Appendix 1: Liste der Teilnehmer

Nachfolgend sind die Teilnehmer der Arbeitsgruppe in alphabethischer Reihenfolge gelistet. Der erste Teil bezieht sich auf die Kommissionsteilnehmer, die aktiv an der Studienbewertung und der Erarbeitung der Leitlinie beteiligt waren. Im zweiten Teil ist der externe Beirat gelistet, der beratend an der Leitlinienerstellung tätig war.

Aktive Arbeitsgruppe

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Beirat

Appendix 2: Fahrplan der Leitlinienentwicklung

Datum	Ziel
03.03.2005	**1. Treffen Leitlinienkommission** • Definition der Zielsetzung der LL • Definition der relevanten Endpunkte • Planung des Prozedere
19.10.2005	**2. Treffen Leitlinienkommission** • Vorstellung der Literaturübersicht anhand von Reviews der einzelnen Themen • Diskussion über sinnvolle Endpunkte • Basisassessment • Methodisches Vorgehen • Übersicht über mögliche Verschreibungsformen PT bei OPO
01.12.2005	Deadline Literaturrecherche
10.03.2006	**3. Treffen Leitlinienkommission** • Vorstellung der Literaturrecherche der einzelnen Themen Arbeitspakete mit der Formulierung erster Empfehlungen • Diskussion über Formulierung der Empfehlungen • Basisassessment • Übersicht über Weiterbildungsmöglichkeiten Osteoporosetrainer
25.09.2006	**4. Treffen Leitlinienkommission** • Vorstellung der Literaturrecherche der einzelnen Themen Arbeitspakete mit der Formulierung erster Empfehlungen • Review der Methodik
Nov. .2006	Öffentliche Diskussion des ersten Entwurfes auf dem Kongress „Muskeln und Knochen – neue Welten“ in Berlin
März 2007	Öffentliche Diskussion des ersten Entwurfes auf dem deutschsprachigen Osteologie Kongress in Wien
30.04.2007	**5. Treffen Leitlinienkommission** • Review der Arbeitpakete/ Handlungsempfehlungen • Planung der Disseminierung
Mai 2007	Öffentliche Diskussion des ersten Entwurfes auf dem Physiokongress Thieme Verlag 2007 in Aachen
ab 10.08.2007-Mitte Sept. 07	Öffentliches Internet Kommentarforum auf der Leitlinien-Homepage des DVO
02.04.2008	Verabschiedung der Leitlinie durch den Dachverband Osteologie (DVO)
03.04.2008	Vorstellen der Endversion der Leitlinie auf dem Osteologie Kongress in Hannover

Appendix 3: Beschreibung der Suchstrategie und der Ergebnisse

Search Strategy

The following databases have been searched using **WebSPIRS Version 5.1** on 01.12.3005.

Medline: MEDLINE(R) In-Process & Other Citations Nov Wk 1-3 2005/11
MEDLINE(R) In-Process & Other Citations 2004/12-2005/10
SilverPlatter MEDLINE(R) November Week 1-3 2005/11
SilverPlatter MEDLINE(R) 2003-2005/10
SilverPlatter MEDLINE(R) 2001-2002
SilverPlatter MEDLINE(R) 1999-2000
SilverPlatter MEDLINE(R) 1996-1998
SilverPlatter MEDLINE(R) 1993-1995
SilverPlatter MEDLINE(R) 1989-1992

Embase: EMBASE (R) DVD 2005/11
EMBASE (R) DVD 2005/08-2005/10
EMBASE (R) 2005/04-2005/07
EMBASE (R) 2005/01-2005/03
EMBASE (R) 2003-2004
EMBASE (R) 2001-2002
EMBASE (R) 1999-2000
EMBASE (R) 1997-1998
EMBASE (R) 1994-1996
EMBASE (R) 1989-1993

Cinahl: CINAHL (R) Database 2005/09-2005/10
CINAHL (R) Database 2004-2005/08
CINAHL (R) Database 2002-2003
CINAHL (R) Database 2000-2001
CINAHL (R) Database 1998-1999
CINAHL (R) Database 1995-1997
CINAHL (R) Database 1982-1994

Search

#1	randomized-controlled-trial in pt
#2	randomized controlled trial* or controlled clinical trial* or random* or random allocation or double-blind method or single-blind method
#3	#1 or #2
#4	fall* or faller* or falling
#5	exercis* or training or sport* or physical activit* or physical education or physical therapy or physiotherap* or movement technique* or fitness or exertion
#6	prevent* or prophylax* or protect*
#7	old* or elder* or aging or aged or middle?aged or senior* or geriatric* or frail* or postmenopausal
#8	bone mineral density or bone mineral content or bone densit* or bone content* or bone mass
#9	osteoporo* or osteopen*
#10	fractur*
#11	strength* or resist* or weight training or muscle power or muscle force
#12	balance or propriocept* or body sway or postural control or equilibrium or postural sway or stability or instability or posturograph* or motor control
#13	posture or kyphosis or range of motion or flexib* or joint mobil* or agilit* or stretch*
#14	home visit* or home hazard* or home modification* or environmental modification* or environmental hazard*
#15	fear of falling

outcome: fracture

#16 (#3 and #5 and #6 and #7 and #10) and (#4 or #8 or #9)

outcome: BMD

#17 #3 and #5 and #7 and #8

outcome: fall risk

#18 #3 and #4 and #5 and #7
strength

#19 #18 and #11
balance

#20 #18 and #12
flexibility

#21 #18 and #13
home hazard modification

#22 #3 and #4 and #6 and #7 and #14

outcome: fear of falling

#23 #18 and #15

Appendix 4: PEDro Scale

1. eligibility criteria were specified	no ❒	yes ❒	where?
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)	no ❒	yes ❒	where?
3. allocation was concealed	no ❒	yes ❒	where?
4. the groups were similar at baseline regarding the most important prognostic indicators	no ❒	yes ❒	where?
5. there was blinding of all subjects	no ❒	yes ❒	where?
6. there was blinding of all therapists who administered the therapy	no ❒	yes ❒	where?
7. there was blinding of all assessors who measured at least one key outcome	no ❒	yes ❒	where?
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	no ❒	yes ❒	where?
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by "intention to treat"	no ❒	yes ❒	where?
10. the results of between-group statistical comparisons are reported for at least one key outcome	no ❒	yes ❒	where?
11. the study provides both point measures and measures of variability for at least one key outcome	no ❒	yes ❒	where?

Notes on administration of the PEDro scale:

All criteria **Points are only awarded when a criterion is clearly satisfied**. If on a literal reading of the trial report it is possible that a criterion was not satisfied, a point should not be awarded for that criterion.

Criterion 1 This criterion is satisfied if the report describes the source of subjects and a list of criteria used to determine who was eligible to participate in the study.

Criterion 2 A study is considered to have used random allocation if the report states that allocation was random. The precise method of randomisation need not be specified. Procedures such as coin-tossing and dice-rolling should be considered random. Quasi-randomisation allocation procedures such as allocation by hospital record number or birth date, or alternation, do not satisfy this criterion.

Criterion 3 ***Concealed allocation*** means that the person who determined if a subject was eligible for inclusion in the trial was unaware, when this decision was made, of which group the subject would be allocated to. A point is awarded for this criteria, even if it is not stated that allocation was concealed, when the report states that allocation was by sealed opaque envelopes or that allocation involved contacting the holder of the allocation schedule who was "off-site".

Criterion 4 At a minimum, in studies of therapeutic interventions, the report must describe at least one measure of the severity of the condition being treated and at least one (different) key outcome measure at baseline. The rater must be satisfied that the groups' outcomes would not be expected to differ, on the basis of baseline differences in prognostic variables alone, by a clinically significant amount. This criterion is satisfied even if only baseline data of study completers are presented.

Criteria 4, 7-11 ***Key outcomes*** are those outcomes which provide the primary measure of the effectiveness (or lack of effectiveness) of the therapy. In most studies, more than one variable is used as an outcome measure.

Criterion 5-7 ***Blinding*** means the person in question (subject, therapist or assessor) did not know which group the subject had been allocated to. In addition, subjects and therapists are only considered to be "blind" if it could be expected that they would have been unable to distinguish between the treatments applied to different groups. In trials in which key outcomes are self-reported (e.g., visual analogue scale, pain diary), the assessor is considered to be blind if the subject was blind.

Criterion 8 This criterion is only satisfied if the report explicitly states *both* the number of subjects initially allocated to groups *and* the number of subjects from whom key outcome measures were obtained. In trials in which outcomes are measured at several points in time, a key outcome must have been measured in more than 85% of subjects at one of those points in time.

Criterion 9 An ***intention to treat analysis*** means that, where subjects did not receive treatment (or the control condition) as allocated, and where measures of outcomes were available, the analysis was performed as if subjects received the treatment (or control condition) they were allocated to. This criterion is satisfied, even if there is no mention of analysis by intention to treat, if the report explicitly states that all subjects received treatment or control conditions as allocated.

Criterion 10 A ***between-group*** statistical comparison involves statistical comparison of one group with another. Depending on the design of the study, this may involve comparison of two or more treatments, or comparison of treatment with a control condition. The analysis may be a simple comparison of outcomes measured after the treatment was administered, or a comparison of the change in one group with the change in another (when a factorial analysis of variance has been used to analyse the data, the latter is often reported as a group × time interaction). The comparison may be in the form hypothesis testing (which provides a "p" value, describing the probability that the groups differed only by chance)
or in the form of an estimate (for example, the mean or median difference, or a difference in proportions, or number needed to treat, or a relative risk or hazard ratio) and its confidence interval.

Criterion 11 A ***point measure*** is a measure of the size of the treatment effect. The treatment effect may be described as a difference in group outcomes, or as the outcome in (each of) all groups. ***Measures of variability*** include standard deviations, standard errors, confidence intervals, interquartile ranges (or other quantile ranges), and ranges. Point measures and/or measures of variability may be provided graphically (for example, SDs may be given as error bars in a Figure) as long as it is clear what is being graphed (for example, as long as it is clear whether error bars represent SDs or SEs). Where outcomes are categorical, this criterion is considered to have been met if the number of subjects in each category is given for each group.

Appendix 5: Auflistung der Testgütekriterien

STURZRISIKO

Berg Balance Scale

Entwickler: Berg et al [1]

Zielsetzung: Einschützung der Balancefähigkeit und des Sturzrisikos

Inhalt: aktiver Test; Beobachtung der Ausführung von 14 standardisierten Aufgaben:
Freies Sitzen 2 min., vom Sitzen zum Stehen, selbständiges Stehen 2 min., vom Stehen zum Sitzen, Transfer von Stuhl zu Stuhl, Stehen mit geschlossenen Augen 10 sec., Stehen mit geschlossenen Füßen 1 min., Tandemstand 30 sec., 1-Bein-Stand 10 sec., Gegenstand vom Boden aufheben, Spielbein auf ein Fußbänkchen stellen und wieder zurück, 360°-Drehung in beide Richtungen, mit ausgestreckten Armen vorwärts lehnen, über die Schulter sehen in beide Richtungen.

Skalierung: Ordinalskala, 0 (nicht möglich) bis 4 (selbständig); Gesamt-Score 56 Punkte

Version: deutsche Übersetzung, aber nicht auf deutsch validiert

Interpretation: Patienten mit einem Wert von < 45 Punkten gelten als erhöht sturzgefährdet.

PRAKTIKABILITÄT
Patientengruppe: Patienten > 60 Jahre, Geriatrie, nach CVI
Training: Einführung in standardisierte Ausführung und Dokumentation
Zeitaufwand: ca. 20 min.
Mittel/ Kosten: Stoppuhr, Stuhl in Standardhöhe mit Seitenlehnen, 30 cm Lineal, Fußbänkchen

PSYCHOMETRISCHE DATEN
Reliabilität: An Heimbewohnern wurde eine hohe Reliabilität dokumentiert (Intratester ICC 0.97, Intertester ICC 0.98 [2], Intratester r=0.88, Intertester r=0.88 [3]). Eine gute interne Konsistenz des Tests konnte mit einem Crohnbachs α von 0.96 belegt werden [1].

Validität: Es besteht eine gute Korrelation zu anderen Performance Tests wie der Tinetti Balance Sub-Skala (r=0.91), der Barthel Mobility Sub-Skala (r=0.67) und dem Timed-up-and-go Test (r=0.76) sowie eine moderate Korrelation zu posturografischen Messungen auf einer Kraftmessplatte (r=0.55) bei Heimbewohnern [4].

Die Voraussage Validität ist je nach Patientengruppe und Studiendesign moderat bis gut:
nach Lajoie [5]
n=125, 45 mit positiver Sturzanamnese (Durchschnittsalter 75.5), 80 mit negativer Sturzanamnese (Durchschnittsalter 73.8) zu Hause lebender Senioren
Cut-off Wert: 46 Punkte
Sensitivität: 82.5% (retrospektiv)
Spezifität: 93% (retrospektiv)

nach Bogle Thorbahn [3]
n=66, Heimbewohner, 69-94 Jahre
Cut-off Wert: 45 Punkte
Sensitivität: 53% (retrospektiv), 53% (prospektiv 6 Monate)
Spezifität: 96% (retrospektiv), 92% (prospektiv 6 Monate)

Schlussfolgerung: Der Test ist ausgiebig an verschiedenen Patientengruppen evaluiert und untersucht verschiedene alltagsrelevante Funktionen. Bei Patienten mit geringerer Einschränkung im funktionellen Bereich zeigen sich Ceiling Effekte. Auf Grund eines erhöhten Zeitaufwandes scheint der Test eher geeignet für den Bereich Rehabilitation bzw. für institutionalisierte Patienten.

Testanleitung erhältlich unter:
http://www.physio-akademie.de/Online-Material_Handbuch.679.0.html
http://www.igptr.ch/welcome.htm

Literatur:
1. Berg, K., Wood-Dauphinee, S., Williams, J. & Gayton, D. Measuring balance in the elderly: prelimary development on an instrument. Physiother Can 41, 304-311 (1989).

2. Berg, K., Wood-Dauphinee, S. & Williams, J. I. The Balance Scale: reliability assessment with elderly residents and patients with an acute stroke. Scandinavian Journal of Rehabilitation Medicine 27, 27-36 (1995).
3. Bogle Thorbahn, L. D. & Newton, R. A. Use of the Berg Balance Test to predict falls in elderly persons. Phys Ther 76, 576-83; discussion 584-5 (1996).
4. Berg, K. O., Maki, B. E., Williams, J. I., Holliday, P. J. & Wood-Dauphinee, S. L. Clinical and laboratory measures of postural balance in an elderly population. Archives of Physical Medicine and Rehabilitation 73, 1073-80 (1992).
5. Lajoie, Y. & Gallagher, S. P. Predicting falls within the elderly community: comparison of postural sway, reaction time, the Berg balance scale and the Activities-specific Balance Confidence (ABC) scale for comparing fallers and non-fallers. Arch Gerontol Geriatr 38, 11-26 (2004).

Tinetti Test
(auch: Performance Orientated Mobility Test POMA)

Entwickler: Tinetti et al [1]

Zielsetzung: Einschützung der Balance- und Gehfähigkeit sowie des Sturzrisikos

Inhalt: Langversion Originalskala ist unterteilt in eine Balanceskala (13 Items) und eine Gangskala (9 Items), Kurzversion ist unterteilt eine Balanceskala (9 Items) und eine Gangskala (7 Items):
In der Originalversion umfasst der Balancetest die Sitzbalance auf einem Stuhl, das Aufstehen, Stehbalance erste 5 sec., Stehbalance mit schmaler Basis, Stehbalance nach Bruststoß, Stehbalance mit geschlossenen Augen, 1-Beinstand, Stehen mit Kopfdrehen, Stehen mit Wirbelsäulenstreckung, Greifen nach einem Gegenstand auf einem hohen Regal, einen Gegenstand aufheben, 360° Drehung, Hinsetzen. Beim Gangtest werden die Qualität des Start des Gehens, die Schrittbreite, -länge, -höhe, -breite, -symmetrie und -gleichmäßigkeit, die Abweichung von der Mittellinie und die Rumpfstabilität beurteilt.
Die Benutzung von Hilfsmitteln ist möglich, wird aber bei verschiedenen Items in die Beurteilung einbezogen.

Skalierung: Ordinalskala (1 oder 0-2)

Version: Es existieren 5 verschiedene Versionen mit unterschiedlichen Skalierungen; Langversion 0-40/ Kurzversion 0-28; Es kann auch nur die Balance-Skala (B-POMA) oder die Gang-Skala (G-POMA) angewendet werden. Der Test ist nicht auf deutsch validiert, auch wenn diverse Übersetzungen im Umlauf sind.

Interpretation: Eine Bewertung mit 1 bzw. 2 Punkten entspricht einer "normalen" Ausführung ohne Hilfestellung. Gewisse Items werden mit 1 Punkt bewertet, wenn diese adaptiert oder mit Hilfestellung/ Hilfsmittel (adaptiv) ausgeführt werden. Mit 0 Punkten wird eine unsichere oder ungenügende Ausführung beurteilt (anormal).
Gesamt Punktzahl: kein Hinweis auf Gang-Gleichgewichtsprobleme
Die Cut-off Werte zur Quantifizierung von Sturzgefahr liegen je nach Version unterschiedlich (s.u.).

PRAKTIKABILITÄT
Patientengruppe: gehfähige Patienten > 60 Jahre, Geriatrie
Training: Einführung in standardisierte Ausführung und Dokumentation
Zeitaufwand: 10-15 min.
Mittel/ Kosten: Stuhl in Standardhöhe ohne Seitenlehnen, Stoppuhr

PSYCHOMETRISCHE DATEN
Reliabilität: An Heimbewohnern ist eine gute Reliabilität dokumentiert (Intertester r=0.95, Intratester r=0.95) [2].

Validität: Der Test zeigt eine gute Korrelation mit dem Physical Performance Test (r=0.78) [3], der Bewältigung eines funktionellen Hindernis-Parcours (r=0.73-0.78) [4] und der Berg Balance Skala (r=0.91) [5].

Die Voraussage Validität ist je nach Patientengruppe und Studiendesign moderat bis gut:
nach Topper [6]
n=83, zu Hause lebende Frauen 62-96 Jahre
Cut-off Wert: nicht angegeben (Version 0-40 Punkte)
Sensitivität: B-POMA 95%, G-POMA 100%, Gesamt POMA 93% (prospektiv 1 Jahr)
Spezifität: B-POMA 16%, G-POMA 0%, Gesamt POMA 11% (prospektiv 1 Jahr)

nach Raiche [7]
n=225, > 75 zu Hause lebende Senioren
Cut-off Wert: ≤ 36 Punkte/ ≤ 33 Punkte (Version 0-40 Punkte)
Sensitivität: 70%/ 51% (prospektiv 1 Jahr)
Spezifität: 53%/ 74% (prospektiv 1 Jahr)

Schlussfolgerung: Der Test ist ausgiebig an verschiedenen Patientengruppen evaluiert und untersucht Gang- und Gleichgewichtsparameter. Bei Patienten mit geringerer Einschränkung im funktionellen Bereich zeigen sich Ceiling Effekte. Es existieren verschiedene Versionen mit unterschiedlichen Cut-off Werten. Auf Grund eines erhöhten Zeitaufwandes scheint der Test eher geeignet für den Bereich Rehabilitation bzw. für institutionalisierte Patienten.

Testanleitung erhältlich unter:
http://www.igptr.ch/welcome.htm

Literatur:

1. Tinetti, M. E. Performance-oriented assessment of mobility problems in elderly patients. Journal of the American Geriatrics Society 34, 119-26 (1986).
2. Harada, N. et al. Screening for balance and mobility impairment in elderly individuals living in residential care facilities. Phys Ther 75, 462-9 (1995).
3. Reuben, D. B. & Siu, A. L. An objective measure of physical function of elderly outpatients. The Physical Performance Test. J Am Geriatr Soc 38, 1105-12 (1990).
4. Means, K. M., Rodell, D. E., O'Sullivan, P. S. & Winger, R. M. Comparison of a functional obstacle course with an index of clinical gait and balance and postural sway. J Gerontol A Biol Sci Med Sci 53, M331-5 (1998).
5. Berg, K. O., Maki, B. E., Williams, J. I., Holliday, P. J. & Wood-Dauphinee, S. L. Clinical and laboratory measures of postural balance in an elderly population. Archives of Physical Medicine and Rehabilitation 73, 1073-80 (1992).
6. Topper, A. K., Maki, B. E. & Holliday, P. J. Are activity-based assessments of balance and gait in the elderly predictive of risk of falling and/or type of fall? Journal of the American Geriatrics Society 41, 479-87 (1993).
7. Raiche, M., Hebert, R., Prince, F. & Corriveau, H. Screening older adults at risk of falling with the Tinetti balance scale. Lancet 356, 1001-2 (2000).

Timed-up-and-go Test
(auch: TUG, modified Timed-up-and-go Test)

Entwickler: Original Get-up-and-go Test: Mathias et al [1],Timed-up-and-go Test nach Podsiadlo et al [2]

Zielsetzung: zur Beurteilung der funktionellen Leistung, Mobilität und des Sturzrisikos bei gehfähigen, geriatrischen Patienten

Inhalt: Gemessen wird die Zeit in Sekunden, die der Patient braucht, um vom Stuhl aus normaler Sitzhöhe (46 cm) mit Armlehnen aufzustehen, drei Meter zu gehen, sich um 180° zu drehen, zurück zum Stuhl zu gehen, sich wieder um 180° zu drehen und sich hinzusetzen. Der Test sollte in normaler, sicherer Gehgeschwindigkeit durchgeführt werden. Sofern notwendig sind Hilfsmittel wie Stock oder Rollator erlaubt.

Skalierung: Sekunden

Version: Um die Fähigkeit des Dual Tasking zu überprüfen, kann man den TUG auch mit kognitiven oder motorischen Zusatzaufgabe verbinden (siehe Dual Task Tests)

Interpretation: Die Cut-off Werte zur Quantifizierung von Sturzgefahr liegen je nach untersuchter Population unterschiedlich (s.u.).

PRAKTIKABILITÄT
Patientengruppe: gehfähige Patienten > 60 Jahre, Geriatrie
Training: Einführung in standardisierte Ausführung und Dokumentation
Zeitaufwand: < 5 Minuten
Mittel/ Kosten: Stuhl in Standardhöhe mit Seitenlehnen, Stoppuhr

PSYCHOMETRISCHE DATEN
Reliabilität: An Patienten einer geriatrischen Tagesklinik konnte eine gute Reliabilität nachgewiesen werden (Intertester ICC 0.99, Intratester ICC 0.99) [2].

Validität: Es zeigt sich eine moderate bis gute Korrelation mit der Berg Skala (r=0.81), der Gehgeschwindigkeit (r=0.61) und dem Barthel Index (r=0.51) [2]. Patienten mit Werten < 20 sec. waren unabhängig bei Transfers, während Werte > 30 sec. stark mit erhöhter Pflegebedürftigkeit einhergehen. Werte zwischen 20 und 30 sec. gelten als Grauzone mit unterschiedlichen Stufen an Pflegebedürftigkeit [2].

Die Voraussage Validität ist je nach Patientengruppe und Studiendesign moderat bis gut:
nach Shumway-Cook [3]
n=30, 15 nicht Gestürzte, 15 Gestürzte
Cut-off Wert: TUG ≥ 13.5 sec.,
Sensitivität: TUG 80% (retrospektiv)
Spezifität: TUG 100% (retrospektiv)

nach Thomas et al [4]
n=30 Patienten einer Tagesklinik, > 65 Jahre
Cut-off Wert: 32.6 sec.
Sensitivität: 75% (retrospektiv)
***Spezifität*:** 67% (retrospektiv)

nach Okumiya [5]
n=328, > 75 Jahre, zu Hause lebende Senioren
Cut-off Wert: >16 sec.
Sensitivität: 54%, (prospektiv 5 Jahre)
Spezifität: 74% (prospektiv 5 Jahre)

Schlussfolgerung: Der Test ist ausgiebig an verschiedenen Patientengruppen evaluiert, untersucht verschiedene alltagsrelevante Funktionen und ist schnell durchführbar.

Testanleitung erhältlich unter:
http://www.igptr.ch/welcome.htm

Literatur:

1. Mathias, S., Nayak, U. S. & Isaacs, B. Balance in elderly patients: the "get-up and go" test. Arch Phys Med Rehabil 67, 387-9 (1986).
2. Podsiadlo, D. & Richardson, S. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. Journal of the American Geriatrics Society 39, 142-8 (1991).
3. Shumway-Cook, A., Brauer, S. & Woollacott, M. Predicting the probability for falls in community-dwelling older adults using the Timed Up & Go Test. Physical Therapy 80, 896-903 (2000).
4. Thomas, J. I. & Lane, J. V. A pilot study to explore the predictive validity of 4 measures of falls risk in frail elderly patients. Arch Phys Med Rehabil 86, 1636-40 (2005).
5. Okumiya, K. et al. The timed "up & go" test is a useful predictor of falls in community-dwelling older people. J Am Geriatr Soc 46, 928-30 (1998).

Functional Reach Test

Entwickler: Duncan et al [1]

Zielsetzung: Beurteilung des Sturzrisikos an Hand der Gewichtsverlagerung im Stand nach vorne

Inhalt: Der Test misst, wie weit der Patient mit vorgestreckten Armen diese nach vorne lehnen kann, ohne die Füße bewegen zu müssen bzw. das Gleichgewicht zu verlieren. Gemessen wird die Differenz zwischen Ausgangsstellung und maximaler Vorneigung.

Skalierung: cm

Interpretation: Patienten, die mehr als 25.4 cm vorreichen können, gelten als nicht sturzgefährdet. Ein Wert von 15.24-25.4 cm gilt als leicht sturzgefährdet und ein Wert von weniger als 15.24 cm gilt als stark sturzgefährdet. Bei Unfähigkeit der Testausführung ist der Patient als hochgradig sturzgefährdet einzustufen.

PRAKTIKABILITÄT
Patientengruppe: stehfähige Patienten >60 Jahre, Geriatrie, Parkinson
Training: Einführung in standardisierte Ausführung und Dokumentation
Zeitaufwand: <5 Minuten
Mittel/ Kosten: Lineal 30 cm

PSYCHOMETRISCHE DATEN
Reliabilität: Nach Duncan et al [2] zeigt sich an 128 Gesunden zwischen 18-87 Jahren eine gute Test-Retest Reliabilität (r=0.89) sowie eine gute Intertester Reliabilität (ICC 0.98).

Validität: Es zeigt sich eine moderate bis gute Korrelation mit der Gehgeschwindigkeit (r=0.71), dem

Tandemgang (r=0.71), 1-Bein-Stand (r=0.64), „Center of Pressure“ Messungen (r=0.71) und dem Grad der Mobilität (r=0.65) bei zu Hause lebenden Senioren (n=45) zwischen 64-100 Jahren [3].

Die Voraussage Validität ist je nach Patientengruppe moderat:
nach Duncan [1]
n=217, Männer > 70 Jahre aus Polikliniken
adjustierte OR 8.07 bei Unfähigkeit des Tests
adjustierte OR 4.02 vorwärts lehnen ≤ 15.24 cm
adjustierte OR 2.00 vorwärts lehnen 15.24-25.4 cm
(prospektiv 6 Monate)

nach Thomas et al [4]
n=30 Patienten einer Tagesklinik, > 65 Jahre
Cut-off Wert: 18.5 cm
Sensitivität: 75% (retrospektiv)
***Spezifität*:** 67% (retrospektiv)

Schlussfolgerung: Der Test ist ausgiebig an verschiedenen Patientengruppen evaluiert und ist schnell durchführbar.

Testanleitung erhältlich unter:
Duncan, P.W., et al., Functional reach: a new clinical measure of balance. J Gerontol, 1990. 45(6): p. M192-7.
http://www.igptr.ch/welcome.htm

Literatur:

1. Duncan, P. W., Weiner, D. K., Chandler, J. & Studenski, S. Functional reach: a new clinical measure of balance. J Gerontol 45, M192-7 (1990).
2. Weiner, D. K., Duncan, P. W., Chandler, J. & Studenski, S. A. Functional reach: a marker of physical frailty. J Am Geriatr Soc 40, 203-7 (1992).
3. Duncan, P. W., Studenski, S., Chandler, J. & Prescott, B. Functional reach: predictive validity in a sample of elderly male veterans. Journal of Gerontology 47, M93-8 (1992).
4. Thomas, J. I. & Lane, J. V. A pilot study to explore the predictive validity of 4 measures of falls risk in frail elderly patients. Arch Phys Med Rehabil 86, 1636-40 (2005).

Short Physical Performance Battery (SPPB)

Entwickler: Guralnik et al [1]

Zielsetzung: Erfassung des Gleichgewichts anhand einer hierarchisch aufgebauten Testbatterie sowie der Funktion der unteren Extremität

Inhalt: Rombergstand, Semitandemstand, Tandemstand, 5 Chair Stands, freigewählte Gehgeschwindigkeit bestimmt auf 4m

Skalierung: Sekunden

Interpretation: Ein Gesamt Score (0-12) aus Balancetests, Chair Stands und frei gewählter Gehgeschwindigkeit errechnet sich wie folgt:

	Romberg (sec.)	Semitandem-stand (sec.)	Tandem-stand (sec.)	Chair-Rising Test (sec.)	Gehgeschwindigkeit (4m/ sec.)
0 Punkte	0-9	0-9	-	-	-
1 Punkt	10	10	-	≥ 16.7	≥ 5.7
2 Punkte	-	-	0-2	13.7-16.6	4.1-5.6
3 Punkte	-	-	3-9	11.2-13.6	3.2-4.0
4 Punkte	-	-	10	≤ 11.1	≤ 3.1

Je niedriger der Gesamtwert, desto höher das Risiko der Behinderung im ADL- und im Mobilitätsbereich.

PRAKTIKABILITÄT
Patientengruppe: gehfähige Patienten > 65 Jahre, Geriatrie
Training: Einführung in standardisierte Ausführung und Dokumentation
Zeitaufwand: < 15 Minuten
Mittel/ Kosten: Stoppuhr, Stuhl in Standardhöhe

PSYCHOMETRISCHE DATEN

Reliabilität: An 1002 Frauen aus der Women's Health and Aging Study (WHAS), die älter als 65 Jahre waren und von moderater bis schwerer funktioneller Beeinträchtigung, konnte eine gute Test-Retest Reliabilität sowohl für die Einzeltest als auch für den Gesamt Test dokumentiert werden (nach 5-6 Wochen: ICC o.71-0.91, nach 19-20 Wochen: ICC 0.70-0.91) [2].

Validität: Guralnik et al [3] haben den Test an mehr als 5000 Probanden über 65 Jahren im Rahmen der EPESE Studie angewendet. Der Gesamt-Score korreliert mit der Selbsteinschätzung des Behinderungsgrades, mit dem Risiko der Mortalität und dem Risiko der Einweisung ins Pflegeheim. Gesamt-Scores von < 4-6 zeigen ein relatives Risiko der Behinderung im ADL-Bereich (RR 4.2) und von Behinderung in der Mobilität (RR 4.9) nach 4 Jahren [3].

Schlussfolgerung: Der Test ist ausreichend evaluiert und untersucht sowohl die statische Balance, den Gang und die Muskelleistung der unteren Extremität. Bei Patienten mit geringerer Einschränkung im funktionellen Bereich zeigen sich Ceiling Effekte.
Alle Tests sind auch als Einzeltests ohne großen Zeitaufwand durchführbar.

Testanleitung erhältlich unter:
Guralnik, J.M., et al., A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. Journal of Gerontology, 1994. 49(2): p. M85-94.

Literatur:

1. Guralnik, J. M. et al. A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. Journal of Gerontology 49, M85-94 (1994).
2. Ostir, G. V., Volpato, S., Fried, L. P., Chaves, P. & Guralnik, J. M. Reliability and sensitivity to change assessed for a summary measure of lower body function: results from the Women's Health and Aging Study. Journal of Clinical Epidemiology 55, 916-21 (2002).
3. Guralnik, J. M. et al. Lower extremity function and subsequent disability: consistency across studies, predictive models, and value of gait speed alone compared with the short physical performance battery. J Gerontol 55, M221-31 (2000).

1-Beinstand

Zielsetzung: Beurteilung des statischen Gleichgewichts im 1-Beinstand

Inhalt: Gemessen wird, wie lange der Patient auf einem Bein stehen kann, ohne das Gleichgewicht zu verlieren bzw. Schutzschritte einleiten zu müssen.

Skalierung: Sekunden

Interpretation: Die Cut-off Werte zur Quantifizierung von Sturzgefahr liegen je untersuchter Population unterschiedlich (s.u.).

PRAKTIKABILITÄT
Patientengruppe: stehfähige Patienten > 60 Jahre, Geriatrie
Training: Einführung in standardisierte Ausführung und Dokumentation
Zeitaufwand: < 5 Minuten
Mittel/ Kosten: Stoppuhr

PSYCHOMETRISCHE DATEN
Reliabilität: An 45 gesunden Frauen zwischen 55-71 Jahren konnte eine gute Intertester Reliabilität (ICC.0.99) nachgewiesen werden [1]. Die Test-Retest Reliabilität bei Parkinsonpatienten mit und ohne positive Sturzanamnese zeigt moderate bis gute Ergebnisse (ICC 0.50-0.94) [2].

Validität:
Die Voraussage Validität ist je nach Patientengruppe und Studiendesign moderat bis gut:
nach Hurvitz [3]
n=53, gesunde > 50 Jahre, ohne Hilfsmittel gehfähig, Durchschnittsalter 73 Jahre
Cut-off Wert: ≤ 30 sec.
Sensitivität: 95% (retrospektiv)
***Spezifität*:** 58% (retrospektiv)

nach Thomas et al [4]
n=30 Patienten einer Tagesklinik, > 65 Jahre

Cut-off Wert: ≤ 1.02 sec.
Sensitivität: 67% (retrospektiv)
***Spezifität*:** 89% (retrospektiv)

nach Vellas [5]
n=316 zu Hause lebende Senioren > 60 Jahren, Durchschnittsalter 73 Jahre
Cut-off Wert: ≤ 5 sec.
Sensitivität: 36% (prospektiv 3 Jahre)
***Spezifität*:** 76% (prospektiv 3 Jahre)

Schlussfolgerung: Der Test ist ausreichend evaluiert, wobei die Cut-off Werte je nach Klientel sehr unterschiedlich sind. Der Test ist schnell durchführbar und vor allem für funktionell wenig beeinträchtigte Patienten geeignet.

Literatur:

1 Franchignoni, F., Tesio, L., Martino, M. & Ricupero, C. Reliability of four simple, quantitative tests of balance and mobility in healthy elderly females. Aging (Milano) 10, 26-31 (1998).
2. Smithson, F., Morris, M. E. & Iansek, R. Performance on clinical tests of balance in Parkinson's disease. Phys Ther 78, 577-92 (1998).
3. Hurvitz, E. A., Richardson, J. K., Werner, R. A., Ruhl, A. M. & Dixon, M. R. Unipedal stance testing as an indicator of fall risk among older outpatients. Arch Phys Med Rehabil 81, 587-91 (2000).
4. Thomas, J. I. & Lane, J. V. A pilot study to explore the predictive validity of 4 measures of falls risk in frail elderly patients. Arch Phys Med Rehabil 86, 1636-40 (2005).
5. Vellas, B. J. et al. One-leg balance is an important predictor of injurious falls in older persons. Journal of the American Geriatrics Society 45, 735-8 (1997).

Gehgeschwindigkeit

Zielsetzung: Der Test erfasst die Gehfähigkeit durch Messung der Ganggeschwindigkeit.

Inhalt: Gemessen wird entweder die Zeit, die ein Patient auf einer definierten Strecke (3m, 5m, 10m) benötigt oder die Strecke, die er in einer vorgegebenen Zeit (2, 6, 12 min.) zurücklegen kann.

Skalierung: Meter pro Sekunde/ Minute

Interpretation: Eine freigewählte Gehgeschwindigkeit von weniger als 0.56 m/ sec. gilt als Indikator für eine erhöhte Sturzgefährdung.

PRAKTIKABILITÄT
Patientengruppe: gehfähige Patienten > 60 Jahre, Geriatrie
Training: Einführung in standardisierte Ausführung und Dokumentation
Zeitaufwand: 1-15 Minuten
Mittel/ Kosten: Stoppuhr, markierte Stecke von 3-10 Metern, langer Flur notwendig

PSYCHOMETRISCHE DATEN
Reliabilität: An 102 Patienten über 65 Jahren mit positiver und mit negativer Sturzanamnese zeigt sich eine gute Intertester Reliabilität (r=0.93) auf 5m frei gewählter Gehgeschwindigkeit [1]. Eine gute Test-Retest Reliabilität (r=0.93, ICC=0.78) zeigt sich sowohl an zu Hause lebenden Älteren über 55 Jahren [2] als auch an gehfähigen Hemiplegikern ICC=0.98 [3].

Validität: Reduktion der Gehgeschwindigkeit korreliert stark mit einer Einbuße in ADL-Bereich sowie mit Abweichungen bei anderen Gangparametern [4].

Eine gute Voraussage Validität ist dokumentiert:
nach VanSwearingen et al [5]
n=84 mobile, aber funktionell leicht eingeschränkte, männliche Veteranen, Durchschnittsalter 75.5
Cut-off Wert: ≤ 0.56 m/sec
Sensitivität: 72% (prospektiv, Zeitraum nicht angegeben)
Spezifität: 74% (prospektiv, Zeitraum nicht angegeben)

Schlussfolgerung: Der Test ist ausreichend evaluiert und ist schnell durchführbar.

Testanleitung erhältlich unter:
http://www.igptr.ch/welcome.htm

Literatur:

1. Chu, L. W. et al. Risk factors for falls in hospitalized older medical patients. J Gerontol A Biol Sci Med Sci 54,

M38-43 (1999).
2. Tager, I., Swanson, A. & Satariano, W. Reliability of physical performance and self-reported funcional measures in an older population. J Gerontol 53, M295-M300 (1998).
3. Liston, R. A. & Brouwer, B. J. Reliability and validity of measures obtained from stroke patients using the Balance Master. Arch Phys Med Rehabil 77, 425-30 (1996).
4. Wolfson, L., Whipple, R., Amerman, P. & Tobin, J. Gait assessment in the Elderly: a gait abnormality rating scale and its relation to falls. Journal of Gerontology 45, M12-19 (1990).
5. VanSwearingen, J. M., Paschal, K. A., Bonino, P. & Chen, T. W. Assessing recurrent fall risk of community-dwelling, frail older veterans using specific tests of mobility and the physical performance test of function. J Gerontol A Biol Sci Med Sci 53, M457-64 (1998).

Dynamic Gait Index (DGI)

Zielsetzung: Der Test erfasst die Anpassungsleistungen der dynamischen posturalen Kontrolle während des Gehens.

Inhalt: Gehen auf ebener Strecke, Gehen mit Tempowechsel und Kopfbewegungen, Gehen und 180° Drehung, Gehen über und um Hindernisse, Treppe steigen

Skalierung: Ordinalskala 0-3 (0=unmöglich durchzuführen, 3= normal); maximale Punktzahl 24

Interpretation: <19 Punkte gilt als erhöht sturzgefährdet

PRAKTIKABILITÄT

Patientengruppe: gehfähige Patienten > 60 Jahre, Geriatrie, Neurologie, vestibuläre Störungen
Training: Einführung in standardisierte Ausführung und Dokumentation
Zeitaufwand: 10 Minuten
Mittel/ Kosten: langer Flur, Treppe

PSYCHOMETRISCHE DATEN

Reliabilität: Intratester-Reliabilität an Heimbewohnern lag bei ICC=0.96 [1], an Multiple Sklerose Patienten bei 0.76-0.98 [2]. Intertester-Reliabilität von ICC=0.96 konnte bei Heimbewohnern nachgewiesen werden [1], bei Multiple Sklerose Patienten lag sie bei 0.98 [2] und bei Patienten mit vestibulären Störungen bei r=0.64 [3].

Validität: Gute Korrelation mit der Berg Balance Skala in Bezug auf Bestimmung des Sturzrisikos [4]

Eine gute Voraussage Validität ist dokumentiert:
n=44 Heimbewohner [5]
Cut-off Wert: ≤ 19 Punkte
Sensitivität: 91% (retrospektiv)
Spezifität: 82% (retrospektiv)

Schlussfolgerung: Der Test ist ausreichend evaluiert und ist schnell durchführbar.

Testanleitung erhältlich unter:
http://www.igptr.ch/welcome.htm

Literatur:

1. Shumway-Cook, A., Woollacott, M., Kerns, K. A. & Baldwin, M. The effects of two types of cognitive tasks on postural stability in older adults with and without a history of falls. J Gerontol A Biol Sci Med Sci 52, M232-40 (1997b).
2. McConvey, J. & Bennett, S. E. Reliability of the Dynamic Gait Index in individuals with multiple sclerosis. Arch Phys Med Rehabil 86, 130-3 (2005).
3. Wrisley, D., Walker, M., Echternach, J. & Strasnick, B. Reliability of the dynamic gait index in people with vestibular disorders. Archives of Physical Medicine and Rehabilitation 84, 1528-1533 (2003).
4. Whitney, S., Hudack, M. & Marchetti, G. The dynamic gaiat index relates to self-reported fall history in individuals with vestibular dysfunction. Physiother Res Int 8, 178-86 (2003).
5. Shumway-Cook, A., Baldwin, M., Polissar, N. L. & Gruber, W. Predicting the probability for falls in community-dwelling older adults. Phys Ther 77, 812-9 (1997a).

Stop walking when talking

Entwickler: Lundin-Olsson et al [1]

Zielsetzung: Beurteilung des Gleichgewichtes und des Sturzrisikos an Hand einer sensomotorischen und gleichzeitig kognitiven Aufgabe

Inhalt: Der Test beruht auf der Beobachtung, dass sturzgefährdete Patienten stehen bleiben, wenn sie gleichzeitig sprechen möchten.

Interpretation:

PRAKTIKABILITÄT
Patientengruppe: gehfähige Patienten >65 Jahre, Geriatrie
Training: Einführung in standardisierte Ausführung und Dokumentation
Zeitaufwand: < 10 Minuten
Mittel/ Kosten: keine

PSYCHOMETRISCHE DATEN
Reliabilität: keine Datenverfügbar

Validität:
Lundin-Olsson et al [1]
n=58 Altenheimbewohner, Durchschnittsalter 80.1 Jahre
Sensitivität: 48% (prospektiv 6 Monate), ***positiver prädiktiver Wert***: 83%
Spezitivität: 95% (prospektiv 6 Monate), ***negativer prädiktiver Wert:*** 76%

Schlussfolgerung: Mit dem Dual Tasking wird eine Komponente getestet, die nicht über die anderen Tests abgedeckt wird. Der Test ist weniger gut evaluiert, aber schnell durchführbar und eher geeignet für im Alltag stark beeinträchtigte ältere Patienten.

Testanleitung erhältlich unter:

1. Lundin-Olsson, L., L. Nyberg, and Y. Gustafson, "Stops walking when talking" as a predictor of falls in elderly people. Lancet, 1997. 349(9052): p. 617.

TUG mit manueller oder kognitiver Aufgabe

Entwickler: Shumway-Cook et al [1]

Zielsetzung: Beurteilung des Gleichgewichtes und des Sturzrisikos an Hand einer sensomotorischen und gleichzeitig kognitiven Aufgabe

Inhalt: Der Test beruht auf der Beobachtung, dass sturzgefährdete Patienten den TUG langsamer ausführen, wenn sie zusätzlich eine manuelle Aufgabe (ein gefülltes Wasserglas tragen) oder eine kognitive Aufgabe (von 100 schrittweise 3 subtrahieren „100, 97, 94...“) bewältigen müssen.

Interpretation:

PRAKTIKABILITÄT
Patientengruppe: gehfähige Patienten > 60 Jahre, Geriatrie
Training: Einführung in standardisierte Ausführung und Dokumentation
Zeitaufwand: < 5 Minuten
Mittel/ Kosten: Stuhl in Standardhöhe mit Seitenlehnen, ein Glas Wasser, Stoppuhr

PSYCHOMETRISCHE DATEN
Es gibt keine Daten zu Reliabilität und Validität zum TUG mit Dual Task, wohl aber für den TUG alleine (s.o.).
nach Shumway-Cook [1]
n=30, 15 nicht Gestürzte, 15 Gestürzte
Cut-off Wert: TUG ≥ 13.5 sec., $TUG_{man.}$≥ 14.5 sec., $TUG_{cogn.}$≥ 15 sec.
Sensitivität: TUG 80%, $TUG_{man.}$ 86.7%, $TUG_{cogn.}$ 80% (retrospektiv)
Spezifität: TUG 100%, $TUG_{man.}$93.3%, $TUG_{cogn.}$93% (retrospektiv)

Schlussfolgerung: Mit dem Dual Tasking wird eine Komponente getestet, die nicht über die anderen Tests abgedeckt wird. Der Test ist weniger gut evaluiert, aber schnell durchführbar.

Testanleitung erhältlich unter:

1. Shumway-Cook, A., Brauer, S. & Woollacott, M. Predicting the probability for falls in community-dwelling older adults using the Timed Up & Go Test. Physical Therapy 80, 896-903 (2000).

STURZANGST

Fall Efficacy Scale-International (FES-I)

Entwickler: Original: Tinetti et al [1], Yardley et al [2]

Zielsetzung: Beurteilung der Sturzangst in Bezug auf Alltagsbewegungen

Inhalt: 16 Fragen zu Sturzangst bei Alltagsbewegungen (Hausputz, An-/ Ausziehen, Essen, Körperpflege, Einkaufen gehen, Aufstehen, Treppe gehen, draußen gehen, über Kopf etwas aus einem Regal holen, schnell das Telefon erreichen, auf einer rutschigen Oberfläche gehen, Freunde besuchen, in Menschenmengen umhergehen, auf unebenem Boden gehen, eine Steigung hoch und runter gehen, eine Veranstaltung besuchen)

Skalierung: 4-Punkte Ordinalskala (1=keinerlei Bedenken, 4=sehr große Bedenken)

Version: Die FES-I wurde in mehrere europäische Sprachen übersetzt und den entsprechenden kulturellen Gegebenheiten angepasst. In den ersten 10 Items ist sie mit dem FES identisch. Sie nimmt Kritikpunkte am FES auf, indem auch für funktionell wenig beeinträchtigten Patienten keine Ceiling Effekte nachgewiesen sind [2].

Interpretation: niedrige Werte geben Hinweise auf eine starke Sturzangst bezüglich Alltagsbewegungen

PRAKTIKABILITÄT

Patientengruppe: gehfähige Patienten > 60 Jahre, Geriatrie, selbständig lebende und institutionalisierte Patienten

Training: Einführung in standardisierte Ausführung und Dokumentation

Zeitaufwand: ca. 10 Minuten

Mittel/ Kosten: Papier und Stift

PSYCHOMETRISCHE DATEN

Für die Originalskala und ihre späteren Modifikationen ist eine sehr gute Reliabilität sowie eine hohe Korrelation zu anderen Messmethoden zur Beurteilung von Gang und Gleichgewicht belegt [1, 3]. Des weiteren ist eine gute Prädiktionskraft in der Vorhersage einer drohenden Dekonditionierung [4, 5] und ein hohe Empfindlichkeit in der Messung einer Veränderung nachgewiesen [6].

Auch für die FES-I liegen nach einer ersten Validierungsstudie an 704 Probanden zwischen 60-95 Jahren sehr gute Werte zur internen Konsistenz (Crohnbachs $\alpha = 0.96$) sowie zur Test-Retest Reliabilität (ICC=0.96) vor [2].

Schlussfolgerung: Der Test zeigt sehr gute psychometrische Eigenschaften und ist relativ schnell durchführbar.

Testanleitung in deutsch auf Anfrage erhältlich unter:

Dias N, Kempen GI, Todd CJ, Beyer N, Freiberger E, Piot-Ziegler C, Yardley L, Hauer K. [The German version of the Falls Efficacy Scale-International Version (FES-I)] Z Gerontol Geriatr. 2006 Aug;39(4):297-300.

Literatur:

1. Tinetti, M. E., Richman, D. & Powell, L. Falls efficacy as a measure of fear of falling. Journal of Gerontology 45, P239-43 (1990).
2. Yardley, L. et al. Development and initial validation of the Falls Efficacy Scale-International (FES-I). Age Ageing 34, 614-9 (2005).
3. Yardley, L. & Smith, H. A prospective study of the relationship between feared consequences of falling and avoidance of activity in community-living older people. Gerontologist 42, 17-23 (2002).
4. Cumming, R. G., Salkeld, G., Thomas, M. & Szonyi, G. Prospective study of the impact of fear of falling on activities of daily living, SF-36 scores, and nursing home admission. J Gerontol A Biol Sci Med Sci 55, M299-305 (2000).
5. Mendes de Leon, C. F., Seeman, T. E., Baker, D. I., Richardson, E. D. & Tinetti, M. E. Self-efficacy, physical decline, and change in functioning in community-living elders: a prospective study. J Gerontol B Psychol Sci Soc Sci 51, S183-90 (1996).
6. Jorstad, E. C., Hauer, K., Becker, C. & Lamb, S. E. Measuring the psychological outcomes of falling: a systematic review. J Am Geriatr Soc 53, 501-10 (2005).

HÄUSLICHE ABKLÄRUNG

Home Intervention Team HIT

Entwickler: Nikolaus et al [1]

Zielsetzung: Identifizierung und Modifizierung von möglichen häuslichen und außerhäuslichen Sturzquellen

Inhalt:
Durchgeführt wird der diagnostische Hausbesuch während der stationären Rehabilitation durch ein speziell ausgebildetes Team (Pflege, Sozialarbeiter, Ergotherapeut, Physiotherapeut). Je nach Schwerpunkt der Behinderung des Patienten wird der Hausbesuch von einer dieser Berufsgruppen durchgeführt. Vorgegangen wird nach einer Checkliste, mit der überprüft wird, ob der Patient sich sicher und selbständig in der häuslichen Umgebung und im näheren Umfeld bewegen kann bzw. welche Maßnamen ggf. erforderlich sind.

Skalierung: ja/ nein

Interpretation: Je nach identifiziertem Problem werden Gegenmaßnahmen eingeleitet.

PRAKTIKABILITÄT
Patientengruppe: geriatrische Rehabilitation
Training: Einführung in standardisierte Ausführung und Dokumentation
Zeitaufwand: > 1 Stunde
Mittel/ Kosten: Papier und Stift

PSYCHOMETRISCHE DATEN
Der Test wurde nicht psychometrisch untersucht. Die Checkliste wurde erfolgreich eingesetzt in einem RCT von Nikolaus et al [2], in dem nachgewiesen werden konnte, dass ein diagnostischer Hausbesuch von einem gezielt geschulten Team in der geriatrischen Rehabilitation bei Patienten mit bleibender Behinderung signifikant die Sturzrate im häuslichen Bereich senken konnte im Vergleich zu einer Kontrollgruppe.

Schlussfolgerung: Der Test ist die einzige auf deutsch verfügbare Check-Liste, die zwar nicht auf psychometrische Eigenschaften überprüft worden ist, zumindest aber in der Anwendung gute Ergebnisse erzielt hat. Der Zeit- und Organisationsaufwand eines diagnostischen Hausbesuchs ist hoch und daher eher geeignet für den stationären Bereich bei geriatrischen Patienten mit einer voraussichtlich bleibenden Behinderung.

Testanleitung erhältlich unter:
Nikolaus, T., et al., Der diagnostische Hausbesuch im Rahmen des stationären geriatrischen Assessments. Z Gerontol Geriat, 1995. 28: p. 14-18.

Literatur:

1. Nikolaus, T. et al. Der diagnostische Hausbesuch im Rahmen des stationären geriatrischen Assessments. Z Gerontol Geriat 28, 14-18 (1995).
2. Nikolaus, T. & Bach, M. Preventing falls in community-dwelling frail older people using a home intervention team (HIT): results from the randomized Falls-HIT trial. J Am Geriatr Soc 51, 300-5 (2003).

KRAFTTESTS

Chair stands

Entwickler: Csuka und McCarty [1]

Zielsetzung: Beurteilung der Muskelkraft und Muskelleistung der unteren Extremität als Indikator für die funktionale Kapazität beim älteren Menschen

Inhalt: Es wird die Zeit gemessen, die ein Patient benötigt, so schnell wie möglich von einem Stuhl aufzustehen ohne Zuhilfenahme der Arme(1-mal [2], 5-mal [3]oder 10-mal [1]). Man kann auch die maximale Anzahl der Chair Stands innerhalb von 30 sec. messen [4].

Interpretation:

PRAKTIKABILITÄT
Patientengruppe: gehfähige Patienten > 65 Jahre, Geriatrie
Training: Einführung in standardisierte Ausführung und Dokumentation
Zeitaufwand: < 5 Minuten
Mittel/ Kosten: Stoppuhr, Stuhl in Standardhöhe ohne Seitenlehnen

PSYCHOMETRISCHE DATEN
Reliabilität: Test-Retest Reliabilität bei gesunden Älteren liegt nach 2-5 Tagen bei 0.84 [4], nach 10 Wochen bei 0.88 [5]. Eine hohe Intertester Reliabilität ist mit einem ICC von 0.95 belegt [5].

Validität: Es zeigt sich eine signifikante Korrelation zu Kraftmessungen an der Beinpresse (r=0.77) [4] sowie zur Gehgeschwindigkeit (r=0.66) [5].

Schlussfolgerung: Der Test eignet sich für leicht bis stark funktionell beeinträchtigten Patienten und ist schnell durchführbar. Ceiling Effekt zeigen sich beim wenig funktionell beeinträchtigten Patienten.

Testanleitung erhältlich unter:
Csuka, M. & McCarty, D. J. Simple method for measurement of lower extremity muscle strength. Am J Med 78, 77-81 (1985).

Literatur:

1. Csuka, M. & McCarty, D. J. Simple method for measurement of lower extremity muscle strength. Am J Med 78, 77-81 (1985).
2. Cress, M. E. et al. Relationship between physical performance and self-perceived physical function. J Am Geriatr Soc 43, 93-101 (1995).
3. Guralnik, J. M., Ferrucci, L., Simonsick, E. M., Salive, M. E. & Wallace, R. B. Lower-extremity function in persons over the age of 70 years as a predictor of subsequent disability. New England Journal of Medicine 332, 556-61 (1995).
4. Jones, C. J., Rikli, R. E. & Beam, W. C. A 30-s chair-stand test as a measure of lower body strength in community-residing older adults. Res Q Exerc Sport 70, 113-9 (1999).
5. Jette, A. M., Jette, D. U., Ng, J., Plotkin, D. J. & Bach, M. A. Are performance-based measures sufficiently reliable for use in multicenter trials? Musculoskeletal Impairment (MSI) Study Group. J Gerontol A Biol Sci Med Sci 54, M3-6 (1999).

Auf die ausführliche Auflistung instrumentierter Messtechnik zur Quantifizierung von Muskelkraft wurde verzichtet, da diese Geräte nicht überall zum Standard einer Physiotherapie Einrichtung gehören. Der Vollständigkeit halber sei auf die folgenden Krafttests hingewiesen:

- Kraftmesszelle
  Anleitung siehe unter: http://www.igptr.ch/welcome.htm

endpoint fracture						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
community dwellers, monofactorial interventions						
Sinaki et al [28]	n=68 white postmenopausal women age: 55.6yrs (48-65) inclusion criteria: not specified. exclusion criteria: vert. wedged and compression fractures; smoking, supplementation of calcium, vit D and estrogen	**IG:** (n=34) Progessive, resistive backpack (weight) lifting exercise program for the back extensor muscles; 10x/d, 5 days/ week **CG:**(n=31) no special exercise program **duration:** 2 years; 8 years cessation of the exercises to follow-up	**primary outcome:** radiographs (vertebral deformities). **secondary outcome:** BES (back extensor strength). BMD measured by DXA (L2-L4), physical activity score (PAS). height, weight r**esults:** compression fractures after 10 years follow-up IG =1.6% (6 per 378 vert. bodies); CG =4,3% (14 per 322 vert. bodies); sign. between group diff. p=0.029 wegded fractures after 10 years follow-up: no sign. between gorup diff. **compliance:** after 10 yrs. 7 drop outs in IG, 8 drop outs in IG, no reasons given	First study demonstrating the long- term effect of strong back muscles on the reduction of vertebral fractures in estrogen deficient women. under-powered for fracture analysis; p-values were calculated by counting the number of fractured and unfractured vetrebrae and not the number of patients with or without incident vertebral fractures.	**5/ 10** [Eligibility criteria: No] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: Yes; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect** **clinical relevance limited**
Ebrahim et al [29]	n=165 postmenopausal women age: 45-75y inclusion criteria: upper limb fracture previous 2 years exclusion criteria: bisphosphonate therapy, cognitive impairment	**IG:** n=81 self-administered brisk-walking, gradually increased up to 40min. 3x week, brisk was defined as walking faster than usually, general health and balanced diet advices; supervision by research nurse, meetings every 3 months, monthly phone calls to check compliance **CG:** n=84 self-admistered upper limb exercise, general health and balanced diet advices **duration:** 2 years	**primary outcome**: BMD DXA (Lx, FN) s**econdary outcome:** incidence of falls, vertebral fracture rate, leg and grip strength r**esults:** fractures: no signif. between group differences in either clinical or spinal x-ray fracture risk. though cumulative risk for falls sign. higher in IG vs.CG (5,9% vs. 4,1%) c**ompliance:** drop outs: IG 32 (from 81); CG 36 (from 84); total: -41%	fracture rate only secondary endpoint; under-powered for statistical analysis of fracture incidence; high-risk study population due to history of falls resulting in upper limb fracture; lack of exercise-standardization; high drop-out rate	**6/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind assessors: Yes; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect** **clinical relevance limited**
Chan et al [31]	n=132 healthy postmenopausal chinese women; age: 54 (+ 3.5yrs) inclusion criteria: postmenopausal since 1-10yrs. exclusion criteria: history of regular participation in physical exercises; HRT or other bone metabolism affecting drugs; diseases of either thyroid or parathyroid; history of fractures; BMI<30g/m2	**IG:** n=67 Tai Chi Chun exercise (Yang style) supervised; 50 min/ day; 5 d/week; **CG:** n=65 sedentary life style; No patricipation in physica exercises **duration:** 1 year	**primary outcome** BMD: DXA (L2-L4 and prox. femur), pQCT distal tibia(tBMD, iBMD, cBMD) **secondary outcome** no. of fractures r**esults:** no signf. diff. between groups c**ompliance:** drop outs: IG: 19.4%; CG: 16.9%; due to change of adress or intake of drugs affecting bone metabolism	fracture rate only secondary endpoint; chinese population; under-powered for fracture analysis;	**4/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect** **clinical relevance limited**

endpoint fracture						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Preisinger et al [30]	n=222 postmenopausal women age=45 to 75yrs; inclusion criteria: at least 1 year postmenopausal status,regular phyical activities below 5 MET's exclusion criteria: smoking, alcohol abuse, evidence of secondary osteoporosis, metabolicand chronic diseases other than osteoporosis, HRT and drug therapy for osteoporosis, functional inability.	**IG:** n=73 non progressive exercise program; warm-ups (brisk-w., jogging, arm swinging, knee bending eg.); streching balanceing exercises with unstable equipment (gym ball eg); exercises with elastic bands; supervision by physiotherapists; home exercises 3x/ w >20min. **CG:** n=64 no special exercise program **duration:** 5-10 years	**primary outcome** fractures (vertebral deformities) **secondary endpoint:** walking speed; muscle strength; static posture; max. oxigen uptake, BMD r**esults:** after 5-10yrs. fractures: no signif. differences between groups no signif. differences compliant vs. non compliant exerciser **compliance:** 50% drop outs altogether since within 5-10yrs; in the high compliant subgroup only 33% drop outs	under powered for fracture analysis; very low exercise compliance in the IG and those who switched from IG to CG during follow-up time due ro self-adminisstered eexercise and long-term follow-up	**5/ 10** [Eligibility criteria: No] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect** **clinical relevance limited**
community dwellers, multifactorial interventions						
Vetter et al [32]	n=674 patients of a general practice age: >70 yrs; proportion of men and women and age distribution similar inclusion criteria not reprorted exclusion criteria not reported	**IG:** n=350 individually tailored multifactorial intervention targeting on specific risk factors for falling 1) Asssessment and correction of nutritional deficiencies. 2) Assessment and referral of medical conditions 3) Assessment and correction of environmental hazards in the home. 4) Assessment and improvement of fitness **CG:** n=324 no care **duration:** 4 years	**primary outcome** fracture rate over 4 years **secondary outcome** number of falls; disability related number (%) of fractures and falls; mortality; **results:** incidence of fractures in the IG was 5% vs. 4% in the CG; difference not significant; **compliance:** drop-outs: 88 IG / 106 CG died; 14 IG / 5 CG moved away; 8 IG / 3 CG refused.	no describtion of the exercise regime; fracture sites not reported. Multifactorial approach disables from estimating specific prevention measures.	**5/ 10** [Eligibility criteria: No] Random allocation: No; Concealed allocation: Yes; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect** **clinical relevance not given**
institutionalized patients, multifactorial interventions						
Jensen et al [33]	cluster-RCT n=402 patients of 9 residential care facilities age: mean yrs.83 (65-100yrs). women 72% inclusion criteria: age>=65yrs exclusion criteria: no	**IG**: n=194 individually tailored multifactorial intervention targeting on specific risk factors for falling 1) staff education 2) environment modifcation 3) exercise programs; individually tailored, progressive training focusing on balance, gait, muscle strength and funktional exercises for improving ADL 4) supply or repair of aids 5) review of drug regimens 6) hip protectors 7) post-fall problem-solving conferences 8) staff guidanc **CG**: n=20 usual care ; weekly fall reports **duration:** 11 weeks	**primary outcome:** number of fallers, incidence of falls, time to first fall **secondary outcome:** fall related injuries (fractures) **results:** sign. difference between IG and CG femural neck Fxs IG=3; CG=12.adjust. OR 0.23 (CI ;0.06 to 0.94) **compliance:** drop outs 19%.	fracture rate only secondary endpoint; Underpowered for fracture analysis. Multi-factorial approach disables from estimating specific prevention measures.	**6/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind assessors: No Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect** **clinicalr elevance limited.**

endpoint fracture						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Haines et al [34]	n=626 men and women of 3 subacute wards in a metropol.hospital specialising in rehablitation and care of eldrely people. (IG/CG=310/316) age: mean 80yrs (38-90yrs) inclusion criteria: referral from a geriatrician, most comonly from an acute hospital exclusioncriteria: none	**IG:** n=310 individually tailored multifactorial intervention targeting on specific risk factors for falling 1) Falls risk alert card with information brochure 2) exercise programme admnistered by a physiotherapist (3x45 min/ week); individually tailored programme with elements of Tai Chi, functional training focusing on ADL, stepping, reaching and weight lifting 3) education programme 2x30 min/ week 4) hip protectors (not obligatory, dependent on staff decision. **CG:** n=316 usual care; no interventions from the falls prevention programme **duration:** assessment after discharge from the ward; mean 9297 days per patient = mean 15 days per patient	**primary outcome:** incidence of falls **secondary outcome:** fractures, injuries related to falls **results:** no sign. between group differences concerning fractures **comliance:** no withdrawal	Though fall incidence could be reduced, there was no effect on fracture rate. fracture rate only secondary endpoint; under-powered for fracture analysis. Multifactorial approach disables from estimating specific prevention measures. Individual daration of the programme	**7/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**I** **no effect** **clinical relevance limited**
Becker et al [35]	n=981 patients from 6 community nursing homes age: mean age 85yrs 79% female. No inclusion or exclusion citeria.	**IG:** n=509 individually tailored multifactorial intervention targeting on specific risk factors for falling 1) Staff and resident education on fall prevention 2) Advice on environmental adaptations 3) Progressive balance and resistance training, 20 min. balance training in a standing or walking position; reistancetrainings at 75% of the 1RM for all major muscle groups, 10 resps in 2 sets 4) hip protectors **CG:** n=472 no specific program **duration:** 1 year	**primary outcome:** number of falls **secondary outcome:** fractures **results:** no sign. between group difference concerning fractures **compliance:** drop outs: 174 died (93 IG/ 81 CG); 6 discharges (5 IG/ 1CG)	Though fall incidence could be reduced, there was no effect on fracture rate. Originally powerd for fracture analysis but because of a low incidence rate of fractures in the control group the study seems to be under-powered for fracture analysis. Multifactorial approach disables from estimating specific prevention measures.	**6/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect** **clinical relevance limited**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
postemonopausal, endurane exercise						
Tsuritani et al [37]	Setting: out-patients n=84 community dwellers Age: 60-70y Inclusion criteria: postmenopausal Exclusion criteria: any cardiovascular disorder that would contraindicate exercise, HRT, medication which affect bone metabolism	**E1:** brisk walking daily, self-selected pace, targe amounts increased from 60-140 min./ week during first 3 month and were maintained at that level later **C:** no training 12 months	**Primary outcome:** BMD DXA (Lx, FN, calcaneus) **Secondary outcome:** VDR genotypes, ultrasound calcaneus **Results:** Lx: 2% mean diff. between groups, sign. ns results other sites **Compliance:** 18% drop-outs	no definition of training regime, no reasons and group distribution on drop-outs is mentioned	**6/ 10** [Eligibility criteria: No] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect** **clinical relevance fully given**
Hatori et al [36]	Setting: out-patients n=33 Japanese community dwellers Age: 50-66y Inclusion criteria: postmenopausal Exclusion criteria: no vit. D or estrogen supplementation	**E1:** walking above anaerobic threshold (AT), 110% heart rate at AT; 3/week 30min.; flat grass-covered ground **E2:** walking below anaerobic threshold (AT), 90% heart rate at AT; 3/week 30min.; flat grass-covered ground both groups exercised 3/week 30min. on flat grass-covered ground, monitoring via ambulatory elctrocardiograph **C:** no training 7 months	**Primary outcome:** BMD DXA (Lx) **Secondary outcome:** cardiopulmonary parameters, bonemarker **Results:** E1 vs. C: 2,7% mean diff. between groups no sign. diff. E2 vs C **Compliance:** 36% drop-outs (2 due to lack of time, rest?), no adverse events	not mentioned: (1) if exercise was delivered in groups or individually, (2) if the training was supervised; (3) reasons why 10 subjects dropped out and in which groups small n with high drop-out rate	**6/ 10** [Eligibility criteria: No] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: Yes; Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positve effect,** **limited clinical relevance**
Ebrahim et al [29]	Setting: out-patients n=165, community dwellers Age: 45-75y Inclusion criteria: upper limb fracture previous 2 years Exclusion criteria: bisphosphonate therapy, cognitive impairment	**E:** self-administered brisk-walking, gradually increased up to 40min. 3x week, brisk was defined as walking faster than usually **C:** self-admistered upper limb exercise 2 years	**Primary outcome:** BMD DXA (Lx, FN) **Secondary outcome:** incidence of falls, vertebral fracture rate, leg and grip strength **Results:** FN: 2% mean diff. after 2 years, ns Lx: ns significant more falls in the brisk-walking group after 1 year (equal distribution after 2 years) ns. diff. concerning fracure rate **Compliance:** 41% drop-outs altogether due to unwillingness to continue (40), illness (10), death (2), exercise-related trauma (1), unspecified difficulties (15); equal distribution both groups; good compliance in the remaining subjects	supervision by research nurse, meetings every 3 months, monthly phone calls to check compliance; women in walking group slightly younger, high drop-out rate	**6/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind assessors: Yes; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect,** **clinical relevance fully given**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Martin et al [38]	Setting: out-patients n=76, community dwellers Age: 59-68 Inclusion criteria: at least 1 yr. postmenopausal Exclusion criteria: any cardiovascular or orthopedic disorder that would contraindicate exercise, medication which affect bone metabolism in the last yr., any regular ecercise in the last 12 months	**E1:** treadmill walking at 70-85% of max. HR, 45 min., 3 x week, **E2:** treadmill walking 70-85% of max. HR, 30 min., 3 x week, **C:** no training 12 months Ca+Vit. D supplementation	**Primary outcome:** BMD DPA (Lx), SPA (forearm) **Secondary outcome:** cardiopulmonary parameters **Results:** no sign. diff. between groups **Compliance:** 28% drop-outs (8 time conflicts, e estrogen therapy, 3 loss of interest, 3 illness, 2 change of adress, 2 unknowen causes attendence 77-85%	better results in women <6 yrs. postmenopausal	**4/10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect,** **clinical relevance fully given**
postmenopausal, resistance training						
Nelson et al. [39]	Setting: out-patients n=40 community-dwellers Age: 50-70y Inclusion criteria: postmenopausal, not engaged in any regular exercise Exclusion criteria: history of osteoporotic fractures, bone affecting medication in the last 12 months	**E1:** prog. resistance training major muscle groups, 80% 1RM, 3 sets, 2/ week **C1:** no training 12 months	**Primary outcome:**BMD DXA; (LX, FN) **Secondary outcome**:dynamic balance **Results:** BMD FN mean diff. 3,4%, sign. BMD Lx mean diff. 2,8%, sign. **Compliance:** Drop-outs: 4% Attendence: 87% **adverse events**: transient musculoskeletal problems 7 subjects	positive results concerning postural sway	**5/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: No; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect,** **clinical relevance fully given**
Stengel et al [43]	Setting: center and home-based exercises n=53 community dwellers Age: mean 57y Inclusion criteria: postmenopausal at least 4 yrs., subjects were well trained already Exclusion criteria: diseases or medication affecting bone metabolism	both groups: each week - 2 weight lifting sessions 1hr. (jumping, resistance training all major muscle groups, 12 week 70-90% 1RM, progressed from 1-4 sets, intermitted with 4-5 weeks 50%RM), 1 gymnastic session 1 hr. (coordination, strength, endurance, flexibility), 1 home-exercise session 25 min. (rope skipping., stretching., isometric exercises) **E1**: high-velocity resistance training (4-s concentric, 4-s eccentric) **E1:** slow-velocity resistance training (fast/ explosive concentric, 4-s eccentric) 12 months, all subjects received Ca+Vit D	**Primary outcome:** BMD DXA ; (LX, total hip, distal forearm) **Secondary outcome:** maximum isometric strength **Results:** **BMD:** mean diff. between groups LX: 1,6%, sign. tothip: 1,2%, sign. no sign. diff. other sites **Compliance:** 21% drop-outs (1 subject due to use of glucocorticoids, 1 subject developed hyperparathyroidism, 9 subjects due to insufficeint training frequency)	subjects were well trained already	**5/ 10** [Eligibility criteria: No] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect,** **clinical relevance fully given**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Kerr et al [40]	Setting: out-patients n=56 community dwellers Age: 40-70y Inclusion criteria: postmenopausal at least 1 yr. Exclusion criteria: chronic diseases or medication which effect BMD, osteopenia, resistance training last 5 yrs.	**E1:** high-intensity resistance-training 60-80% 1RM, all major muscle groups at one site of the body, 3 sets, 3 x week, 20-30 min. **E2:** low-intensity resistance-training 40% 1RM, all major muscle groups at one site of the body, 3 sets, 3 x week, 45-60 min. non-trained side served as control (randomized) 12 months	**Primary outcome:** BMD DXA (forearm, Hip) **Secondary outcome:** wbc, strength **Results:** mean diff. in % compared to non-trained side E1 vs. C: forearm: 3,8%, sign. Trochanter: 2,3%, sign. Intertroch: 1,6%, sign. Ward's: 3,1%, sign. E2 vs. C: forearm 0,9%, sign. E1 vs. E2: no data on significance given **Compliance:** Drop-outs: 18% E1: -3, E2: -7), 7 due to time commitments, rest? overall attendence 87% adverse events: transient mild tendonitis		**4/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positve effect, clinical relevance fully given**
Kerr et al [41]	Setting: out-patients n=126 community dwellers Age: 54-68y Inclusion criteria: postmenapausal at least 4 years Exclusion criteria: more 2h/ week activity, weigth training within last 5 years, HRT, any disease or medication affecting bone metabolism, any cardiovascular, physical or orthopedic disease which would risk or limit exercise performance	**E1**: progressive high-intensity resistance training 60-80% 1RM+Calcium, 3/ week, all major muscle groups, 3 sets,1h **E2**: non-progressive low-intensity resistance training with minimal load and additoinal stationary bicycle training (HR<150 beats/ min.) +Calcium, 3/ week, all major muscle groups, 3 sets,1h **C1**: Calcium 24 months	**Primary outcome**:BMD DXA; (LX, Total Hip, Trochanter,Intertroch, FN, Radius) **Secondary outcome**: strength **Results:** mean diff. between gorups in % E1 vs. E2 and C. intertochanter 1,8% sign tot. hip: 1,2%, sign. no sign. effect any other site **Compliance:** Drop-outs: 16%, Compliance: 87%		**4/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect, clinical relevance fully given**
Notelovitz et al [45]	Setting: out-patients n= 33 community-dwellers Age: 39-54y Inclusion criteria: surgical menopause Exclusion criteria: contrainications for HRT	**E1:** HRT + exercise **C:** HRT only Exercise: strength training slow technique, 5 machines whole body, 3x/week with a personal trainer, 15 - 20min, weight, which could be lifted 8x properly (80%RM), progressive 12 month	**Primary outcome:** BMD and BMC, SPA, DPA, radius, tot. body, **Secondary outcome:** VO2 **Results:** tot. body: no sig diff. between groups LS: no sig. diff. between groups mid shaft radius: E1 sig. increase, C no change (BMC 4,1% mean diff in change, BMD 2,5%) **Compliance:** adherence >70%, drop out 7/18 HRT-group, 6/15 HRT+ex, 3x orthopedic problems	surgical postmeonpausal sign. increase BMD baseline versus end for exercise groups, but intergroups differance only at radius significant small n! high drop-out SPA and DPA	**4/ 10** [Eligibility criteria: No;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect for midshaft radius, clinical relevance limited**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Heikkinen et al [44]	Setting: out-patients n=78 Age: 65-75y Inclusion criteria: postmenopausal Exclusion criteria: diseases, contraindication for HRT	**E1:** HRT dose 1 **E2:** HRT dose 2 **C:** Control E1, E2 and C were divided into ex and no ex ex: 1h guided loading ex/ week in a fitness center plus 2 hour alone (lumbar and femural areas) 24 month	**Primary outcome:** DXA: BMD LS and prox. femur **Secondary outcome:** Vo2max, strength **Results:** all HRT groups gained BMD on LS and prox. femur but indepently from ex C/ ex gained at ward and trochanter compared to C/ non-ex **Compliance:** Drop-outs: 12%	training regime not described	**6/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: Yes; Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect,** **clinical relevance not given**
Taaffe et al [42]	Setting: out-patients n=36 community dwelling women Age: 65-79y Inclusion criteria: sedentary to moderately active, BMI<33, postmenopausal Exclusion criteria: cardiovascular/ musculoskeletal disorders Subjects were matched for estrogen status.	**E1:** progressive high-intensity resistance training, 80% 1RM **E2**: progressive low-intensity resistance training, 40% 1RM, E1+E2: 3 sets targeting thigh muscles, 3 x week, bracketed by warm-up and cool-down sessions **C:** no training 12 months	**Prim. outcome:** BMD DXA (middle third of femur) **Second. outcome:** isometric muscle strength, muscle cross sectional area, thigh fat free mass, bone-free lean tissue mass **Results: mean diff. between groups in %** E1 vs. E2: 3,2%, sign. E1 vs. C: 2,8%, sign. **Drop-outs:** 30% drop-out rate in intervention groups (health problems unrelated to training, change of residence, loss of interest and time problems), no sign. differences between groups **Compliance** (% completed weekly sessions) Exercisers completed 79% of the sessions.	small n, not standardized measurement site	**4/ 10** [Eligibility criteria: No] Random allocation: Yes Concealed allocation: No Baseline comparability: Yes Blind subjects: No Blind therapists: No Blind assessors: No Adequate follow-up: No Intention-to-treat analysis: No Between-group comparisons: Yes Point estimates and variability: Yes c**onfirmed**	**II** **positve effect** **clinical relevance not given**
Revel et al [51]	Setting: out-patients n=78 community dwellers Age: mean 65y inclusion criteria: postmnopausal at least 1 yr. Exclusion criteria: medication or diseases which effect BMD, osteoporotic fractures	**E1:** psoas strengthening (sitting position, 5 kg, to 30° hip flex. with stabilized Lx), 3 x daily **E2:** deltoid strengthening (sitting position, 1 kg, to 60° abduction), 3 x daily control via telephone calls 12 months	**Prim. outcome:** lumbar trabecular bone with CT (TBMD) **Second. outcome:** cross-sectional muscle area (CT scan) **Results:** no sign. effect subgroup of most comliant subject (n=49) sign. effect between groups on TBMD L2/ L3, L1-L4, not on L1/ L4 alone **Compliance** Drop-outs**:**14% (reason E1: 1 change of residence, 1 hip pain, 4 considered exercise too constraining; reason E2: 3 shoulder pain, 1 back pain, 1 considered exercise too constraining) only 55% exercised regularly 5 days/ week	no progressive training, stimulus not strong enough, low compliance, positive results only in sub-group of compliant subjects	**7/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: Yes; Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes c**onfirmed**	**I** **no effect,** **clinical relevance fully given**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Rhodes et al [46]	Setting: center and home-based exercises n=44 community-dwellers Age: 65-75 yrs. Inclusion criteria: postmenopausal Exclusion criteria: symptomatic cardioresperatory conditions, uncontrolled hypertension or diabetes, chronic disabling arthritis, regular exercisers	**E1**: prog. resistance 75% 1RM 3/week,1h **C1**: no training 12 months (3 month supervised training study center/ 9 months training in recreation facilites, same exercise regime, regular check by study team)	**Primary outcome**:BMD DPX (LX, FN, Trochanter, Wards) **Secondary outcome**:Strength **Results**: no sign. effect on BMD on any site **Compliance:** Drop-outs: 14%, Attendence: 85% no adverse events		**5/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect,** **clinical relevance fully given**
Verschueren et al [48]	Setting: out-patients n=25 community-dwellers Age: 58-74y Inclusion criteria: non-institutionalized Exclusion criteria: disease or med. affect. bones, osteoporosis	**E1:** progressive whole body vibration exercise (Power Plate), deep squats, wide stance suats, one-legged squats, lunges; training intensity increased by increasing amplitude and frequency 35-40Hz, acceleration 2.28-5.09g 3 x week, max. 30min., **E2:** progressive resistance training (20 min. warm-up at 60-80% max. HR, leg extension and leg press machine, trainings increased form 50-80% 1RM, 2 sets), max. 1h **C**: maintain current activity level 6 months	**Primary outcome:** BMD DXA; (whole body, LS, FN) **Secondary outcome:** Bone turnover, Strength, postural control **Results:** E1 v. C: 1,55% mean diff. tot. hip, sign. E1 vs E2: 0.3% mean diff tot. hip, sign. E2 vs C: 0,42% mean diff tot. hip; not sign. **Compliance:** no side effects	no information about drop-out, positive results concerning postural sway, small n, short study period, resistance training focused on lower limb exercises, no trunk exercises	**5/ 10** [Eligibility criteria: no Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: yes Adequate follow-up: no Intention-to-treat analysis: no Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **no effect,** **clinical relevance limited**
Smidt et al [49]	Setting: out-patients n=55 Age: 45-75 Inclusion criteria: postmenopausal at least 1 yr. Exclusion criteria: any cardiovascular, physical or orthopedic disease which would risk or limit exercise performance; nerve-root compression, medication or diseases which effect BMD; current involvement in weight-training	**E1:** progressive resistive trunk muscle training, 3*10 sit ups, prone trunk extension and double leg raise exercises (70% 1 RM), 3-4/ week for 10 min., exercise regime was demonstrated in study center, subjects exercised at home **C1**: no training 12 months	**Primary outcome**: BMD DPA (Lx, Hip) **Secondary outcome:** Strength **Results:** no sign. effect **Compliance:** 11% drop-outs (2 subjects due to illness, 2 had difficulites with exercise, 1 lack of time)	not mentioned how load was increased with home exercises	**5/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect,** **clinical relevance limited**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Pruitt et al [47]	Setting: out-patients n=40, community dwellers Age: 65-79y Inclusion criteria: postmenopausal at least 1yr., never done reistance training before Exclusion criteria: diseases which effect BMD, vertebral fractures	**E1:** high-intensity resistance-training, all major muscle groups,1 set 40% 1RM, 2 sets 80% 1 RM, 3/week **E2:** low-intensity resistance-training, all major muscle groups, 3 sets 40% 1RM, 3/week **C1:** no training 12 month	**Primary outcome:**BMD,DXA; (LX, Total Hip) **Secondary outcome:**strength **Results:** no sign. effects on BMD training vs. control, no sign. effects on BMD E1 vs. E2 **Compliance:** Drop-outs: together 35% E1: -7, E2: -6, C: -1, 5 health problems unrelated to training, 3 moved away, 2 aggrevation of pre-existing back or knee conditions, 2 lost interest, 2 experienced conflicts with family and work life) Adherence in trainings groups: 79% **adverse events**: 2 aggrevation of pre-existing back or knee conditions	high drop-out rate with small n, 11 of the 16 exercisers took HRT at least 1 yr.	**4/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect,** **clinical relevance limited**
Chilibeck et al [50]	Setting: out-patients n=57 community-dwellers Age: mean of groups 55, 9 - 58,8y Inclusion criteria: postmenopausal Exclusion criteria: disease or med. aff. bone, z-score < 2,0, exercise programm, high blood pressure	**E1:** exercise + placebo **E2:** Bisphosphonate **E3:** exercise + bisphosphonate **C:** placebo exercise: progressive restistance training, all major muscle groups, 2 sets 70% RM, 3x/ week 12 month	**Primary outcome:** DXA BMD LS, FN, whole body **Secondary outcome:** muscle strength **Results:** LS: E1+E3 greater decrease than E2+C; when 1 outliner was not considered, there was no longer a difference between groups FN: no change **Compliance:** Drop Out 16%, att.: 77,6 ±3,4% ex/plac group, 74,8% ± 3,2% ex/bis group	small n	**3/ 10** [Eligibility criteria: No;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: No; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect,** **clinical relevance limited**
postmenopausal, vibration exercise						
Rubin et al [52]	Setting: home exercises n=70, community dwellers Age: 47-64 Inclusion criteria: postmenopausal 3-8 years, no limitations concerning BMD, groups matched for BMD Exclusion criteria: bone and neuromuscular diseases, fractures, high-impact sports at least 3x week	**E:** self-built mechanical vibration device delivered at home, 30 Hz, 0.2 g; standing on the device 10 min. daily **C**: sham vibration device delivered at home; low-frequency audible sound, standing on the device 10 min. daily 12 months	**Primary outcome:** BMD DXA; (LX, trochanter, FN, radius) **Secondary outcome:** Bone turnover, Strength, postural control **Results:** no sign. effect **Compliance** was controlled by electronic monitor within the device; ranged from low complinace (59,1%) to high compliance (85.9%); the higher the compliance the better the results drop-out: 9% (1 in E, 5 in C, no reasons mentioned) full data from 56 patients side effects: 1 headache in sham-vibration group	in posthoc analysis: sign diff. E vs. C. in the 60% comliance group and weight<65kg at the spine	**10/ 10** [Eligibility criteria: Yes] Random allocation: Yes Concealed allocation: Yes Baseline comparability: Yes Blind subjects: Yes Blind therapists: Yes Blind assessors: Yes Adequate follow-up: Yes Intention-to-treat analysis: Yes Between-group comparisons: Yes Point estimates and variability: Yes **confirmed**	**I** **no effect,** **clinical relevance limited**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Verschueren et al [48]	Setting: out-patients n=70 community-dwellers Age: 58-74y Inclusion criteria: non-institutionalized Exclusion criteria: disease or med. affect. bones, osteoporosis	**E1:** progressive whole body vibration exercise (Power Plate), deep squats, wide stance suats, one-legged squats, lunges; training intensity increased by increasing amplitude and frequency 35-40Hz, acceleration 2.28-5.09g 3 x week, max. 30min., **E2:** progressive resistance training (20 min. warm-up at 60-80% max. HR, leg extension and leg press machine, trainings increased form 50-80% 1RM, 2 sets), max. 1h **C**: maintain current activity level 6 months	**Primary outcome:** BMD DXA; (whole body, LS, FN) **Secondary outcome:** Bone turnover, Strength, postural control **Results:** E1 v. C: 1,55% mean diff. tot. hip, sign. E1 vs E2: 0.3% mean diff tot. hip, sign. E2 vs C: 0,42% mean diff tot. hip; not sign. **Compliance:** no side effects	no information about drop-out rate short study period positive results concerning postural sway	**5/ 10** [Eligibility criteria: no Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: yes Adequate follow-up: no Intention-to-treat analysis: no Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **positve effect,** **clinical relevance limited**
Russo et al [53]	Setting: out-patients n=29, healthy community dwellers Age: 54-67y Inclusion criteria: postmenopausal 1 year, HRT therapy were considered eligible Exclusion criteria:	**E:** Vibration 3*2min 3/week , Galileo 2000, standing with slightly bended knees, trainings intensity was increased by amplitude and frequency (12-28Hz, 0.1-10g) **C:** no training all subjects received Ca+vit. D daily 6 months	**Primary outcome:** bone density, mass and geometry, pQCT tibia 4% **secondary outcomes:** muscle power and force lower limb, bone markers **Results:** not sig. **Compliance:** 17% drop-out together; E: 2 due to family problems and 1 due to knee pain; C: 1 due to posttraumatic muscle pain poor attentance with 77% of all sessions side effects: leg itching and erythema 6/ 17 subjects during first 3 sessions knee pain 2/ 17 in obese subjects with preexisting knee OA	knee pain as adverse event after vibration exercise with preexisting osteoarthritis at beginning of the study small n short study period	**5/ 10** [Eligibility criteria: Yes] Random allocation: Yes Concealed allocation: No Baseline comparability: Yes Blind subjects: No Blind therapists: No Blind assessors: No Adequate follow-up: Yes Intention-to-treat analysis: No Between-group comparisons: Yes Point estimates and variability: Yes **confirmed**	**II** **no effect,** **clinical relevance limited**
postmenopausal, Tai Chi						
Chan et al [31]	Setting: out-patients n=132 community-dwellers, chinese Age: 51-58y Inclusion criteria: within 10y postmenopausal, no regular physical exercise, BMI > 30kg/m2 Exclusion criteria: HRT, drug or disease aff. bone metabolism, fractures	**E:** supervised Tai Chi (Jang Style) 50min/ day, 5x week, **C:** sedentary lifestyle 12 months	**Primary outcome:** BMD DXA (Lx, FN), **Secondary outcome:** pQCT dist. tibia, fracture rate **Results:** keine sigf. Ergebnisse DXA pQCT: ultradistal Tibia tBMD 0.4% mean diff., sign iBMD 0.4% mean diff., sign. distal tibial diaphysis cBMD 0.8% mean diff., sign. **Compliance:** attandance 4,2 (0,9) days /week, drop-out E: 19,4% (lost contact to subjec, bone metabol. affecting medication), C: 16,9% did not show up for final DXA)	chinese women, adverse events: 3 fractures in C (1 vertebral, 1 colles, 1 metacarpus); E (1 fibula); vertebral fracture due to overload during work, others due to falls, no definition of measured levels stated	**4/ 10** [Eligibility criteria: yes Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind assessors: no Blind subjects: no Blind therapists: no Adequate follow-up: no Intention-to-treat analysis:no Between-group comparisons: yes Point estimates and variability: yes **comfirmed**	**II** **positive effect,** **clinical relevance limited**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
medication, postemonopausal mixed exercise						
Uusi-Rasi et al [59]	Setting: out-patients n=159 community dwellers Age: mean around 53y Inclusion criteria: 1-5y postmenopausal Exclusion criteria: previous bone fractures, use of HRT, Corticoids, or other drugs or illness affect. bone, T-score FN > -2,5 SD	**E1:** Alendronate 5mg; **E2:** Alendronate 5mg plus progressive jumping exercise **E3:** placebo + jumping **E4:** placebo + exercise exercise 3x/ week, 12 month	**Primary outcome:** BMC with DXA LS, FN, radius; pQCT tibia **Secondary outcome:** muscle strength, balance, sway, VO2max, bone turnover **Results:** no interaction of ex and alendronate no diff. exercise versus non-exercise groups BMC LS and FN; Exercise improved BSI (+3,6%) and ratio of cortical bo no change for prox tibia in either group **Compliance:** 7 drop-outs, attendence 1,6 ± 0,9 per week, ex-group: 19 consultation of physicist due to musculoskeletal symptoms	exercise no additive or interactive effect; blinding in respect to medication BMC	**7/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind assessors: yes Blind subjects: no Blind therapists: no Adequate follow-up: yes Intention-to-treat analysis: yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**I** **positive effect, clinical relevance fully given**
Grove et al [54]	Setting: out-patients n=49 Age: 45-75y Inclusion criteria: postmenopausal at least 1 yr., sedentary Exclusion criteria: >8 yrs. postmonopausal, nerve-root compression, medication or diseases which effect BMD (other than estrogen)	**E1:** 15-20 min. warm-up (stretching), 20 min. exercise high- impact (jumping and running in place up to 3 times of body weight based on force plate measurements), 15 min. cool-down (abdominal strengthening exercises) **E2:** 15-20 min. warm-up (stretching), 20 min. exercise low- impact (walking, heel jacks, charlestons up to 1.5 times of body weight based on force plate measurements), 15 min. cool-down (abdominal strengthening exercises) **C1:** no training 3 x week, 1 hr., 12 months	**Prim. outcome:** DPA; Lx **Second. outcome:** VO2 max **Results:** E1 vs. C: sign. diff. E2 vs. C: sign. diff. No sign. diff between E1 and E2 **Compliance:** Drop-outs**:** 7% due to injury in the high-impact group Attendence 80%	additional abdominal strength exercies might be responsible for positive effect Lx as well	**5/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **Confirmed**	**II** **positive effect; clinical relevance fully given**
Going et al [60]	Setting: out-patients n: 320 Age: 40 - 65y Inclusion criteria: postmenopausal, BMI less than 33, nonsmoker, Z-score >-3,0; no osteoporotic fracture, cancer free for 5 y., no med. aff. bone, no betablocker, calcium > 300mg/day, less than 120min physical activity/ week	**E1:** Ex only **E2:** Ex + HRT **E3:** HRT only **C.** no ex/ no HRT Exercise: 3x per week supervised by trainer, stretching, balance, aerobic weight bearing, weightlifting with machines (2 sets 6-8rep at 70% repmax., weight bearing circuit, stairclimbir 12 month	**Primary outcome:** DXA , muscle strength, **Results:** women (HRT and no HRT) who exercised increased trochanteric BMD sig. more than women who did not exercise **Compliance:** 83% completed 1y, dropout higher for ex group, att: 71,9% ± 10,8%	young postmenopausal	**5/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: no; Blind subjects: No; Blind therapists: No; Adequate follow-up: no; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect, clinical relevance fully given**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Milliken et al [61]	Setting: out-patients n=94 community dwelling women, Age: 40-65y Inclusion criteria: at least 3 yrs. postmenopausal, sedentary Exclusion criteria: T-score spine or hip <-3.0, hx of eating disorder, musculoskeletal disorders, bone affecting medication except HRT	**E1:** HRT + exercise **C1:** HRT + no exercise **E2:** no HRT + exercise **C2:** no HRT + no exercise all subjects received Ca 800mg daily exercise: 20 min. aerobic weightbearing exercises (jumping, skipping with weight vests), 3-5 min. resistance exercises major muscle groups, 70-80% 1RM, 2 sets, 10 min. stretching and balance training, 3 x week, 75 min 12 month	**Prim. outcome:** BMD DXA (L2-L4, proximal femur, total body) **Second. outcome:** iIGF-, IGF-2, IGFBP3 **Results:** E1 versus C1: sign. changes at greater trochanter for exercise group (2,9% diff) E2 versus C2: sign. changes at Ward's triangle (3,3% diff) largest effects on BMD in the group on HRT+exercise except for femoral neck **Compliance:** not mentioned	Sign. baseline difference between HRT and no HRT groups in favour for no HRT group (age,, OC, Dpd, IGF-1, estrogen, estradiol) but not for BMD drop out and compliance not mentioned	**4/ 10** [Eligibility criteria: No] Random allocation: Yes Concealed allocation: No Baseline comparability: No Blind subjects: No Blind therapists: No Blind assessors: No Adequate follow-up: Yes Intention-to-treat analysis: No Between-group comparisons: Yes Point estimates and variability: Yes **confirmed**	**II** **positive effect, clinical relevance fully given**
Cheng et al [62]	Setting: center and home-based exercises n=80 Age:50-57y Inclusion criteria: postmenapausal 5 years after onset, no serious cardiovasc. or locomotor problems, BMI < 33kg/m2, Exclusion criteria: HRT, Bisphosphonates, Calcitonin, steroids, fluoride	**E1:** HRT **E2:** Exercise **E3:** HRT+ Exercise **C:** placebo Exercise = supervised circuit training (skipping, hopping, drop jumping, resistance training for upper body) 2x/week and exercise (skippings, jumping) 4/week at home, interruption by 3 high impact aerobic dance periods for 2 weeks and a 12 month	**Primary outcome:** BMD and bone structure with CT at prox femur, tibia and mid.femur, tibia shaft **Results:** Exercise had no effect on BMD, but on bone mass distribution (moments of inertia: Imax and Ipolar) there was a positive effect for exercise at the prox. tibia Drop-outs: 35%	CT BMD no effect only effect on bone structure at prox. Tibia measurements sites for femur not comparable with other studies	**4/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: No; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect, clinical relevance fully given**
Prince et al [56]	Setting: center and home-based exercises n= 168 community dwellers Age: 50-70y Inclusion criteria: 10 years postmenopausal Exclusion criteria: medication or diseases which effect BMD	**E1:** 2x 1h weight bearing exercise plus 2 hour Walk/ week (60% peak heart rate), + Calzium **E2:** Milkpowder containing 1g Ca **E3:** 1g Calzium as tablett **C1**: Placebo 24 months	**Primary outcome:** BMD DXA (FN, Trochanter, Intertroch, ankle) **Secondary outcome:** iso. strength of knee extensors, grip strength, max. walking speed, balance **Results:** E1 versus E3: E1 sig gain at FN (0,46% mean diff in change) no sign. diff. at other sites between the intervention groups **Compliance:** Compl with ex: 39%	compliance with exercise very low	**5/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect, clinical relevance limited**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Englund et al [55]	Setting: out-patients n= 48 community dwellers Age: 66-87y Inclusion criteria: postmenopausal Exclusion criteria: Dementia, current smoking, current HRT, use of walking aid cardiovascular disease, functional disability of a degree, that would contraindicate physical exercise	**E:** mixed weight bearing exercise, 2x/week 10min warm-up, mix (27min.) of strengthening exercises (2x8-12 reps); balance and coordination exercises (static and dynamic); aerobic , 11min. cool down no jumping activities If subjects missed out seesions they were asked to perfom home exercises like brisk walking, squats, hand grip training with t-foam **C:** no training 12 months with 5 weeks break in the summer	**Primary outcome:** BMD DXA (FN, trochanter, Ward's, Lx) **Secondary outcome:** iso. strength of knee extensors, grip strength, max. walking speed, balance **Results:** BMD ward triangle 8.1% mean diff; sign. no sign. diff. at other sites **Compliance:** 17% dropt-outs together; E (1 dementia, 1 heart failure, 1 unspecified knee pain), C (2 lack of interest, 1 death, 2 started exercise classes) 67% adherence to intervention	only sign. change was observed in the ward's triange which can not be conisdered as clinical relevant BMD wards triangle sig. lower in exercise group at baseline, improved balance in 1-leg stance	**4/ 10** [Eligibility criteria:Yes] Random allocation: Yes Concealed allocation: No Baseline comparability: No Blind assessors: No Blind subjects: No Blind therapists: No Adequate follow-up: Yes Intention-to-treat analysis: No Between-group comparisons: Yes Point estimates and variability: Yes **confirmed**	**II** **positive effect, clinical relevance not given**
Preisinger et al [57]	Setting: home exercises n=146 community dwellers Age: 45-75y Inclusion criteria: at least 1 yr. postmenopausal, sedentary Exclusion criteria: any chronic disease, malabsorption, smokers, use of estrogens/ steroid hormones, anticonvulsant drugs, diuretics, any drugs affecting bone metabolism	**Intervention:** warm-ups (walking, modest jogging, moderate skill exercises) stretching, complex exercises to improve posture, strength, neuromotor control, coordination and trunk stabilization using elastic bands and unstable equipment such as gymnastic balls **E1:** 3xweek, at least 20 min. **E2:** irregularly, < 1h per week Supervised 20 times first 10 weeks, later 5 times every 6 mo., **C**: no training 3±1.3 yrs.	**Prim. outcome:** single photon absorptiometry non-dominant forearm (BMC, bone width, BMD **Results: mean % BMD/ yr** **E1 vs. E2:** distal 1.5%, sign., prox: 0.9% sign. **E1 vs. C:** distal 1.4%, sign., prox. 1.2%, sign. **Drop-outs:** no **Compliance** (% completed weekly sessions) **E1**: 48%	poor compliance, maybe due to rare supervision; measurement site not relevant for the administered trainings regime	**3/ 10** [Eligibility criteria: Yes] Random allocation: Yes Concealed allocation: No Baseline comparability: No Blind subjects: No Blind therapists: No Blind assessors: No Adequate follow-up: No Intention-to-treat analysis: No Between-group comparisons: Yes Point estimates and variability: Yes **Confirmed**	**III** **positive effect, limited clinical relevance**
McMurdo et al [58]	Setting: out-patients n=118 Age: 60-73 Inclusion criteria: postmenopausal Exclusion criteria: medication affecting bone metabolism	**E:** weight-bearing exercises with music (endurance, low-resistance muscle strengtheninng and suppleness), calcium; 3/week 45min. Control group: calcium 3x 10 weeks per year over 2 years	**Primary outcome**: BMC SPA distal forearm, BMD QCT Lx **Secondary outcome:** number of falls, fractures **Results:** 3.74% mean diff. BMC ultradistal forearm, sign. no effect other sites 2 fractures in C within 2 years sign. less falls in E in the 2. year **Compliance:** E: 26%; C: 22% drop-outs, no reasons given mean adherence to iexercise 76%	no description of the exercise regime	**2/ 10** [Eligibility criteria: No] Random allocation: Yes; Concealed allocation: No; Baseline comparability: No; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: No; Point estimates and variability: Yes. **confirmed**	**III** **positive effect, clinical relevance not given**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Bassey et al [65]	Setting: center and home-based exercises n=61 premenopausal women + 124 postmenopausal women Age: 37-59y Inclusion criteria: premenopausal or postmenopausal Exclusion criteria:nerve-root compression, medication or diseases which effect BMD, contraindication to exercise, osteoporosis	**E1:** premenopausal exercise group **E2:** postmenopausal exercise group on HRT for at least 12 month **E3:** postmenopausal exercise group no HRT **C1:** premenopausal control **C2:** postmeno control on HRT for at least 12 month **C3:** postmeno control no HRT 50 vertical jumps plus stretching, 6x/ week, at least 1 under supervision 1 premeno. control and 1 postmeno control 12 month	**Primary outcome:** DXA: BMD prox. femur and LS **Secondary outcome:** WBC, muscle power **Results:** E1 versus C1: sig. increase BMD at prox femur **postmenopausal groups**: no effect of exercises no matter of HRT-Status **Compliance:** drop-outs: 4% attendence. 67%	exercise effect only for premenopausal	**5/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: Yes; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **postive effect premenopausal,** **no effect post menopausal,** **clinical relevance fully given**
Lord et al [63]	Setting: out-patients n=179 community dwellers Age: 60-85y inclusion ciriteria: postmnopausal Exclusion criteria: major cardiovascular/ musculoskeletal disorders, already trained intensively.	**E:** 5 min. warm-up, 25 min. conditioning period (aerobic exercises, activities for balance/ hand-eye coordination/ foot-eye coordination, strengthening), 15 min. stretching, 5-10 min. cool-down, focus on group activities and social interaction **C:** no training 2 x week, 12 months (10-12 weeks training, 1-2 weeks off, together 42 weeks exercise)	**Prim. outcome:** BMD DXA (L2-L4, transcervical area femoral neck, trochanter) **Second. outcome:** isometric quadriceps strength, body sway **Results:** E: no sign. effect on BMD compared to control **Compliance** (% completed weekly sessions) **Drop-outs:** E: 24% (2 death/ 4 injuries not related to training, 1 change of residence, 15 irregular attendance) C: 21% (3 change of residence, 15 withdraw consent) Total: 23% E: 72.9% attendence		**4/10** [Eligibility criteria: Yes] Random allocation: Yes Concealed allocation: No Baseline comparability: Yes Blind subjects: No Blind therapists: No Blind assessors: No Adequate follow-up: No Intention-to-treat analysis: No Between-group comparisons: Yes Point estimates and variability: Yes **Confirmed**	**II** **no effect,** **clinical relevance fully given**
Bassey et al [64]	Setting: center and home-based exercises n=63 community dwellers Age: 50-60y Inclusion criteria: at least 1 years postmenopausal Exclusion criteria: HRT, vigorous physical activity (such as squash, jogging), recent injuires, predescribed medication, cardiovascular signs which might restrict exercises tolerance	**E1:** 50 heel drops per day performed without shoes on hard surface, 2.5-3 times of body weight with a rate of rase of 50-100 NN/ sec. controlled by force plate measurements, additionally weekly class of low-impact acitivites (rebounding) **C:** weekly class of low-impact acitivites (rebounding) + flexibility exercises at home 12 months	**Primary outcome:** BMD DXA (hip, Lx, radius) **Secondary outcome:** muscle strength, coordination, balance **Results:** no sign. results **Compliance:** 30% drop-outs in total (famaily pressures, illness) no injuries due to exercise	poor compliance, questionalble usefulness of measured site in relation to the applied training	**4/ 10** [Eligibility criteria:Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: No; Blind assessors: Yes; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect,** **clinical relevance limited**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Lau et al [66]	Residents of a hostel for elderly, n=50 chinese women Age: 62-92y Inclusion criteria: postmenopausal Exclusion criteria: metabolic bone disease, diabetes mell., hx.of hip fracture, dementia	**E1:** Ca 800mg daily **E2:** placebo pill daily + load-bearing exercises 4x week, stepping up and down a block 100 times and exercise moving the upper body for 15 min. **E3:** Ca 800mg daily + load-bearing exercises 4x week **C:** placebo pill daily 10 months 10 months	**Prim. outcome:** BMD DXA (L2-L4, femoral neck, ward triangle, intertrochanteric area) **Second. outcome:** parathyroid hormone levels and indices of bone metabolism **Results:** **no data is given about between group differences!** Ca alone increased BMD sig. at ward triangle and intertr. area ., not at LS. Exercise alone showed no sign. effect at any site? Interaction of Ca + exercise showed sign effect on fem. neck, not at other sites. **Compliance:** 17% Drop-outs:	exercise regime not further described (supervised or home exercise?) chinese women	**4/ 10** [Eligibility criteria: Yes] Random allocation: Yes Concealed allocation: No Baseline comparability: Yes Blind subjects: No Blind therapists: No Blind assessors: No Adequate follow-up: No Intention-to-treat analysis: No Between-group comparisons: Yes Point estimates and variability: Yes c**onfirmed**	**II** **no effect** **clinical relevance limited**
osteopenic/ osteoporotic; strength agility training						
Liu-Ambrose et al [67]	Setting: out-patients n=106 community dwellers Age: 75-85y Inclusion criteria: lpostmenopausal, osteoporosis or osteopenia Exclusion criteria: care facilities, non-caucasian regular exercise 2x/week, chron. disease or medication affecting bone metabolism, MMSE<24	**E1:** Resistance training, progressive, 75-85% 1RM, two sets; upper and lower extremities, trunk, **E2:** Agility training: coordination, balance, reaction time, use of ball games, relay races, dance, obstacle courses; **C:** Stretching: stretching and relaxation 2x/ week, 50min, 25 weeks	**Primary outcome:** pQCT Tibia and Radius, DXA Femur **Results:** E1 vs E2: cortical bone density (30% of radius) mean diff. 1.8%, sign. E2 vs. C: cortical bone density (50% of tibia) mean diff. 0.9%, sign. no sigs. diff at other sites no sig. diff. for DXA **Compliance:** 6% dropouts together; E1 (1 due ot death, 1 due to time commitments); E2 (2 due to time commitments), C (1 due to illnes, 1 due to time commitments) adverse events: minor musculoskeletal complaints in al groups (muscle soreness)		**6/ 10** [Eligibility criteria: yes Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind assessors: yes Blind subjects: no Blind therapists: no Adequate follow-up: yes Intention-to-treat analysis: no Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **positive effect,** **clinical relevance fully given**
Hans et al [68]	Setting: out-patients n=200 community dwellers Age:60-85y Inclusion criteria: at least 5 years postmenapausal, osteoporotic or osteopenic Exclusion criteria: diseases or medication affecting bone metabilism (besides Ca), prior hip fracture, acute signs of vertebral fracures, symptomatic OA knee or hip	**E1:** daily heel drop training on "Osteocare system" including a response generating and force measuring platform; 120 correct heel drops in 3-5min., beginning with 25% of resting force up to 50% of resting force after 6 months; rise time <20msec., rep. rate 1/3-2/3 Hz **E2:** sham intervention on osteocare (dito), but slow heel drops with no specific impact **C:** no Training 24 months all subjects were supplemented with Ca+Vit. D	**Primary outcome:** BMD DXA (tot. Hip, FN, trochanter, inter-tochanter Ward's)) **Results:** no sign. results **Compliance:** 25% drop-outs in the first 6 months 50%-70% adherance	poor compliance, questionalble usefulness of measured site in relation to the applied training	**6/ 10** [Eligibility criteria: No] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind assessors: Yes; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect,** **clinical relevance limited**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
medication, osteopenic/ osteoporotic, vibration exercise						
Iwamoto et al [69]	Setting: out-patients n=50 Age: 55-88y Inclusion criteria: postmenopausal, osteoporosis, osteoporotic fractures, Exclusion criteria: osteoarthritis, degenerative discogenic disease, other musculosceletal disease, arthroplasty (hip/ knee)	**E1:** alendronate (ALN) **E2:** alendronate plus exercise (ALN/EX) - Vibration Ex. 20HZ, 1x/ week, 4 min, 6 month	**Primary outcome:** BMD LS, Vertebral fractures, Back Pain, blood samples **Sec.outcome:** number of falls **results:** no sign. diff. between E1 and E2 in the increase of BMD, though no exercises effct no new fractures, 2 falls in ALN, 1 fall in ALN/ EX **Compliance:** no drop out	Japanese women, training intensity very low	**4/ 10** [Eligibility criteria: yes Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind assessors: no Blind subjects: no Blind therapists: no Adequate follow-up: yes Intention-to-treat analysis: yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **no effect,** **clinical relevance limited**
osteopenic/ osteoporotic; mixed exercises						
Bravo et al [70]	Setting: center and home-based exercises n=124 community dwellers Age: 50-70y Inclusion criteria: at least 1y postmenopausal, osteopenic Exclusion criteria: matched for bone affecting medication	**E:** weight-bearing exercise at 60-70% max. heart rate; 10min. warm-up, 25min. rapid walking or aerobic dancing, 15min. stepping up and down benches, 15min. strength training (12-15 reps) major muscle groups with rubbber bands or additional weights, 5min. cool-down includeing balance and coordination exercises 3/week 60 min duration **C:** education seminar 12 months	**Primary outcome:** BMD DXA (Lx, FN) **Secondary outcome:** functional fitness, LBP, psychosocial well-being **Results:** Lx: 1.8% mean diff., sign. FN: 0.8% mean diff., ns **Compliance:** 13% drop-outs together due to worsening of physical and psychological health, equal distribution both groups,		**7/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: Yes; Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**I** **positive effect,** **clinical relvance fully given**
Judge et al [72]	Setting: center and home-based exercises n=189 community dwellers Age: 59-76 y. Inclusion criteria: HRT>2y. tot. fem. T-score, -0,8-2,8 , postmenopausal Exclusion criteria: smok., alkohol >2 drinks/d, med. affect. BMD, hip fr., BMI>32, cancer within 5y, hypercalc., renal insuff., resist. train. prior 1y	**E1:** resist. train. upper body (elastic bands and dumbbells) without loading the femur **E2:** lower body (chair rises and step-ups with weight belt 7,8kg) (3x/week, 45-60 min, first supervised, later most training at home with tapes and manuals) both groups performed together 15 min. low back and abdominal exercise and should walk 45 min/ week **no control group** 24 month	**Primary outcome:** BMD le fem, lumb. spine, radius, tot. body **Secondary outcome:** bone markers, hormones, adherence, phys. act., 1RM seated leg press, chair rise time, gait speed, 6min walk dist., SF-36 **Results:** E1 and E2: BMD increase at all sites except radius no diff. between groups, 6 months observation before start: BMD femur decline **Compliance:** drop out 17,4% (upper body), 19,6% (lower body), 15 orthopaedic probl., adherence 25,7 of 28 classes (first 6 month)	both groups took HRT for at least 2 years	**5/ 10** [Eligibility criteria: yes Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind assessors: no Blind subjects: no Blind therapists: no Adequate follow-up: no Intention-to-treat analysis: yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **positive effect,** **clinical relevance fully given**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Iwamoto et al [71]	Setting: out-patients n=35 community dwellers Age: 53-77y Inclusion criteria: postmenopausal, osteoporosis Exclusion criteria: OA, deg. disc. disease, other musc.- scelet. disease, arthroplasty (hip/knee)	**E1**: daily brisk walking monitored by pedometers, 30% increase of steps every week, 2 sets of gymnastics daily (straight leg raising, squats, trunk muscles), 2 years **E2**: like E1, but only 1 year **C:** no training all subjects received Ca+Vit. D3 supplemantation	**Primary outcome**: BMD DXA (Lx) **Secondary outcome:** bonemarker **Results:** E1 vs C: 4.3% mean diff. after 1 year; sign.; 4.3% mean diff. after 2 years; sign. E2 vs C: 4.5% mean diff. after 1 year; sign.; 2.2% mean diff. after 2 years; ns **Compliance:** all subjects did their additional gymnasticxat least 5 day/ week no drop-outs	Japanese women, small n	**6/ 10** [Eligibility criteria: Yes] Random allocation: Yes Concealed allocation: No Baseline comparability: Yes Blind assessors: No Blind subjects: No Blind therapists: No Adequate follow-up: Yes Intention-to-treat analysis: Yes Between-group comparisons: Yes Point estimates and variability: Yes **confirmed**	**II** **positive effect** **clinical relevance limited**
Prince et al [74]	Setting: center and home-based exercises n=162 Age: mean age around 55y Inclusion criteria: >42y, postmenopausal 1-10y, osteopenic, no chronic disease, nonsmokers, no HRT, no med, BMD >290mg/cm2	**E1:** EX **E2:** EX/ Ca **E3:** EX / HRT all osteopenic **C:** nothing (normal BMD!) exercise**:** 1x/ week class (low-impact, 30% of time reserved for arm ex.) plus 2x30min brisk walking 24 month	**Primary outcome:** forearm BMD (SPA) **Results:** E1 versus C: no sign. diff. E2 versus E1 and C**:** bone loss sign. higher E3: sign. increase BMD positive correlation between change of BMD and change of phys. activity level **Compliance:** att. of 10 classes in 12 weeks, EX 56%, EX/Ca 24%, EX/HRT 44%, drop out: EX/ HRT 8, EX 6, EX/ Ca 3	control group had normal BMD at baseline very low attendance of exercise classes SPA	**6/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: Yes; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect,** **clinical relevance limited**
Preisinger et al [73]	Setting: center and home-based exercises n=92 community dwellers Age: 45-75y Inclusion criteria: mild to moderate low back pain, at least 1y postmenopausal, osteoporosis, sedentary Exclusion criteria: nerve-root compression, medication or diseases affecting bone metabilism	**Intervention:** moderate intensity warm-up; exercises imroving flexibility, postural stability, motor control, coordination and muscle strength (Brunkow, Klein-Vogelbach, Brügger; Knott) including rubber bands or swiss ball initially 10 sessions, home exercise 3x week, 10x year supervised sessions **E1:** compliant, 20min. 3/ week, **E2:** non-compliant, less than 1hour/ week **C:** no-exercise 4 years	**Primary outcome:** BMD SPA forearm **Secondary outcome:** fractures **Results:** E1 vs.C: no sign. diff. between groups **Compliance:** 56% drop-outs altogether (no reasons mentioned)	measurement site not relevant for administered trainings regime	**4/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: No; Point estimates and variability: yes **confirmed**	**II** **no effect,** **clinical relevance limited**

endpont BMD						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
male and female, mixed exercise						
Stewart et al [75]	Setting: out-patients n=115 community dwellers, male+female Age: 55-75y Inclusion criteria: ow back pain, post menopausal Exclusion criteria: cardiovascular diseases, medication or diseases which affect BMD (besides HRT), exercisers >90 min. per week	**E1:** warm-up with streching, prog. strengthening 50% 1RM, 45 min. aerobic exercise (treadmill, stationary cycle, stepper) at 60% of max. HR, 3 x week **C1:** no training 6 months	**Primary outcome:** BMD DXA (Lx, hip) Secondary outcome: muscle strength **Results:** no sign. effect for mixed group sub-group only women: total skeleton: sign diff. compared to C greater trochanter: sign diff. compared to C **Compliance:** 10% dropout (unrelated to exercise), 88% attendence	short study period positive results only in female sub-group	**5/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **effect only in sub-group** **clinical relevance limited**

endpoint fall incidence						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
home-dwelling fallers, non-fallers; monofactorial interventions						
Davison et al [85]	**Setting** : Accident & emergency centre, uni., UK **Sample**: Patients with recurrent falls **N** = 313 randomized, 282 finished 1 year Age : Mean 77 y Sex : both **Incl**: Congnitive intact, fall history of at least 1 fall / last y **Excl**: MMSE < 24, history of syncopes, immobility, living away from centre > 15 miles, accute myocard infacrtion, stroke, epilepsy	**Exp**. group Physiotherapy and occupational therapy assessment (various and highly sophisticated) But only 3 x within 32 days in mean ! **Contr**.group : Conventional care (but 21 % received a form of falls intervention as well)! 1 year follow-up	**Number of falls** (fall-diaries as postcards) 36 % fewer falls in exp group **Number of fallers**: Not sign **Injury rates** : Not sign Fall-related hospitalisation, fewer in exp group mortality not sign	Intervention regime is not clearly , ranges in number of therapies are very wide. Controls in some cases had more exercises than Experimentals.	**7/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind subjects: yes Blind therapists: no Blind assessors:no Adequate follow-up:yes Intention-to-treat analysis: yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**I** **positive effect** **clinical relevance fully given**
Hornbrook et al [86]	**Setting**: members of a HMO, Portland, Vancouver, Washington Sample :independently living persons, 65 + **N** : 3118 randomized, finished ? Age: 73 mean Sex: both **Incl**: ambulatory, English-speaking, able for written informed consent **Excl**: being institutionalized, blind, deaf, housebound, mentally ill, terminally ill, living more than 20 miles away from the centre	**Exp**.group: Multi-disciplinary (home safety, behaviour, exercise) 90 min. monthly group meeting. Exercise incl: easy strengthening, balance, flexibility. Part. Were encouraged to walk 3x / week, 2 years **Contr**. Group Only home assessment with information on fall risks	**Fall rate**: Was lower among exercisers comp. with contr. **Risk to become a faller** : Was lower in intervention group	Intervention was not of sufficient intensity and / or duration to achieve protective effect	**5/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind subjects: yes Blind therapists: no Blind assessors:no Adequate follow-up: yes: Intention-to-treat analysis: no Between-group comparisons: yes Point estimates and variability: no **confirmed**	**II** **postive effect** **clinical relevance not given**
Steadman et al [87]	**Setting**: district general hospital, falls clinic **Sample**: elderly patients at risk f. falls **N** = 198 Age : 82 at mean Sex : both, 82 % female **Incl**. 60 years +, balance problems, BBS < 45 pts, **Excl**: amputees, unability to walk less than 10 m, recent stroke (6 months), progressive neurological disorder, severe cognitive impairment	**Exp** group: Conventional therapy with treatment for elderly pat with mobility problems plus Enhanced therapy specific to functional balance : Sit to stand, Balance Performance Monitor, lateral reaching, step-ups, tandem standing, walking practice with time feedback Progressive adjusting 45 min, 2x / week over 6 weeks **Contr**. Group: Conventional therapy with treatments for pat with mobility problems: assisted walking, stair practice, mobility skills, transfers, sit to stand 2x / week over 4 weeks	**Outcomes**: 10 m timed walk, Berg Balance Scale, Frenchay Activity Index, Falls Handicap Inventory, QoL **Results** : Significant improvement in BBS, number of falls, FHI for Contr. In comp to baseline Significant improvement in balance, falls, TWT, QoL for Exp. from baseline, but no differences between to treatment strategies		**5/ 10** [Eligibility criteria: yes] Random allocation: no Concealed allocation: no Baseline comparability: yes Blind subjects: yes Blind therapists: no Blind assessors: no Adequate follow-up:no Intention-to-treat analysis:yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **positive effect,** **clinical relevance fully given**

endpoint fall incidence						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Morgan et al [89]	n: 294 Sample: allmost all were post bed rest (only 1 posthospitalisation) Age: 60 and older Sex: f/m **Inclusion criteria:**hospital admission lasting 2 days or longer OR bedrest for 2 days or more within the previous month **Exclusion criteria**:(see table 1) - medical condition that made participating unsafe, (e.g., resting angina, severe osteoporosis) - lost ability to follow instructions (e.g. dementia) - needed help (e.g. human assistance, oxygen therapy, wheelchair, artificial limbs)	**Experimental group:**Easily implemented, low-intensity exercise program (SAFE-GRIP): 24 exercise sessions (including warm up and cool down) lasting 45 min (3 times a week for 8 weeks) in small groups a 5 persons (individualisation possible) **goal**: improve neuromuscular functioning, balance and gaite.g. seated gymnastics, standing balance exercises…(see p. 1064 for examples) **Control group**:No intervention, Participants were instructed to continue their usual activities	**Primary outcome**: - incidence of falls - time to first fall or end of the follow up **Results**: - 68 (of the 229, 29.7%) reported a fall during study period (no significant difference in the two groups). After splitting each group in one with high baseline PF (Physical Functioning) and one with low baseline PF the effect of exercise in preventing falls varied signifiantly by PF level: **exercise group**: risk of falling decreased with low baseline PF and increased with high baseline PF **- fall risk associations:** history of previous falls, higher age, higher amount of medication, low baseline PF, gait oder balance) **Follow-up**:Number of falls one year after baseline assessment (Participants send back predated postcards every 2nd week for 1 year) **Compliance:** - 433 were screened- 294 passed both screenings and were randomized- 245 did baseline assessment (49 stopped for varied reasons)- 229 started intervention and controldesign (8 missed out some of the baseline measures)- 157 finished the study (72 dropped out before reaching one of the studies endpoints)	all posthospitalization participants but one were excluded because of exclusion criteria so this is basically a study about community based "post bed rest" Participants. Age, Gait score and balance score were not significantly related to time to first fall after controlling for PF level, history of falling and number of medications…activity levels were not measured	**5/ 10** [Eligibility criteria: Yes] Random allocation: Yes Concealed allocation: No Baseline comparability: Yes Blind subjects: No Blind therapists: No Blind assessors: No Adequate follow-up: No Intention-to-treat analysis: Yes Between-group comparisons: Yes Point estimates and variability: Yes **confirmed**	**II** **positive and negative effect,** **clinical relevance fully given**
Barnett et al [90]	**Setting**: community based group exercise with ancillary home exercises over 1 year n= 163 Sample: at-risk community-dwelling older people who attended a general practice clinic or a acute hospital PT department Age: over 65 Sex: **Inclusion criteria**:- one or more physical performance impairment (risk factor for falls that could be addressed by exercise) - lower limb weakness- poor balance- slow reaction time **Exclusion criteria**: - cognitive impairments - degenerative conditions - medical condition involving neuromuscular, skeletal or cardiovascular system	**Experimental group**: - 1 hour weekly exercise group performed to music (37 classes in all, over 4 terms) - home exercise program based on the class content and diaries to report participation - written information on practical strategies for avoiding falls the Program was specifically designed to address physical falls risk factors, e.g. balance, coordination, aerobic capacity, muscle strength **Control group**:No intervention but the same written information on practical strategies for avoiding falls	**Primary outcome**: - physical performance (e.g. knee strength, simple reaction time, sway, leaning balance) - health status (e.g. general health, physical finction, vitality, mental health) - fallsResults:Falls:40% lower falling rate in the intervention group (significant)and significantly lower rate of Participants reporting two or more falls. Physical performance:Significantly better performance in the interventiongroup only in 3 Balance measures **Follow-up**:6 month follow-up about physical performance and general health measures12 month follow-up, using monthly postal surveys **Compliance**:26 did not complete all stages of the project33% attended 30 or more classes91% did at least once a week the home exercise, 13% did it daily	The program based on balance exercises!! (see FICSIT studies: programs that contain balance componens are the most effective programs for preventing falls in elderly people)	**8/ 10** [Eligibility criteria: Yes] Random allocation: Yes Concealed allocation: Yes Baseline comparability: Yes Blind subjects: Yes Blind therapists: No Blind assessors: No Adequate follow-up: Yes Intention-to-treat analysis: Yes Between-group comparisons: Yes Point estimates and variability: Yes **confirmed**	**I** **positive effect,** **clinical relevance fully given**

endpoint fall incidence						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Means et al [91]	**Setting:** outpatient rehabilitation center n: 338 Sample: elderly community dwelling fallers and nonfallers Age: 65 years and older Sex: f/m **Inclusion criteria:** - 65 years and older - ability to walk at least 30 feet with or without an assistive device and without physical assistance from others - ability to comprehend instructions and give consent **Exclusion criteria:** - living in a nursing home - akute medical problems - cognitve impairment - hospitalisation within the past month	**Experimental group**:6 weeks (3 times a week for 90 min) of supervised moderate exercise, consisting of stretching, balance, endurance, coordination and strengthening including cool down and warm up to improve balance and mobilityà progressive change in frequency and repetitionsà groups of 6-8 **Control group:**Series of seminars on various, non-health-related topics of general interest to senior citizens (fraud prevention, tax, gardening, pet-care…), presented by volonteers.à 20 persons per group	**Primary outcome:**Completion time and performance quality on a functionally oriented obstacle course (FOC) **Secondary outcome**: - Health outcome related to balance and mobility - subsequent falls (6 month before and after) - fall-related injuries **Results**: Only for Falls:Significantly more people (baseline-fallers) from the intervention group (87%) shifted to the non-fallers at 6 month follow up than from the control group (34%) **Follow-up:**- Reassessment at 6 weeks-Reassessment at 6 monthsCompliance:38% dropped out for the 6month follow up	what happend to the non-fallers?	**5/ 10** [Eligibility criteria: yes Random allocation: yes Concealed allocation: yes Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: no Adequate follow-up: no Intention-to-treat analysis: no Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **positve effect,** **clinical relevance fully given**
Reinsch et al [97]	**Setting :** 16 senior centres, Los Angeles **Sample:** adults 60 plus **N =:** 230 Age: 74,2 at mean Sex: both **Incl:** meeting the age group, agreement to physician's approval **Excl:** not stated	**Expergroup:** 1.exercise: stand-up from sit to stand / step up on toe 6 inch step at low intensity focused on strength and balance, 1 hour, 3 / week over 1 year 2. exercise and cognitive exercise as above plus relaxation training, discussion of safety topics, 1 hour, 3 / week over 1 year 3. cognitive and behavioral: health and safety curriculum to prevent falls, relaxation training, video to improve reaction time 1 hour 1 / week over 1 year **Contr.group :** dicussion: health and discussion topics with no special topics 1 hour 1 / week over 1 year	**Outcomes:** Falls, injuries, sec : muscular strength and balance of lower extremities **Results:** Slight improvement in secondary outcomes from initial assessment to assessment after intervention for both exercise groups in contrast to behavioral and discussion group. No differences between groups for falls and fallers	explanations for no effects: -not sufficient intensity of exercises, -interventions may have been successful but made patients more confident of their abilities, increased outdoor activities which exposed them to more opportunities for falls	**4/ 10** [Eligibility criteria: no] Random allocation: yes Concealed allocation: no Baseline comparability:yes Blind subjects: no Blind therapists: no Blind assessors: no Adequate follow-up:no Intention-to-treat analysis:no Between-group comparisons:yes Point estimates and variability:yes **confirmed**	**II** **no effect,** **clinical relevance not given**

endpoint fall incidence						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Rubenstein et al [92]	**Setting** Ambulatory Care Center, USA **Sample:** ambulatory men **N =** 59 randomized, 52 finished Age 74 years mean Sex : Men **Incl:** ≥ 70 y, at least 1 of defined fall risk factors (muscle weakness, gait, balance, mobility) **Excl** Regular exercise, cardic / pulmonary disease, terminal illness, severe joint paint, dementia, neurology disease	**Exp.group** 12 week group exercise 3x / week, 90 min. Focus : increase strength, and endurance, improving mobility, balance (with outlined exerc. protokoll) **Contr. Group** Observation	**Isokinetic strength + endurance** Increased with exerc. **5 physical perf tests** Improved with exercise **self-rep physical functioning** no effect **health perception** activity level increased with exerc **falls** no effect, rather fall-association with growing activity level	Relatively small sample size, short follow-up period may produce limited study power	**7/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation:yes Baseline comparability:yes Blind subjects: no Blind therapists:no Blind assessors: yes Adequate follow-up: yes Intention-to-treat analysis:no Between-group comparisons:yes Point estimates and variability:yes **confirmed**	**I** **no effect,** **clinical relevance fully given**
Lord et al [93]	**Setting:** census collector's district in Sydney **Sample:** independent elderly, living in the community Age: 72 mean Sex: women **N:** 197 randomized, 151 finished **Incl:** ≥65 y, living independent in the community **Excl:** Not english-speaking	**Exp.group :** 1 hour exercise sessions 2x / week, 1 year with detailed program, conditioning period focused on aerobic and strengthening exercise, balance flexibility endurance. Assessments contained : muscle strength, reaction time, neuromuscular control (detailed protokol) **Contr. group** Only assessment	**Falls** No evidence on falls, but different fall types **Sway** **Reaction time** **Neuromuscular control** **Muscle strength of lower limb** Significant improvements in every function test for exercisers, no change for controls		**4/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: no Adequate follow-up: no Intention-to-treat analysis: no Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **no effect** **clinical relevance fully given**
Steinberg et al [98]	**Setting :** 10 branches from National Seniors Association, Brisbane, Australia **Sample:** Well older community dwelling people **N =** 252 randomized, 249 finished Age no info on mean / median Sex : both **Incl:** Member of obove mentioned homes > implicates to be capable of study situation, understand requirements, meet targeted age of 50 + **Excl:** not stated	**Exp group :** 1= video + handout on risks and home safety and prevention 2 = 1 hour exercise class, 1 / month with handout and video for at home between classes 3 = home safety assessment with advice and financial support for modification 4 = clinical assessment with advice on medical risk factors for falls 12 months follow-up, **group 1 was declined as control**	**Time to first slip** Significant reduction in groups 2,3,4 compared with 1 **Trips** Significant reduction in groups 2,3,4 compared with 1 **Falls** No evidence	No random of individuals but of institutions, strange statistics (complicated risk models and combination of intervention)	**5/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: no Adequate follow-up: yes Intention-to-treat analysis: no Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **no effect** **clinical relevance limited**

endpoint fall incidence						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Nitz et al [94]	**Setting**:n=73 Sample: elderly people living independantly in the community who had fallen in the previous year Age: over 60 Sex: 67 females and 6 males **Inclusion criteria:** - living independently in the community - over 60 years - a fall in the previous year **Exclusion criteria:** - no fall recently - unstable cardiac condition - lived too far away - could not guarantee regular attendance	**Experimental group**: - Specific balance strategy training program (workstation format): once a week 1 hour for 10 weeks- falls risk education booklet- incident callender for the duration of the study **Control group**: - "Typical" balance exercise class in the community to prevent falls and improve balance and function- falls risk education booklet	**Primary outcome**:Number of falls **Secondary outcome**: - co-morbidities - medications - activity level - functional motor ability - balance measures - fear of falling **Results**: Falls:Main effect for falls reduction due to the interventions but no significant difference in fall reduction between groups **Follow-up**:After 3 monthsCompliance:Only 32 participants completed (19 balance, 13 control) 41 Participants did not finish the follow up!	Examples are given for workstation. Unclear what balance-training is for them	**5/ 10** [Eligibility criteria: yes Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind subjects: yes Blind therapists: no Blind assessors: no Adequate follow-up: no Intention-to-treat analysis: no Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **no effect,** **clinical relevance fully given**
Latham et al [99]	**Setting**: Five hospitals in Auckland, New Zealand, and Sydney, Australia. Sample: Frail older people after hospital discharge(Frail= one or more healthproblem or functional limitation from a list of indicators) n: 243 Age: 65+ Sex: men/women **Inclusion criteria**: - 65+- frail - no clear indication or contraindication to either of the study treatments (which means, that the clinician had uncertanty about the benefits of the treatment for a specific patient) **Exclusion criteria**:· Poor prognosis and were unlikely to survive 6 months· Severe cognitive impairment· Physical limitations· Unstable cardiac status· Large ulcers about the ancles· Not fluent in english	**Resistance exercise group** (120):Quadriceps strength exercises with adjustable ankle cuff weights, 3 times a week at 60-80% of the patients "one repetition maximum" (1RM) (MaxKraft), 10 weeks with frequency matched social home visits **Exercise control group** (123):Same frequency of phone calls/home visits as resistance training group, but no specific intervention. **Vitamin D group** (121):Vitamin D was given in a single oral dose, 6 1.25mg calciferol tablets. **Placebo group** (122):Like Vitamin D group, but placebo tablets.à primary aim was not to investigate the interactive effects of the interventions, all results are reported for the IG and CG for each intervention	**Primary outcome:**Physical health (at three month)Falls (over 6 months) **Secondary outcome**:Physical performanceSelf-rated function **Results**:No significant effect of either intervention on physical health or falls.Vitamin D did not improve physical performance, even if the subjects were Vitamin D deficient. **Compliance:28** deaths14 refusals **Follow-up**:- after 3 months- after 6 months		**8/ 10** [Eligibility criteria: Yes] Random allocation: Yes Concealed allocation: Yes Baseline comparability: Yes Blind subjects: No Blind therapists: No Blind assessors: Yes Adequate follow-up: Yes Intention-to-treat analysis: Yes Between-group comparisons: Yes Point estimates and variability: Yes **confirmed**	**I** **no effect,** **clinical relevance fully given**

endpoint fall incidence						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Li et al [88]	**Setting** Local health system,Portland, USA **Sample** Physically inactive older adults, community dwelling **N =** 256 randomized, 222 fininshed Age : mean 77 y Sex :both **Incl** ≥ 70 y, being inactive concerning regular exercises previous 3 months, independent, physician's clearance **Excl :** chronical medication with influence, cognitive impairments	**Exp group =** 1 = Tai Chi by instructor 2 = stretching exercise 60 min, 3x / week 6 months, plus 6 months follow-up without structured exercises with explicit protocol	**Functional balance :** **(BBS)** **(DGI)** **(FR)** evidence between t1 and t2 as well as in comparison to stretching group. Besides longer effect after discontinuing intervention **Falls** Significant effect for Tai Chi in comp. to stretching	No strength measurement High precision but no evident accuracy (what does Tai Chi lead to ?)	**4/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: no; Baseline comparability: yes Blind assessors: no; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: no. **confirmed**	**II** **positive effect** **clinical relevance limited**
Hauer et al [95]	Out-patient geriatric rehabilitation unit Female N=57 Age=/>75 yr, history of injuious falls as reason for hospital	**Exerc.therapy:** 3x/week for 12 weeks Warm up: bicycle 25 Watt 10min High intensity PRT, at the beginning with minimal resistance: leg press, hip abd./extens. By cable pully system, ankle planta flex, Stretching Progressive functional-balance training in static and dynamic positions (throwing, catching a ball, basic forms of tai chi)Placebo: 3x/week motor placebo activitiesPhysiotherapie: 2x/week for acute orthopaedic problemsPatients documented all falls in a diary every day	no significant reduction of fall incidence Fall incidence during 6 month: RR=0.753, 95% CI=0.455-1.245Muscle strength and functional performance improved	Fall Def: BuchnerAhospital committee adjudicated questionable fall events. Syncopal falls were excluded	**6/ 10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: Yes; Adequate follow-up: No; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect** **clinical relevance limited**

endpoint fall incidence						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Ballard et al [96]	**Setting**: ambulatory, community- dwelling N=40Age: 65 and older Sex: f I**nclusion criteria**: Histories of falling , minimum 1 fall during the last yr. Or fear of a future fall **Exclusion criteria** : 1. serious injury 2. cardiovascular disease not able to perform moderate exerc. 3. disease causing extreme vertigo and exerc. Not expecting change 4. walker for support	**Exerc.program**: · 1 h/ 3 times/week· 15 weeks· warm-up 5-10 min, low-impact aerobic routine 20-30 min, functional leg strength and balance work 5-10 min, elastic band routine 5-10 min, cool down 5 min· body weight resistance and elastic band resistance for strength training in groups **Control group:**Fall prevention exerc. for 2 weeks + videotap for home based exerc.Six home safety education sessionFor both groups	Reductionof falls: n.s. Berg balance scale improved in the exerc. Group **Adherence** 65% of the exerc.gr. continued after 1 yr 11% of the control group	Small sample size 80% power only for Berg balance scale falls are not defined	**5/ 10** Eligibility criteria: yes Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: no Adequate follow-up: yes Intention-to-treat analysis: no Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **no effect** **clinical relevance limited**
homedwelling non-fallers						
Day et al [83]	**Setting**: urban community in Melbourne n=1090 Sample: people over 70 living in their own home Age: 70 and older Sex: f/m **Inclusion criteria**: - living at home and being allowed to make modifications **Exclusion criteria**: - if they did not expect to remain in the area for 2 years - if they did balance training in the previous 2 months - if they could not walk 10-20 m without rest, help or angina - severe respiratory cardiac disease - phychiatric illness- had dysphasia - had had recent major home modification - mental status - no approval of their general practitioner	**Experimental group**:3 interventions - **exercise:** flexibiliy, strenth and balance (mainfocus on balance!!) 15 week program, 1 hour, weekly with daily home exercises - **home** hazard management: were removed by Participants or by a home maintenance program - **vision:** referral to the eye care providers if necessarymixed into 8 (n=~136) **interventions groups**: - exercise - home hazard management - vision - exercise and hazard - exercise and vision - vision and hazard - all three interventions **Control Group**: the 8. group received no intervention untill after the studyà all Participants received a 18 months falls callender and send a postcard once month which reports daily falls outcome	**Primary outcom**e: Time to first fall **Secondary outcome:**changes in targeted risk factors: - strength and balance - vision - number of hazards at home **Results**: - no interactiv effect of the interventions on fall outcome, the interventions were additive!-significant effect for exercise alone - significant effect for all interventions in which exercise was combined with other interventions - strongest effect for all three interventions together **Follow-up**: After completion of the 15 weeks exercise (only the first 177 participants) follow up for balance and strength measures After 18 months, only compareable parts of the groups (n= 442): - reassessment of the risk factors - fall rate **Compliance:** 119 dropped out for various reasonsrelatively poor compliance to the home exercise, only done twice a week instead of the recommende daily practice	Multiple interventions are more likely to prevented falls in older peopleA weekly exercise program focussing on balance plus exercise at home can help to prevent fallsHome hazard and vision screening don´t show effects when used allone, but add value when combined with exercise	**6/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: No Blind assessors: Yes; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect,** **clinical relevance fully given**

endpoint fall incidence						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Lord et al [79]	Self- care apartments or intermediate-care hostels N=551 Male and female Age: 62 – 95 yrs.	**Group Exercise intervention program:** 1 hour, 2x/week, 12 month follow-up Group exerc.: 5-15 min. warm-up, 35-40min. conditioning (aerobic exerc., strengthening, balance, coord., flexibility), 10 min cool-down. Most exerc. were weight bearing and undertaken as group activities **Exerc.classis** were individualized to the functional capabilities Progression **Control group** Minimal-intensity exerc. 2x/week, 1 hour, 12 month or no exerc.Fall docu: Questionnaires every month/falls record book: cause, location	nach 12 Monaten22% fewer falls in the group exercisers IRR=0.78, 95%CI=0.62-0.99 For fallers in the past yr.: IRR=0.69; 95%CI=0.48-0.99	Cluster randomized Fall def.: events that resulted in a person coming to rest unintentionally on the ground or other lower level, not as the result of a syncopal event, major intrinsic event or an overwhelming hazard.	**6/10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: no Adequate follow-up: yes Intention-to-treat analysis: yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **positive effect** **clinical relevance fully given**
Campbell et al [77]	Community dwelling General practise, New Zealand N=233 Age =/> 80, female Duration: 1yr	**Individually tailored home based exerc. Program: 30 minutes, at least 3 times/week:** 1. moderate intensity (0.5-1kg) strengthening exerc. For: hip extensor and abductor musc., knee flex/ext., inner range quadriceps, ankle plantar and dorsiflex. 2. balance retraining: i.e. tandem walk, walking on the toes and heels, backwards, sidewards, turning around, stepping over an object; bending and picking up an object; stair climbing; rising from sitting position to a standing one, knee squat, ROM-exerc 3. walking plan: 3x/weekMonitoring falls and injuries: calendar comprising 12 addressed, reply paid postcards for daily record of falls monthly and telefon calls	Rate of falls per year: Difference: 0.47 (95% CI= 0.04 to 0.9)Ex.Gr.: 0.87 Controls: 1.34Hazard ratio for the first fall: 0.81 (0.56 – 1.16)	Falls: unintentionally coming to rest on ground, floor, or other lower level	**8/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: yes Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: yes Adequate follow-up: yes Intention-to-treat analysis: yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**I** **positive effect** **clinical relevance fully given**

endpoint fall incidence						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Campbell et al [76]	**Setting:** elderly people living in the community N=233 Age: 80 and older Sex: f **Inclusion criteria:-** Living in the local community- computerized register at general practice- able to move around- no physiotherapy **Exclusion criteria**:- mental status questionnaire <7 out of 10	**Exerc.Programm**: - prescribed by a physiotherapist: muscle strengthening and balance retraining exerc. At increasing levels of difficulty- home-based 3x/week- walking plan 3x/week **Control group**:usual care and social visits at home Duration:2 years	**Primary outcome**:Falls and injuriesSecondary **endpoints:**Compliance with the exerc. Programme for the second year **Results**: - relative hazard for all falls in the exerc.gr. was 0.69 compared with the contr.gr. - Exerc.gr. 50 falls, n=71, during the 2nd yr. 41 Contr.gr 68 falls, n=81; 62 during year 2- 213 completing 1 yr - 74% of the control group and 69% of the exerc. gr. continued - exerc.gr. more medication and more likely a history of knee arthritis than the control gr. **Follow-up:** - Falls were recorded daily and sended each month by reply-paid postcards - Completition of the prescribed ex.pr. or walking were recorded by post cards **Drop out rate after 2 yrs** Contr.gr. n= 19 Exerc.gr. n=30	Prolongation of the 1 yr program Falls: unintentionally coming to rest on ground, floor, or other lower level	**4/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: no Baseline comparability: no Blind subjects: no Blind therapists: no Blind assessors: no Adequate follow-up: no Intention-to-treat analysis: yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **positive effect** **clinical relevance fully given**
Robertson et al [78]	Comunity dwelling N=240 Age =/>75yr, female	**Individually tailored home based exerc. Program: 30 minutes, at least 3 times/week**: 1. moderate intensity (0 -6kg ankle cuff weights) strengthening exerc. 2. balance retraining: 3. walking plan: 2x/weekMonitoring falls and injuries: postcard calenders and telefon calls	Number of falls in the exerc.-gr.: IRR 0.54, 95% CI=0.32-0.90-> 46% reduction in the number of falls Fewer injuries in the exerc. Group (2 v 9, RR 4.6)	Fall def.: events that resulted in a person coming to rest unintentionally on the ground or other lower level,	**8/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: yes Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: yes Adequate follow-up: yes Intention-to-treat analysis: yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**I** **positive effect** **clinical relevance fully given**
Wolf et al [81]	Community dwelling, ambulatory N=200, female and male Age=/>70 yr. With and without falls during the past yrs. With and without fear of falling Follow-up time: 4 month	**Tai Chi – group exerc**.: 15- week session, progression involved a gradual reduction of the base of standing support until single limb stance, increased body and trunk rotation and reciprocal arm movements. **Home-based**: 15 min twice a day **Computerized balance training**: 15 sessions, static exerc. Education exerc.-control condition: no change of exerc.level	15 week Tai Chi: risk ratio=0.525 = reduced by 47.5% rate of fall was elevated if subjects had experienced falls within the past yr before entering the study /risk ratio 2.016) or had a relatively higher score on the “fear of falling” quest. (risk ratio 1.417)	Fall def.: events that resulted in a person coming to rest unintentionally on the ground or other lower level,	**6/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: yes Adequate follow-up: yes Intention-to-treat analysis: no Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **positive effect** **clinical relevance fully given**

endpoint fall incidence						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Lord et al [84]	Comunity- dwelling Age=/>75, female and male n=620 follow-up time: 12 month **Exclusion criteria** language, Parkinson, blindnesss)	**Extensive intervention group:** individualized exerc. improving strength, coordination, balance: 5-10 min.warm up, 30 min conditioning in the group, 10 min individualized program, 5-10 min cool-down. 2x/week, 12 month maximizing vision counselling **Minimal intervention group**: report outlining their fall risik recommendations sheets for home exerc. **Control group**: no intervention Monthly fall calendar and telefon Call	Fall rate: n.s. Difference Functional improvement	strengthening exerc., kein PRT (i.e chair assisted knee bends, seated resistance training) Fall def.: events that resulted in a person coming to rest unintentionally on the ground or other lower level, not as the result of a syncopal event, major intrinsic event or an overwhelming hazard.	**8/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: yes Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: yes Adequate follow-up: yes Intention-to-treat analysis: yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**I** **no effect** **clinical relevance limited**
MacRae et al [82]	**Setting**: Senior centers, independently living, N=80 Age: 60 and older Subset of 20 subject older than 80 yrs. Sex: female and male with and without falls during the last yr.	**Exerc.Intervention** (Groups with 4 participants): · 1 h/ 3 times/week, 12 month· stand up/step up (Liss): graded (increasing reps) and monitored (pulse rate) exerc.program· warm up (breathing, ROM exerc, stretching), cool down (walking)· low intensity· goul:4 sets of 10 reps· warm up and cool down 10-15 min.· by an instructor **Control group**:usual care	Falls: no effect 21 women failed to completeFallers : 10 in the exerc.gr. and 14 in the contr.gr., requirement of medical attention: 0 in the exerc. Gr., 3 in the contr.gr	drop out rate high Fall def.: events that resulted in a person coming to rest unintentionally on the ground or other lower level, not as the result of a syncopal event, major intrinsic event or an overwhelming hazard	**4/ 10** Eligibility criteria: no Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: no Adequate follow-up: no Intention-to-treat analysis: no Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **no effect** **clinical relevance limited**
Lui-Ambrose et al [67]	Community-dwelling N=104 female Age:75-85 yrs with low bone mass I**nclusion criteria**: - osteoporosis or osteopenia diagnosed (T-Score at the total hip or spine at least 1.0 SD below the young normal sex-matched areal BMD of the Lunar reference database) **Exclusion criteria**: - living in care facilities - non Caucasian race - twice a week regularly exercise or more - history of illness or condition that affects balance (e.g. stroke, Parkinson desease)	6 month, twice weekly classes instructed by certified fitness instructors. **Resistance training**: extremities and trunk: initially 50-60% of 1RM, 2 sets, 10-15 reps, after 2 weeks 75-85% of 1RM, 2 sets, 6-8 reps progressively1:2 instructor-participant ratio Free weights and "Keiser Pressurized Air System" exercises. Biceps curls, triceps extensions, seated row, lat pull-downs, mini-squats, mini-lunges, hamstring curls, calf raises, GM extension **Agility training**: coordination, dynamic balance, psychomotor performance (reaction time). Ball games, dance, etc. **Control gr**.: stretching (sham) exerc.: relaxation techniques, deep breathing, general posture educ.	Falls: no effect Fall risk assessment improved in the resistance and agility group more than in the stretching gr.	3 arms	**6/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: no Baseline comparability: no Blind subjects: no Blind therapists: no Blind assessors: yes Adequate follow-up: yes Intention-to-treat analysis: yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **no effect** **clinical relevance limited**

endpoint fall incidence						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Suzuki et al [80]	Community-dwelling Japanese women· N=52· Age:73-90 yrs, **Exclusion criteria**: - marked decline in the basic activities of daily living - hemiplegia- missing baseline data	**Intervention group:** 1h exerc. every 2 weeks for 6 month + home based exerc. : 10-15 min warm-up + stretching, strengthening exerc.without weights, balance- and gait training, resistance exerc using dumbbells (0.5-1.5 kg) and Thera-Band, TaiChiHome exerc: 15 exerc.,3x/week, 30min., mailed monthly **Control group**: pamphlet and advice	increased number of fall in control group Follow-up time: 8 month Before intervention:4 of 24 fallers in the control and 4 of 28 fallers in the exerc. group After 20 month:12 of 22 fallers in the control.gr. and 3 of 22 in the exerc. group (p=0.0097; Fisher´s exact test)		**6/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: yes Adequate follow-up: no Intention-to-treat analysis: yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **posoitve effect** **clinical relevance limited**
institutionalized fallers						
Nowalk et al [102]	**Setting** : 2 senior housing communities Pittsburgh **Sample** from independent living to nursing care **N** = 110 randomized, 82 finished Age : mean 84 y Sex : both **Incl**: ≥ 65 y, capable of ambulating with or without assistive devices, able to follow simple directions **Excl** Unable or unwilling to complete baseline assessments	**Exp group:** 1 =Resistance / endurance (focus on muscle strength) plus basic enhanced programming 2 = Tai Chi plus basic enhanced programming 3 = basic enhanced programming (no exercises) each 3x / week over 2 years detailed training-protokoll	**Reduction of falls:** No significant differenced among exercises and control group	Small sample size (70 would have been required to detect reduction)	**4/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: no; Baseline comparability: yes Blind assessors: no; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: no; Between-group comparisons: Yes; Point estimates and variability:Yes. **confirmed**	**II** **no effect** **clinical relevance not given**
McMurdo et al [103]	**Setting** :9 Local authority residential homes for elderly, UK **Sample** : residents living in institutional care **N** = 133 randomized, 90 finished Age : mean 84 y Sex : no info, both **Incl**.: ≤ 70 y, MMSE score <12	**Exp.group :** Assessment + risk modificat. for multipl. RF + 30 min. 2x / week, 6 months: seated group exercise focused on strengthening major muscle groups, improve joint flexibility and balance, adjusted dosage **Contr.group:** 30 min 2x / week, 6 months: Reminiscence training	**Falls (daily calendar):** No difference between groups **Dynamic Postural control (functional reach, reaction time)** No differences in changes **Functional mobility (tugt) grip** No differernces in changes **Spinal flexion** No differernces in changes	very high drop-out-rate may reduce the power of results - seated exercise may not have influence on dynamic balance and falls - exercise was not sufficientliy vigorous (must include weight transference)	**5/ 10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: no; Baseline comparability: no Blind assessors: no; Blind subjects: No; Blind therapists: yes; Adequate follow-up: No; Intention-to-treat analysis: yes; Between-group comparisons: Yes; Point estimates and variability:Yes. **confirmed**	**II** **no effect** **clinical relevance not given**

endpoint fall incidence						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Shimada et al [104]	**Setting**: N=32 Sample: disabled frail elderly people who were either long-term care facility residents or outpatients of geriatric health service and who were all receiving rehabilitation. Age: 66-98 Sex: 25 women and 7 men **Inclusion criteria:** - muscle weakness - decreased gait and balance functions - high risk of falls **Exclusion criteria**: - walkspeed on treadmill for 3 mins was not high enough - dementia- healthproblems (not specified)	**Experimental group (EG):** Treadmill exercise group which did the treadmill gait exercises in addition to their usual exercise program for 6 months, 1-3 times a week, duration was individualized (total duration:600 min) The bilateral seperated treadmill continiously and randomly generates unexpected perturbation while walking Training had 8 different phases, pertubation deceleration increased to 100% **Control group (CG)**:Usual exercise group which continued the same exercise regimen they had previously been doing In both groups usual exercise consisted of: - PT against pain - stretching - resistance training - group training - outdoor gait training	**Primary outcome**: - Number of Falls - time to first fall **Secondary outcome**: Physical fnctions: - balance and gait function - reaction time **Results**: **Fall rate**:EG: 33,3%; CG: 54.5% Difference statistically not significant! **Number of falls**: EG: 8; CG:11 Difference statistically not significant! **Time until first fall**: EG: 147 days; CG: 120 days Difference statistically not significant! **Physical functions**: Balance and reaction time improved significantly **Follow-up**: Number of falls 6 months after intervention **Compliance**: 3 in each group dropped out, mostly because of health problems	8 neurological patients small group not significant	**4/ 10** [Eligibility criteria: No] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes Blind assessors: No; Blind subjects: No; Blind therapists: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes; confirmed	**II** **no effect** **clinical relevance limited**
Wolf et al [105]	**Setting**: Twenty congregate living facilities in the greater Atlanta area. **Sample**: older peoplen: 311 Age: 70-97 Sex: 291 women/20 men **Inclusion criteria**: - 70+ - transitioning to frailty - at least one fall during the last year **Exclusion criteria**: - Unstable cardiopulmonary diseases - cognitive impairment - contraindications to physical exercise - restricted to wheelchair - terminal cancer - other unstable neurological or medical condition	**Tai-Chi group**: 2 session a week, increasing duration from 60 to 90 minutes over the course of 48 weeks. **Wellness Education group**: 1 hour a week.Instruction about falls prevention, exercise and balance, diet and nutrition, pharmacological management, mental health issues like stress, depression and life changes. Interactive handout materials were provided, but there was no formal instruction in exercise.	**Primary outcome**: Risk ratio (RR) of falling **Results**: No siginificant difference in falling risk in TC and WE groups. Risk Ratio (RR) = 0.75. Over the 48 weeks period 46% of the participants did not fall. Percentage of participants that fell at least once was 47.6% for the TC group and 60.3% for the WE group. **Compliance**: 37 discontinued TC intervention 32 discontinued WE intervention		**7/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind assessors: no Blind subjects: no Blind therapists: yes Adequate follow-up: yes Intention-to-treat analysis:yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**I** **no effect** **clinical relevance limited**

endpoint fall incidence						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
institutionalised non-fallers						
Sihvonen et al [100]	**Sample:** Older women living in two residential care homes n: 27 Age: 70+ Sex: women **Inclusion criteria**: - 70+ - ability to stand without walking aid - ability to see visual feedback from a computer screen - ability to follow instructions for testing and training **Exclusion criteria**: - health problems at the initial stage (e.g. demetia, fractures, illness)	Exercise group: n=20. Control group: n = 7 **Exercise group:** 20-30 min individualized balance exercises 3 times a week for 4 weeks. A computerized force platform with visual feedback was used (Good Balance). Monthly sent back diaries with daily fall reports **Control group**: Continue as usual.	**Primary outcome**:FallsBalance Performance **Secondary outcome**:Fear of falling, Balance measures, Physical activity **Results**:Improved balance for the exercise group.During the 12 month follow up 11/20 subjects (55%) of the exercise group vs. 5/7 subjects (71%) of the control group fell. significant more recurrent falls in the CG Reduced risk of falling for the exercise group (risk ratio 0.389, p=0.029) compared to the CG **Compliance**:One women dropped out of the control group because of illness. **Follow-up**:Monthly for 1 year	small n	**5/ 10** Eligibility criteria: yes Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind assessors: no Blind subjects: no Blind therapists: no Adequate follow-up: yes Intention-to-treat analysis:no Between-group comparisons: yes Point estimates and variability: yes **comfirmed**	**II** **positive effect,** **clinical relevance limited**
Becker et al [35]	Six community nursing homes in Germany N=981, long-stay (>4 weeks), residents, 79% females Age =/>60 needing at least 1 and 11/2 hour care per day Minimum: standing	**Exerc.program** 2x/week, 75 min Balance exerc. 20 min PRT (10 reps, 75% of max. voluntary contr., ankle weights , dumbbells), Hip protector Staff and resident education on fall prevention Environmental adaptation	Nach 12 Monaten Incidence density rate of falls per 1000 resident years: RR=0.55 , 95% CI 0.41-0.73 For frequent fallers: RR=0.56, 95% CI=0.35-0.89. For hip fractures: RR=1.11, 95% CI=0.49-2.51.	Cluster randomized study Falls: unintentionally coming to rest on ground, floor, or other lower level regardless of the cause.	**6/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: yes Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: no Adequate follow-up: yes: Intention-to-treat analysis: no Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **positive effect** **clinical relevance limited**
Donald et al [101]	Elderly care rehabilitation ward· N=54, female and male· Mean age: 81,1-85,3	7-12-months follow-up period **Control and intervention group** received conventional physiotherapy **Intervention group:** Strengthening exerc. While sitting: 3 sets, 10 lifts using hip flexors and ankle dorsiflex. , 2x daily, maximum of weight in addition	No significant difference in the number of falls after 9 month Significant more falls in the carpeted bedrooms vs linoleum (venyl) flooring	No power	**5/ 10** [Eligibility criteria: yes] Random allocation: yes Concealed allocation: no Baseline comparability: yes Blind subjects: no Blind therapists: no Blind assessors: no Adequate follow-up: no Intention-to-treat analysis: yes Between-group comparisons: yes Point estimates and variability: yes **confirmed**	**II** **positive effect** **clinical relevance not given**

endpoint home hazard modifications						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Nikolaus et al [107]	Setting: Geriatric Clinic in in a mid-size town southern Germany,In-patients admitted from home n=360 yr mean 83,5 +/- 6,4 Gender: f & m Inclusion:showing functional declineor multiple chronic conditions, could be discharged to home Exclusion:Terminal illness, severe cognitive decline, lived > 15 km away	**EG:** Geriatric assessment, diagnostic home visit and home intervention, advice, offer of facilities for modifications, training in the use of technical and mobility aids. Additional home visit after 3 months.By a team of nurses, physiotherapists, occupational therapist. **CG:** geriatric assessment with recommendations & usual care **Follow-up**: 12 months. Standardised home safety checklist.	**Outcome measures:** Number of falls, type of modifications, compliance with recommendation. **Results:** EG: 31 % fewer falls, IRR = 0.69, CI 0.51-0.97, but the proportion of fallers with =/> 2 falls did not differ significantly.In a subgroup with =/> 2 falls in the year before study the proportion of frequent fallers and rate of falls was significantly reduced compared with the CG (21 vs 36 subjects with recurrent falls, P = .009, IRR 0.63, CI = 0.43-0.94). **Drop-outs:** EG 8 /181 lost, together 41not followed, CG 10 lost, together 40/ 179 not followed **Compliance:** varied with the type of recommendation from 83%-33%		**7/10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: Yes; Adequate follow-up: No; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**I** **positive effect** **clinical relevance fully given**
Close et al [114]	Setting: elderly people living in the community N=397 Mean Age: 65 and older Gender: f & m Inclusion:- Living in the local community- attended the accident and emergency department with primary diagnosis of fall Exclusion : cognitive impairment, no regular carer, living not locally, no English speaking	**EG:** Detailed and structured bidisciplinary (medical and occupational-therapy OT) assessment with referral to relevant services if indicated I. One Medical ass.: 1. assigning primary cause for last fall 2. identifying risk factors (visus, balance, cognition, affect, prescription practice, postural hypotension) and modifying them if possible **Follow-up:** Every 4 months for 1 year by postal questionnaire II. OT Single home visit: 1. assigning function, environmental hazards, psychol. Consequences of the fall. 2. advice and education about safety 3. modifications **CG:** usual care	**Primary outcome:** Fall rate **Secondary endpoints:** Death, major injury, referral to institutional care, functiona status, use of health care **Results:** Significantly fewer falls in the intervention group (and 50% reduction in fracture rate) EG: 183 falls CG: 510 falls **Compliance:** 304 patients (77%) remained in the study,36 moved to instit. Care, 36 died, 11 are lost to follow up		**6/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: No; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; **confirmed**	**II** **positive effect** **clinical relevance fully given**
Cumming et al [113]	Setting: Private dwellings in Sydney, Australia N=550, mean age 77, Gender: f&m Recruited before discharge from selected hospital wards. Inclusion: aged 65 yr and older, living in the community in the study area, also people with cognitive impairment were included, as long as they lived with someone who was able to give informed consent	**EG:** A home visit by an experienced occupational therapist, assessment of environmental hazards, facilitation of necessary home modifications. **CG**: no visits **Follow-up:** 12-month, monthly fall calendar.	**Primary outcome:** Falls (monthly falls calendar). **Results:** 36 % of the EG had at least 1 fall, compared with 45 % of controls (P= .050). The intervention was effective only among subjects (n=206) who reported having had one or more falls during the year before recruitment. Relative risk of at least 1 fall in this groupWas 0.64 (CI 0.50-0.83). The intervention group had fewer falls both at home and away from home!! **Drop-outs:** 27 % of subjects (n=142) did not provide a full of 12 months of fall data. **Compliance:** about 50 % of the recommended modifications were in place at a 12-month follow-up visit.		**6/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: No; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; **confirmed**	**II** **positive effect** **clinical relevance fully given**

endpoint home hazard modifications						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Day et al [83]	Setting: urban community in Melbourne n=1090 Sample: living in their own home Age: 70 and older Gender: f & m Inclusion:- living at home and being allowed to make modifications Exclusion:- if they did not expect to remain in the area for 2 years- if they did balance training in the previous 2 months- if they could not walk 10-20 m without rest, help or angina- severe disease- had had recent major home modification- no approval of their general practitioner	**EG:** 3 interventions - exercise: flexibiliy, strenth and balance 15 week program, 1 hour, weekly with daily home exercises- home hazard management: were removed by participants or by a home maintenance program- vision: referral to the eye care providers mixed into 8 (n=~136) interventions groups: exercise- home hazard management, vision- exercise and hazard, exercise and vision, vision and hazard, all three interventions **CG** the 8. group received no intervention, all Participants received a 18 months falls calendar and send a postcard once month which reports daily falls outcome **Follow-up:** After completion of the 15 weeks exercise (only the first 177 participants) follow up for balance and strength measuresAfter 18 months, only comparable parts of the groups (n= 442): reassessment of the risk factors, fall rate	**Primary outcome:** Time to first fallSecondary outcome:changes in targeted risk factors: strength and balance, vision, number of hazards at home **Results:** the interventions were additive! - significant effect for exercise alone - significant effect for all interventions in which exercise was combined with other interventions- strongest effect for all three interventions togetherhazard modification was combined with other interventions - strongest effect for all three interventions togetherHome hazard and vision screening did not show effects when used alone, but add value when combined with exercise **Compliance:** 119 dropped out for various reasonsrelatively poor compliance to the home exercise, only done twice a week instead of the recommended daily practice		**6/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: No; Blind subjects: No; Blind therapists: No; Blind assessors: Yes; Adequate follow-up: No; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; **confirmed**	**II** **no effect** **clinical relevance fully given**
Stevens et al [106]	Setting: Community-based study in Perth, Western Australia. n=1737, yr mean 83,5 +/- 7,7, EG:CG=1:2, EG n=570. Gender: f & m Inclusion: 70 yr and older, Living independently. English speaking and writing cognitively intact. Subjects who could make changes inside the home, had not modified their home by ramps or grab rails.	**EG:** Single home visit from a trained research nurse. Offering a Home hazard assessment, information on hazard reduction, offering installation of free safety devices, educational strategy to empower seniors to modify home hazards. **Follow-up:** 1 yr	**Primary outcome:** fallsThe intervention was not associated with any significant reduction in falls or fall related injuries. **Results:** There was no significant reduction in the EG in the incidence rate of falls involving environmental hazards inside the home (adjusted rate ratio, 1.11; CI 0.82-1.50), or the proportion of the EG who fell because of hazards inside the home (adjusted odds ratio, 0.97, CI 0.74-1.28). **Drop-outs:** 46 persons in EG and 76 in CG failed to complete the 1 yr follow-up.264 subjects were lost from the study 111 (17,5 %) from the EG and 153 (12,3%) from the CG (P < .010). **Compliance:** 86 % completed follow-up.		**5/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect** **clinical relevance fully given**
Van Haarstregt et al [115]	Setting: 6 general practices in Hoensbroek in the Netherlands. N= 316, mean age 77,2 Gender: f/m Inclusion:Aged 70 and over,living in the community, with moderate impairments in mobility or a history of recent falls (=/> 2 falls within the previous six months. Exclusion:Bedridden, wheelchair-bound, terminally ill, on the waiting list for admission to a nursing home, receiving home care from a community nurse	**EG:** Five home visits from a community nurse over a period of one year.Advice, referrals, and other actions.CG: usual care **Follow-up:**18 months	**Outcome measures:** Falls and impairments in mobility. **Results:** No differences were found in falls and mobility outcomes between the intervention and usual care group.Multifactorial home visits had no effects on falls and impairments in mobility in elderly people at risk who were living in in the community. **Drop-outs:** 81 people dropped out, EG n=39, CG n= 42.		**5/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: No; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; **confirmed**	**II** **no effect** **clinical relevance fully given**

endpoint home hazard modifications						
Study	**Population/ setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Pardessus et al [116]	Setting: Geriatric Hospital in a mid-size town in France.Patients hospitalized for falling in the acute department. n=60 yr mean 83,5 +/- 7,7 Gender: f & m Inclusion: =/> 65 yr, could be discharged to home Exclusion:cognitive decline = MMSE <24, lived > 30 km away, without phone, falls secondary to cardiac, neurologic, vascular or therapeutic problems.	**EG:** Single home visit of an ergotherapist and a physician (specialist for physical medicine and rehabilitation) during the time of hospitalization. Check list. Modification with patients consent. Social supports were addressed. **CG:** usual care. During hospitalization information on home safety **Follow-up:** every month during 6 months and at 12 months.Standardised check list.	**Primary outcome measures:** Falls, autonomy **Secondary outcome measures:** institutionalization, death. **Results:** 15 fallers in CG and 13 in the EG. Difference not significant.12 patients from CG and 7 from EG institutionalized, difference not significant.EG: CG: loss of autonomy was significant more prevalent in CG than in the EG. Drop-outs: three of the CG and 6 of the EG died. **Compliance:** not reported		**4/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**I** **no effect** **clinical relevance limited**

endpoint fear of falling						
Study	**Population/Setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Barnett et al [90]	setting: people over 65 years identified as at risk o falling by general practitioner or hospital- based physiotherapist residing South Western Sydney community-dwelling n = 163 intervention group: n = 83 age: 74.4 + 4.9 sex: 58 f (69.9 %) control gro	intervention group community based group intervention of a variety of exercises, a home exercise program, and written information for avoiding falls. Weekly sessions of 1 hour for 1 year control group written information	balance muscle strength reaction time physical functioning health status falls afraid of falling IG: 16.4 % => 7,5 % CG: 12.9 % => 8.6 % baseline 6 month 12 month no statistic significant difference	positive effect in IG and CG	**8/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: Yes; Adequate follow-up: Yes; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**I** **no effect** **clinical relevance limited**
Brouwer et al [123]	setting: community-dwelling seniors who reported a fear of falling and activity restriction but were free of neurological and mobility- limiting orthopedic conditions n = 38 activity program (n = 17) age: 77.1 + 5.1 sex: 5 m, 12 f education program (n	intervention group 1 activity program: low resistance exercises and weight-shifting activities. intervention group 2 education program: focused on identifying and reducing risk factors for falls weekly sessions to groups of three to five seniors for 8	balance confidence score activity trial limits of stability (LOS) isokinetic strength health status preintervention postintervention 6 weeks later both programs reduced fear of falling (p = 0.006) as ascertained from the balance confidence score		**6/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: Yes; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect** **clinical relevance fully given**
Campbell et al [77]	setting: 17 general practices in Dunedin, New Zealand intervention group n = 116 age: 84.1 + 3.1 control group: n = 117 age: 84.1 + 3.4 inclusion criteria: - able to move around within their own home - not receiving physiotherapy design randomised c	intervention group home-based intervention of strength exercises and walking four home visits of 1 hour during first two month and motivational phone calls to exercise and walk three times per week for 30 minutes for 1 year control group individual socia	falls from falls injuries compliance with the exercise programme FES 12-month follow-up FES increased in the CG		**8/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: Yes; Adequate follow-up: Yes; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**I** **positive effect** **clinical relevance limited**

endpoint fear of falling						
Study	**Population/Setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Choi et al [119]	setting: two facilities for older adults in Korea sample: ambulatory adults aged 60 years or over with at least one fall-related risk factor exercise group: n = 29 age: 76.7 + 7.7 sex: 23 f, 6 m control group: n = 30 age: 78.7 + 6.9 sex: 21 f, 9 m	experimental group tai chi exercise program three times per week for 12 weeks 10 minutes warming-up 20 minutes tai chi movements 5 minutes cooling-down control group maintain routine activities without participating in any regular exercise classes	muscle strength (knee and ankle, manual muscle tester) balance fall episode fall avoidance efficacy (Tinetti) baseline after 12 weeks significant improved muscle strength improved flexibility and mobility improved balance fall episodes not statistical		**5/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect,** **clinical relevance fully given**
Clemson et al [130]	setting: community venues follow-up home visit sex: 230 f, 80 m age: CG 78.47 + 5.66 IG 78.31 + 5.26 inclusion criteria: community-living men and women aged 70 and older fallen in the previous year or concerned about falling exclusion criteria:	intervention group community-based group intervention of exercises, medication management, visual loss an screening, home and community safety, action planning seven weekly sessions of 2 hours 1 home visit of 1.5 hours and 1 booster session control g	primary outcome falls secondary outcome MFES MES PASE SF36 MFES no significant difference between groups CG -1.10 + 19.6 IG 0.63 + 16.4 p > 0.05 MES significant difference between groups CG -3.38 + 17.18 IG 0.89 + 16.46 p< 0.05		**7/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: Yes; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**I** **no effect** **clinical relevance not given**
Davison et al [85]	setting: accident and emergency departments in a university teaching hospital and associated general hospital n = 313 sample: cognitively intact men and women aged over 65 years presenting to accident and emergency departments with a fall or fall-relat	intervention group hospital-based medical assessment and home-based physiotherapy and occupational therapy assessment followed by a prioritized individualized intervention for fall risk factors. control group did not undergo medical or therapy assessment	primary outcome number of falls and fallers in 1 year after recruitment secondary outcome injury rates fall-related hospital admissions mortality fear of falling fall diaries interviewer-led questionnaires at 3, 6, 12 month mean activities-specific b		**7/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: Yes; Adequate follow-up: Yes; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**I** **positive effect,** **clinical relevance fully given**

endpoint fear of falling						
Study	**Population/Setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Devereux et al [129]	setting: community-dwelling women residing in the Metropolitan and Peel Regions of Western Australia n = 50 age: 73.3 (+ 3.94) sex: 50 f inclusions criteria: women 65 years of age or older osteopenia or osteoporosis exclusions criteria: lived outside	intervention group 10-week water-based exercise and self-management program at a community aquatic center twice a week for one hour 50 minutes warm-up, stretches, aerobic, Thai Chi, strength, posture, gait, vestibular, proprioception and balance activiti	SF 36 MFES Step Test no statistically significant differences were found between groups in the change from baseline to follow-up in the MFES	fear of falling no inclusion crit	**7/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind subjects: No; Blind assessors: No; Adequate follow-up: Yes; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; **confirmed**	**II** **no effect** **limited clinical relevance**
Li et al [121]	setting: pool of patients enrolled in the legacy Health System in Portland n = 256 IG: n = 125 sex: 87 (70 %) f age: 76.94 + 4.69 CG: n = 131 sex: 92 (70 %) f age: 77.94 + 5.14 inclusion criteria: aged 70 years or older inactive (not being involved	intervention group community-based group intervention of tai chi, six month program with 3 sessions of 1 hour per week control group community-based group intervention of stretching exercises, six month program with 3 sessions of 1 hour per week drop-ou	primary outcome number of falls secondary outcome Berg Balance Scale Dynamic Gait Index Functional Reach single-leg standing physical performance fear of falling (range 0 - 3) baseline 3 months 6 months 6 months post-intervention follow-up reduced fear		**5/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: No; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect** **clinical relevance fully given**
Nitz et al [122]	setting: Neurological disorders, Ageing and Balance Clinic, Department of Physiotherapy, The University of Queensland n = 73 (6 m, 67 f) sample: males and females over 60 years, living independently in the community and who had fallen in the previous	intervention group balance strategy training program delivered in a workstation format (balance group) control group community based exercise class program all subjects received a falls risk education booklet training sessions once a week for 10 weeks	number of falls co-morbidities medications community services activity level function motor ability clinical and laboratory balance measurements fear of falling ("falls efficacy scale" FES) before intervention after intervention 3 month follow-u	training only once a week may	**5/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: Yes; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect,** **clinical relevance fully given**

endpoint fear of falling						
Study	**Population/Setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Reinsch et al [122]	setting: 16 senior centers in Orange County and Los Angeles County n = 230 exercise: n = 57 age: 73.4 (+ 7.6) sex: 49 f, 8 m cognitive: n = 51 age: 74.9 (+ 5.8) sex: 39 f, 12 m exercise cognitive n = 72 age: 73.9 (+ 6.7) sex: 51 f, 21 m discussion	exercise intervention low-intensity exercise program; "stand-up/step-up" procedure 1 hour, 3 days per week, 1 year cognitive-behavioral intervention health and safety curriculum, relaxation training, videogame playing to improve reaction time 1 hour, 3	primary outcome monitoring falls monitoring injury secondary outcome strength balance fear of falling (5-point-scale) secondary outcome such as fear of falling did not significantly change baseline 1 year follow-up participants expressed low levels		**4/10** [Eligibility criteria: No;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **no effect** **clinical relevance limited**
Sattin et al [120]	setting: ten matched pairs of congregate living facilities in the greater Atlanta Area n = 311 age: 70 - 97 sex: 294 f, 20 m inclusion criteria: age 70 and older ambulatory no severe or unstable medical conditions absence of severe psychological condit	intervention group (n=158) tai chi 10 to 50 minutes over the course of 48 weeks, two sessions per week control group (n=153) wellness education one hour each week, no formal instruction in exercise	Falls Efficacy Scale (FES) Activities-Specific Balance Confidence Scale (ABC) baseline 4 month intervals for 12 months tai chi led to a significantly greater reduction in fear of falling than wellness education program		**6/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: Yes; Adequate follow-up: No; Intention-to-treat analysis: Yes Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect,** **clinical relevance fully given**

endpoint fear of falling						
Study	**Population/Setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Schoenfelder et al [126]	Setting: two long-term care facilities located in Midwestern US n = 16 age: 82.8 sex: 12 f, 4 m inclusions criteria: - at least age 65 - ambulate independently or with an assistive device - speak and understand English - Score of 20 or higher	intervention group (n=9) supervised exercise 3 x weekly for three month, lasting approximately 20 minutes each time Ankle strengthening program and walking program control group (n=7)	primary outcome Mobility/activity Balance Ankle strength Fall risk assessment Fear of falling Falls efficacy baseline 3 months 6 months fear of falling mean score was unchanged intervention group 2.33/2.22/2.57 control group 2.00/2.29/2.29 falls eff	statistical significance not reac	**4/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: No. **confirmed**	**II** **no effect** **clinical relecance limited**

endpoint fear of falling						
Study	**Population/Setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Schoenfelder et al [122]	setting: 10 private, urban nursing homes in Eastern Iowa, ranging in size from 68 beds to 178 beds n = 81 age: 64 - 100 years (84.1) sex: 62 f, 19 m inclusion criteria: nursing home residents at least 65 years old ambulate independently or with assis	intervention group (n = 42) 3 month supervised exercising three times weekly for about 15 to 20 minutes. Ankle exercising followed by supervised walking control group (n = 39) no exercise intervention receive an attention placebo visited weekly about 3	mobility fear of falling (1-4) Balance Ankle strength Walking speed Fall Risk Assessment RAFS II Falls efficacy scale (0-100) baseline 3 month 6 month fear of falling significantly affected, specifically from 3 to 6 month for intervention subjects wh	fear of falling no inclusion crit	**4/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect in subgroup** **limited clinical relevance**
Sihvonen et al [100]	setting: 2 residential care homes for older people, all women received an invitation sample: frail elderly women living in a residential area Exercise group: n = 20 age: 80.7 + 6.1 control group: n = 7 age: 82.9 + 4.2 inclusion criteria: age 70 ye	intervention group balance training using computerized force platform with visual feedback. 20- to 30-min-long individualized specific balance exercise session 3 times a week for 4 weeks control group continue normal daily routines	Balance Test on a force platform Berg Balance Scale incidence of falls during one-year follow up fear of falling (question) physical activity baseline after training 12 month follow-up fear of falling: measurements showed a decrease in the fear of fa		**5/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect after intervention,** **negative effect 12 month follow-up,** **limited clinical relevance**
Tennstedt et al [122]	setting: public or publicly subsidized senior housing sites in the greater Boston area n = 434 age: 77.8 sex: 389 f, 45 m 40 sites, unit of randomization was the senior housing site inclusion criteria: - age > 60 years - absence of any major physi	intervention group structured group program eight 2-hour session scheduled twice a week for 4 weeks videotape, lecture, group discussion, mental problem solving, role playing, exercise training, assertiveness training, home assignements behavioral contr	outcome variables modified version of the Falls Efficacy Scale abbreviated sickness Impact Profile (SIP) seven item scale measuring intended activity (Intended activity scale) baseline 6-week 6-month 12-month control fear of falling unchanged	positive effect only patients in	**5/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: No; Blind subjects: No; Blind therapists: No; Blind assessors: Yes; Adequate follow-up: Yes; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: No. **confirmed**	**II** **positive effect,** **clinical relevance fully given**

endpoint fear of falling						
Study	**Population/Setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Trudelle-Jackson et al [122]	setting: Exercise were performed in subjects' homes. Exercise instruction and measurements taken before and after the trial were performed in an outpatient research and treatment center n = 34 adults 4 to 12 months post-THA. 28 completed the study. age:	experimental exercise group (n = 14) 7 weight bearing exercises control exercise group (n = 14) 7 basic isometric and AROM exercises 15 repetitions of each exercise in their program 3 to 4 times a week for 8 weeks at the beginning 2 sets of 20 repetiti	HQ-12 fear of falling two following "yes" or "no" questions "Are you afraid of falling?" "Since your surgery are there any activities that you avoid doing because you are fearful of falling?" postural stability using BEP-IV force platform muscle stre	patients months after total hip	**4/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: Yes; Blind therapists: No; Blind assessors: No; Adequate follow-up: No; Intention-to-treat analysis: No; Between-group comparisons: No; Point estimates and variability: Yes. **confirmed**	**II** **no effect,** **clinical relevance not given**
Wolf et al [127]	setting: Physical and recreational therapy departments from two rehabilitation centers sample: subjects of > 75 years with functional balance problems living independently or in a residential area n = 94 included n = 77 four-week follow-up n = 49 one-	experimental group after careful clinical examination a physical therapist developed for each subject an individualized balance training program 12 sessions, twice or three times a week during 4 - 6 weeks control group individualized extra attention pro	Berg Balance Scale Dynamic Gait Index fear of falling (visual analog scale) Hospital Anxiety Depression Scale Subjects improved significantly in the Berg Balance Scale and the Dynamic Gait Index. Effect disappear at one-year follow-up on the Berg Balance		**8/10** [Eligibility criteria: Yes;] Random allocation: Yes; Concealed allocation: Yes; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: Yes; Adequate follow-up: Yes; Intention-to-treat analysis: Yes; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**I** **no effect,** **clinical relevance fully given**
Wolf et al [81]	settings: Persons aged 70 and older living in the community n = 200 age: 76.2 years sex: 162 f, 38 m inclusion criteria: - 70 years of age or older - live in unsupervised environments - ambulatory exclusions criteria: - presence of debilitating	Intervention group Tai Chi (TC) (n = 72) home practice at least 15 minutes twice a day (no monitoring) intervention group computerized balance training (BT) (n = 64) progressively more difficult targets intervention group education (ED) (n = 64) met wee	Primary outcome variables strength (Nicolas MTT_01160 muscle tester) grip strength (hand dynamometer) flexibility lower extremity range of motion cardiovascular endurance (12 minute walk) ADL scale (activities of daily living) psychological well-being		**6/10** [Eligibility criteria: Yes; Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: Yes; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: Yes. **confirmed**	**II** **positive effect,** **clinical relevance fully given**

endpoint fear of falling						
Study	**Population/Setting**	**Interventions**	**Results**	**Comments**	**PEDro**	**quality**
Yates et al [125]	setting: community-dwelling older adults intervention group: n = 18 age: 67 - 90 median 76 sex: 13 f, 5 m control group: n = 19 age: 69 - 88 median 78 sex: 13 f, 6 m inclusion criteria: over the age of 65 living independently within the	intervention group multifactoriell risk reduction intervention adressing fall risk, exercise, nutrition and environmental hazards 10-week exercise program 19 chair-based exercises control group delayed intervention following the 10-week intervention per	FES balance lower extremity power reduction of environmental hazards nutritious food behavior FES IG 15.61 CG 22.58 p = 0.023		**4/10** [Eligibility criteria: Yes] Random allocation: Yes; Concealed allocation: No; Baseline comparability: Yes; Blind subjects: No; Blind therapists: No; Blind assessors: No; Adequate follow-up: Yes; Intention-to-treat analysis: No; Between-group comparisons: Yes; Point estimates and variability: No. **confirmed**	**II** **positive effect** **clinical relevance limited**