: Background and Overview

In persons over 65 years of age, approximately 30% of community-dwelling adults fall each year. Falls in care facilities and hospitals are common events that cause considerable morbidity and mortality for older adults. In addition, falls constitute a significant social and economic burden to individuals, their families, community health services, and the economy.

As the proportion of older adults continues to increase globally, the financial costs associated with falls will increase worldwide. Therefore, prevention of falls is an urgent public health challenge. National health service providers and international guidelines are promoting the implementation of appropriately designed intervention programs that are known to prevent falls in older adults.

Accidents and environment-related reasons are the most commonly recognized causes leading to falls. Most of such falls are associated with one or more identifiable risk factors, e.g muscular weakness, gait or balance disorders, confusion, postural hypotension, visual disorders, and certain medications. A Large body of research has shown that attention to these risk factors can significantly reduce rates of falling.

There is strong scientific evidence that appropriately designed exercise training can prevent falls in older people. Exercise interventions has been shown to reduce the rate of falls (number of falls per person) and the risk of falling (proportion of people having one or more falls) in community-dwelling older people.

Furthermore, exercise as a single intervention has a falls prevention effect comparable to that of multi-

factorial programs which suggests that implementation of exercise as a stand-alone intervention may be the optimal and potentially the most cost-effective approach to falls prevention at a population level.

Promising results using exercise as a single intervention have been observed in subjects with Parkinson's disease and cognitive impairment, but using exercise as a single intervention in other clinical groups and aged care facility residents may require further studies.

The HUR falls prevention concept helps the health care and rehabilitation professionals to provide the best practice of exercise as medicine based on the latest international preventive and treatment guidelines, to help people to engage in regular weekly physical activity and to follow an exercise training regimen.

The role of balance and strength training in falls prevention



A range of exercise modalities have been studied with the objective of preventing falls, including balance exercises, strength training, flexibility, tai chi, and endurance training. These can be used as individual or group exercises in isolation or in combination.

A large body of evidence supports the recommendation that balance, strength, gait, and coordination training is effective in reducing falls, and therefore it should be included as part of a multi-component intervention to prevent falls in older persons and may be considered as a single intervention. In most scientific trials, the exercise program has been longer than 12 weeks (1-3 times per week) with variable intensity.

According to the latest meta-analysis, overall exercise reduces fall rates in community-dwelling older people by 21%. Greater fall prevention effects (rate reductions of 39%) are seen from exercise programs that challenge balance and involve 3 or more hours of weekly exercise.

In addition to increased muscle strength in older adults, strength

training offers numerous other advantages as well. It has clearly shown improvements in balance, functional mobility, stability limits, quality of life, and fall prevention. Strength training can attenuate age-related changes in muscle function and improve activities of daily living, such as walking endurance, gait speed, and stair climbing.

Muscle mass decreases by approximately 2% every year after the age of 50. In an analogous manner, there is a decrease of approximately 15% decrease in muscle strength every 10 years after the age of 50. However, strength training can mitigate the loss of muscle mass and muscle strength. To attenuate the effects of sarcopenia, it has been recommended that older adults perform strength training 2 to 3 times per week.





Outcome measures

To gather information on the baseline status and effectiveness of exercise training, each patient is evaluated individually. A multi-factorial fall risk assessment is carried out for all older adults who have recently had a fall or who have gait and balance problems. A multi-factorial falls risk assessment should also be undertaken with individuals who simply report difficulties with gait or balance.

The recommendations for more detailed assessment include examination of the feet and footwear, functional assessment (assessment of activity of daily living skills, including use of adaptive equipment and mobility aids, as appropriate), assessment of the individual's perceived functional ability and fear related to falling, and environmental assessment including home safety.

HUR Balance testing solutions are recommended as outcome measures for balance and stability.

The balance systems are easily controlled via the touch-screen computer featuring the HUR SmartBalance software. The test results are compared to normative values and the fall risk is presented in an easy-to-understand manner using traffic light colors.

The maximal isometric strength of big muscle groups can be evaluated by the [HUR Performance Recorder](#) for the assessment of side-to-side differences and to document changes in strength after the intervention.

The Performance Recorder can be directly connected to all HUR exercise machines, which are equipped with the isometric testing sensor attachment.



Recommended HUR equipment for Falls prevention

The optimal setup for a HUR falls prevention gym comprises 10 HUR SmartTouch controlled HUR machines covering the muscle groups that are the most important regarding falls prevention, a balance platform for balance assessment and training, one or more pulleys for functional movements, and a performance recorder to assess maximal isometric strength.

In addition, a gallery of exercises features a selection of key exercises designed to improve the individual's ability and preparedness to act in the event of loss of balance in order to prevent falls. The HUR FreeTrainer contains a gallery of functional exercises to address balance and falling. The exercises are stored in the same database of the HUR SmartTouch system. Users can also create their own exercises and store them in the HUR database.

With this package, about 12 persons can exercise at the same time. This brings advantages, as exercising

with others can greatly improve an individual's exercise adherence. By utilizing the automatic setup of the SmartTouch machines one physiotherapist can manage and supervise the whole group.

Although this is the optimal setting, you can also start with a smaller set of machines if there is a budget or a space constraint.



Optimal Falls Prevention gym package: Full Set

FULL SET



5120
PUSH UP/
PULL DOWN REHAB



3125
DIP/SHRUG



5140
CHEST PRESS
REHAB



5175
OPTIMAL RHOMB
REHAB



5340
TWIST REHAB



5310
ABDOMEN/
BACK REHAB



5510
BODY EXTENSION
REHAB



5520
ADDUCTION/
ABDUCTION REHAB



5530
LEG EXTENSION/
CURL REHAB



5540
LEG PRESS
REHAB



PULLEY



HUR
SmartBalance



HUR
FreeTrainer
Exercise Panel

Optimal Falls Prevention gym package: Medium Set

MEDIUM SET



3125
DIP/SHRUG



5140
CHEST PRESS
REHAB



5310
ABDOMEN/
BACK REHAB



5520
ADDUCTION/
ABDUCTION REHAB



5530
LEG EXTENSION/
CURL REHAB



5540
LEG PRESS
REHAB



PULLEY



HUR
FreeTrainer
Exercise Panel

Optimal Falls Prevention gym package: Basic Set

BASIC SET



5520
ADDUCTION/
ABDUCTION REHAB



5530
LEG EXTENSION/
CURL REHAB



PULLEY



HUR
SmartBalance



HUR
FreeTrainer
Exercise Panel



Balance and strength training prescription for HUR falls prevention concept

The amount of exercise training should be at least 2 hours per week on an ongoing basis. Greater fall prevention effects are seen from exercise programs that challenge balance and involve 3 or more hours of weekly exercise. Strength training frequency should be at least 2 days a week. Endurance training (e.g., walking) training may be included and other health-related risk factors and baseline fitness status should also be addressed when planning an individually tailored exercise training program.

The exercise training duration should be longer than 12 weeks. It is very important to bear in mind that the benefits of exercise are rapidly lost when exercise is discontinued. Therefore, ongoing exercise would be necessary for a lasting falls prevention effect.

Exercise program prescription should aim at providing a high challenge to **balance**. Choose exercises that can be performed safely:

- reduce the base of support, such as standing with two legs close together or standing with one foot directly in front of the other, or standing on one leg.
- move the center of gravity and controlling body position while standing, for example reaching, transferring body weight from one leg to another and stepping up onto a higher surface
- stand without using the arms for support, or if this is not possible then aim to reduce reliance on the upper limb, such as hold onto a surface with one hand rather than two or one finger instead of the whole hand.

For improvements in strength and muscle hypertrophy:

- use of both multiple- and single-joint exercises with slow-to-moderate velocity, for 1-3 sets per exercise with 60-80% of 1 RM (repetition maximum) for 8-12 repetitions with 1-3 min of rest in between sets for 2-3 is recommended.

For targeting increased power in healthy older adults, include:

- perform training to improve muscular strength.
- perform both single-joint and multi-joint exercises for 1-3 sets per exercise using light to moderate loading (30-60% of 1 RM) for 6-10 repetitions with high repetition velocity.

For enhancing muscular endurance:

- perform low to moderate loads for moderate to high repetitions (10-15 or more).
- use short rest periods for muscular endurance training, e.g., 1-2 min for high-repetition sets (15-20 repetitions or more), less than 1 minute for moderate (10-15 repetitions) sets.
- for circuit strength training, it is recommended that rest periods correspond to the time needed to get from one exercise station to another.

Strength and muscle hypertrophy training prescription for HUR devices

Regular exercise training - including strength, power and balance training - is considered as a cornerstone of the falls prevention. Outlines for six-month workout programs (both beginners and advanced) using HUR intelligent strength training devices are presented below.



Strength training program for falls prevention (beginner and advanced) for six months.

Falls prevention, Strength Training program for 24 weeks: Beginner							
Week	Weekly volume	Series	Reps	% 1-RM	RPE	Rest intervals	Stage
1 - 2	2	1	15	50	13	90 - 120	Familiarization
3 - 4	2	1	15	50	13	90 - 120	Familiarization
5 - 6	2	2	12	60	14	90 - 120	Training
7 - 8	2	2	12	60	14	90	Training
9 - 10	2	2	12	60	14	90	Training
11 - 12	2	2	12	60	14	60 - 90	Training
13 - 14	2	2	10	70	15	60 - 90	Training
15 - 16	2	2	10	70	15	60 - 90	Training
17 - 18	3	3	10	70	15	60 - 90	Training
19 - 20	3	3	10 - 15	70	15	60 - 90	Maintenance
21 - 22	3	3	10 - 15	80	16	60 - 90	Maintenance
23 - 24	3	3	10 - 15	80	16	60 - 90	Maintenance

***Weekly volume:** exercise sessions weekly
Series: series for each muscle or muscle group
Reps: repetitions in each series
% 1-RM: % of one repetition maximum
RPE: ratings of perceived exertion (Borg's scale 6-20)
Rest intervals: in seconds
Stage: target level of exercise training.

Falls prevention, Strength Training program for 24 weeks: Advanced							
Week	Weekly volume	Series	Reps	% 1-RM	RPE	Rest intervals	Stage
1 - 2	2	1	12	60	14	90 - 120	Training
3 - 4	2	1	12	60	14	90 - 120	Training
5 - 6	2	2	12	60	14	90 - 120	Training
7 - 8	2	2	12	60	14	90	Training
9 - 10	2 - 3	2 - 3	12	60	14	90	Training
11 - 12	2 - 3	2 - 3	12	60	14	60 - 90	Training
13 - 14	2 - 3	2 - 3	10	70	15	60 - 90	Training
15 - 16	2 - 3	2 - 3	10	70	15	60 - 90	Training
17 - 18	3	3	10	70	15	60 - 90	Training
19 - 20	3	3	10 - 15	70	15	60 - 90	Maintenance
21 - 22	3	3	10 - 15	80	16	60 - 90	Maintenance
23 - 24	3	3	10 - 15	80	16	60 - 90	Maintenance

***Weekly volume:** exercise sessions weekly
Series: series for each muscle or muscle group
Reps: repetitions in each series
% 1-RM: % of one repetition maximum
RPE: ratings of perceived exertion (Borg's scale 6-20)
Rest intervals: in seconds
Stage: target level of exercise training.

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