Appendix Table. Outline of the included papers

Authors	Subjects	Study type	Intervention	Follow-up	Outcome measures	Conclusions
Arnadottir et al (2000) [9]	35 older women living in assisted facilities (n=5) or in retirement communities (n=30); aged 65-93 years (mean age: 80.0 ± 6.5 years)	Cross-over, randomised, controlled comparison	Barefoot, own walking shoes and own high-heel dress shoes (mean heel height: 5.3±1.2cm)	Immediate effects	Functional reach test, Timed up & go test, 10m walk test	Best leaning balance barefoot and in walking shoes. Fastest Timed up & Go and 10m walk tests in walking shoes and slowest in high-heel shoes. High-heel shoes impair older women's performance in balance and mobility tests.
Brecht et al (1994) [10]	27 women aged 18-40 years	Cross-over, randomised, controlled comparison	Own tennis shoes and test cowboy boots (mean heel height: 3.7±0.1cm)	Immediate effects	Highest forward accelerations from a motorized balance platform at which the subjects cannot maintain their balance (feet flat on the floor)	Cowboy boots impair balance control during sudden forward platform accelerations compared to tennis shoes.
Burnfield et al (2004) [11]	19 older people (10 women) aged 55-85 years (mean age: 69.5±9.2 years)	Cross-over, randomised, controlled comparison	Barefoot and own comfortable shoes	Immediate effects	Plantar pressures with pressure insoles during overground walking at set slow, medium and fast speeds	Barefoot versus shod walking increase foot plantar pressures due to higher force and reduced contact area.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Burns et al (2002) [12]	65 older people admitted to a rehabilitation ward; aged 64-93 years (mean age: 82 years)	Cross-sectional	N/A	N/A	Relationship between of footwear fit and foot problems	72% of the older adults wearing ill-fitting footwear, with 65% wearing shoes too big in length and/or width. Significant associations between incorrect shoe length and, increased ulceration, and self-reported pain.
Corbin et al (2007) [84]	33 young people (17 women) (mean age: 27.4±9.1 years)	Cross-over, randomised controlled comparison	Own athletic shoes worn with or without textured insoles	Immediate effects	Standing balance (COP velocity and excursions area) during unipedal and bipedal stance with eyes open or closed using a force platform	No difference in standing balance between eyes open and eyes closed conditions when wearing the textured insoles.
Corrigan et al (1993) [65]	30 people (23 women) aged 18-56 years (mean age: 24 years)	Cross-over, controlled comparison	Barefoot, with heels attached to the foot (2cm and 4cm high)	Immediate effects	Forefoot loading and plantar pressures using a pedobarograph during overground walking at self-selected speed	Increasing heel height causes medial transfer of load in the forefoot and increase in forefoot pressure due to smaller forefoot contact area.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
De Lateur et al (1991) [13]	*Static study:* 16 people (7 women) *Dynamic study:* 14 people (8 women) aged 18-40 years	Cross-over, blinded comparison	*Static study:* Own negative-heels shoes and, low heel shoes (men) or high-heel shoes (women) *Dynamic study:* negative-heels shoes (-1.5cm), barefoot, low-heels shoes (men: 1.8cm; women: 2.2cm), and high-heel shoes (men: 6.9cm; women: 8.9cm)	Immediate effects	*Static study:* Sagittal kinematics during quiet standing (Pelvic tilt, back and hip angles) using photographs and x-ray (n=2) *Dynamic study:* Sagittal kinematics (ankle, knee, hip, back) during overground walking at set cadence (from self-selected speed for each footwear condition) using an exoskeleton	No differences in sagittal kinematics across heel heights when standing. Increase in heel height during walking reduces lumbar lordosis in men, and increases ankle angle excursion, ankle plantarflexion at heel strike and knee extension before toe-off.
Dunne et al (1993) [14]	652 surveyed people aged 65 years and over	Cross-sectional, telephone survey	N/A	N/A	Footwear worn at the time of the call, use of sturdy shoes (laced shoes with non-skid sole or men's dress shoes) and reasons for not wearing sturdy shoes	Sturdy shoes worn by only ¼ of the respondents. Socks and barefoot (20.1%), slippers (18.3%) and laced canvas shoes (14.6%) next reported.

Appendix Table. Outline of the included papers (continued)

Authors	Subjects	Study type	Intervention	Follow-up	Outcome measures	Conclusions
Ebbeling et al (1994) [15]	15 women aged 18-29 years (mean age: 23.3±2.9 years), 7 experienced high-heel shoe wearers	Cross-over, randomised, controlled comparison	4 tests shoes of similar construction but increasing heel height: 1.25 cm, 3.81 cm, 5.08 cm, and 7.62 cm	Immediate effects	Lower limb kinematics and GRF during overground walking at set speed using high-speed video cameras and a force platform Heart rate and oxygen consumption recorded during treadmill walking	With increasing heel height, increase in ankle plantarflexion at touch down, maximum ankle plantarflexion and knee flexion, vertical GRF and maximum braking GRF. Least maximum calcaneal eversion and greatest energy cost in the highest heel shoe.
Eisenhardt et al (1996) [66]	30 women aged 18-30 years	Cross-over, randomised, controlled comparison	Barefoot and 4 pairs of tests shoes of similar construction but increasing heel height: 1.75 cm, 3.12 cm, 5.72 cm and 8.74 cm.	Immediate effects	Plantar pressures and temporal gait variables during overground walking at a set cadence using electrodynography	Irrespective of heel height, increased stance phase and loading duration on the medial forefoot in dress shoes versus barefoot. Various heel heights affect plantar pressures generation and distribution differently.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Esenyel et al (2003) [16]	15 women aged 23 - 42 years	Cross-over, randomised, controlled comparison	Sport shoes with low heels (1cm) and dress shoes with high heels (5.5cm)	Immediate effects	Lower limb kinematics and kinetics in the sagittal and frontal planes, GRF, and temporo-spatial gait variables during overground walking at self-selected speed	Smaller walking speed and step length, and significant differences in lower limb joint angles, moments and work in high-heel shoes versus sports shoes.
Finlay (1986) [67]	274 older people (206 women) admitted to a geriatric unit (mean age: 79.6±7.3 years)	Cross sectional	N/A	N/A	Footwear assessment, identification of those requiring new footwear, foot problems. Characteristics and cost of footwear supplied	47% of the older people wearing inappropriate footwear: slippers and slip-on shoes causing heel slippage, shoes with too high or narrow heel, and shoes with cut uppers or flapping soles. More than ½ of those wearing slip-on shoes, sandals or shoes lacking fastening had claw or hammer toes.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Gabell et al (1985) [17]	100 older community-dwellers (55 women) aged 65-85 years	Cross-sectional, with prospective falls assessment	N/A	One-year follow-up	Prospective falls, relationships between falls and predisposing factors, and falls and circumstantial factors	Inappropriate footwear for the walking surface (cut-away heels, slippery sole, slip-on shoe, and sole with excessive slip-resistance) involved in 10 out of 22 falls. Relationship between history of wearing high-heels and multiple falls in low-heel shoes.
Gao et al (2004) [18]	N/A	Mechanical testing of footwear slip-resistance	4 types of footwear differing in midsole hardness , outer sole tread and roughness, sole and heel material (synthetic rubber, polyurethane, nitrile rubber, natural rubber)	N/A	Relationships between footwear properties and dynamic coefficient of friction (COF) on hard ice (-12°) measured with an apparatus simulating the movements of the foot and the forces applied to the underfoot surface during a slip.	Polyurethane sole otherwise very slip-resistant on wet or lubricated floors significantly less slip-resistant on ice than other sole materials. Positive correlation between sole roughness and increased slip-resistance.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Gard and Lundborg (2001) [19]	10 older community-dwellers (5 women) (mean age: 62.4 years)	Cross-over, randomised comparison	4 anti-slip devices: 2 heel devices, 1 forefoot device, and 1 whole-foot device	Immediate effects	Walking postures and movements from video recordings and ratings of perceived walking balance and safety during 5 walking tasks on 5 ice-slippery surfaces. Time to take on and off each device, pros and cons of each anti-slip device and priorities according to safety, balance and appearance/own use	Fixed metal heel device perceived as being comfortable and stable during walking, rated best in terms of walking safety and balance, own use, time to take on and easiness to use compared to the other devices, and had no effects on walking patterns.
Gard and Berggard (2006) [68]	107 people aged 22-80 years	Cross-over, randomised, controlled comparison	3 anti-slip devices: heel, forefoot, and whole-foot devices	Immediate effects	Same as for Gard Lundborg (2001)	Heel device rated best across all criteria.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Gastwirth et al (1991) [20]	43 young women (mean age: 26.1 years) who had worn high-heel shoes for on average 11.14 years	Cross-over, controlled comparison	Barefoot, athletic shoes with low heels (0.2cm) and dress shoes with high heels (4.2cm)	Immediate effects	Foot plantar pressures and temporal gait variables during overground walking at self-selected speed using an electrodynogram. Comparisons between frequent and less frequent high-heel shoe wearers	High-heel shoes lead to longer forefoot loading and decreased pressure at the 5th metatarsal head versus barefoot and low-heel shoes. Possibility of a learned locomotor response to wearing high-heel shoes.
Gefen et al (2002) [21]	8 women (mean age: 26±4 years)	Cohort study	Barefoot and own shoes: flat-heel shoes for 4 women and dress shoes with high heels (5cm) for 4 experienced high-heel shoe wearers	Before and after fatiguing exercise simulating foot loading during high heeled gait	Foot stability (COP medio-lateral eccentricities at the heel and the metatarsal heads), and lower-limb muscles EMG during overground walking on a contact pressure display gait platform	Mediolateral foot instability and imbalance in gastrocnemius lateralis and medialis muscles activity during gait in fatigued conditions in habitual high-heel shoe wearers. Adaptation of the lower limb's muscular system to regular high-heel shoes wear.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Gehlsen et al (1986) [69]	19 female college students aged 19-38 years (mean age: 24.5±3.9 years)	Cross-over controlled comparison	Barefoot, own running shoes with low heels (1.2 to 1.5cm) and own shoes with high heels (6 to 10.7cm)	Immediate effects	3D knee kinematics and temporo-spatial gait variables during treadmill walking at set cadence using a triaxial electrogoniometer and a video camera	Shorter and faster steps and reduced range of knee motion in the sagittal and transverse planes during swing in high-heel shoes versus barefoot and low-heel shoes.
Hijmans et al (2007) [22]	Older people and people with peripheral nervous system disorders	Systematic review of literature (6 cohort studies and 1 case-series) selected out of 146 studies	Shoes or ankle/foot appliances	N/A	Variables related to balance or falling	Improvement of plantar sensation via insoles with tubing or vibrating, or of proprioception via ankle appliances to enhance balance and reduce falls in older people requires further research. Long term effects of shoes and footwear appliances need to be investigated.

Appendix Table. Outline of the included papers (continued)

Authors	Subjects	Study type	Intervention	Follow-up	Outcome measures	Conclusions
Hinman (2004) [64]	56 older community-dwellers aged 57-89 years (mean age: 76 years)	Cross-over, randomised, controlled, double-blinded comparison	3 pairs of insoles of similar texture but either nonmagnetic or magnetic (2 different gauss ratings)	Immediate effects	Standing balance, leaning balance and stability index with a moving platform	No effects of magnetic insoles on older people's balance
Hong et al (2005) [23]	20 young women aged 21-30 years (mean age: 25.4±3.8 years)	Cross-over, randomised, controlled comparison	3 tests shoes of similar construction but increasing heel height: 1.0 cm, 3.8 cm and 7.6 cm, with and without total contact insert	Immediate effects	Foot plantar pressures and GRF during treadmill walking at set walking speed, using pressure insoles, and comfort ratings using a visual analogue scale	With increasing heel height, increase in discomfort, impact force, vertical and anteroposterior GRF, peak pressure in the medial forefoot, and decrease in peak pressure in the heel and midfoot. Peak pressure in the medial forefoot, impact force and first peak vertical in GRF can predict comfort in high-heel shoes.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Hosoda et al (1997) [70]	30 university students (20 women) aged 18-22 years	Cross-over, randomised comparison	Barefoot, slip-on slippers, health sandals (inside sole made of small projections)	Immediate effects	Postural reactions to vertical and horizontal movements from underfoot platform	Increased latency responses to antero-posterior perturbations in the textured sole sandals versus the slip-on slipper.
Hourihan et al (2000) [71]	107 older adults (82% women) admitted to a hospital following a hip fracture-related fall, aged 54-92 years (mean age: 77 years)	Cross-sectional with an interviewer administered questionnaire	N/A	Up to 2 weeks recall of the fall	Footwear worn at the time of the fall	In 70% of cases habitual footwear worn at the time of fall: 24 % barefoot or socks, 33% slippers and 22% slip-ons. 73% of subjects chose footwear for comfort versus 19% for safety.
Jessup (2007) [24]	44 patients from geriatric and subacute rehabilitation wards	Cross-sectional study	N/A	Immediate effects	Podiatrist evaluation of characteristics of footwear currently worn and considered to increase risk of falling. Prevalence of foot problems	Slippers or moccasins worn by 66% of patients. More than 70% of patients current shoes lacked a fastening mechanism, had slippery or too flexible soles, or had too flexible or no heel counter.

Appendix Table. Outline of the included papers (continued)

Authors	Subjects	Study type	Intervention	Follow-up	Outcome measures	Conclusions
Keegan et al (2004) [59]	Cases: 2348 people aged 45 years and over who suffered from fall-related fractures at various anatomical sites. Controls: 512 people aged 45 years and over who had a fall in the previous year	Case-control with an interviewer-administered questionnaire (in person or by phone)	N/A	N/A	Relationships between personal characteristics, falls extrinsic circumstances, characteristics of footwear worn at the time of the fall, and risk of fracture at various sites	Shoes with a medium/high heel and shoes with a narrow heel associated with increased risk of fractures at all sites. Slip-on shoes and sandals, socks /slippers, and to a lesser extent high-heel shoes and spongy sole shoes increased the risk of foot fracture.
Kerse et al (2004) [25]	606 people (434 women) aged 19-104 years (mean age: 83 ± 11 years) from residential care facilities	Cross-sectional, with prospective falls follow-up	N/A	18 months follow-up for falls	Among others, relationships between type of shoes usually worn (slippers, soft sole shoes or hard sole shoes), and risk of falls and injurious falls	Wearing shoes rather than slippers independently associated with fewer injurious falls.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Koepsell et al (2004) [26]	Cases: 327 older people who had a fall Controls: 327 non-fallers, age and sex-matched to cases. Cases and controls from cohort of 1371 community-dwellers aged 65 years or over prospectively followed for falls for 2 years	Nested case-control, with prospective falls follow-up	N/A	Footwear assessment conducted at a median 22 days post fall.	Relationships between type of footwear worn at the time of the fall (for control: footwear worn in circumstances similar to the fall) and risk of fall. In-person footwear assessment at home or fall site	Athletic and canvas shoes (sneakers) associated with lowest risk of fall. Going barefoot or in stockings associated with significantly greater risk of fall, even after controlling for measures of health status.
Larsen et al (2004) [27]	4281 community-dwelling adults (2649 women) aged 66-102 years	Cross-sectional, with 24h-retrospective falls recall. Mail survey	N/A	24-hrs prior to survey reception.	Among others, relationships between footwear worn in the home (self-administered questionnaire) and risk of fall .	Walking in socks without shoes or slippers without a sole associated with falls in women

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Lee et al (1987) [73]	13 men aged 16-48 years	Cross-over, controlled comparison	Stockings and 3 pairs of standard men shoes of identical construction but increasing heel height: 1.9cm, 3.8cm, and 5.7 cm	Immediate effects	Peak muscle activity of medial gastrocnemius and tibialis anterior recorded using EMG, during treadmill and overground walking, at set speed and cadence, respectively	Decrease in gastrocnemius muscle peak activity with increasing heel height during overground walking. Increase in tibialis anterior muscle peak activity with increasing heel height (up to 3.8cm then decrease) during treadmill and overground walking.
Lee et al (1990) [28]	6 women habitual high-heel shoe wearers, aged 20-31 years	Cross-over, controlled comparison	Stockings and 3 pairs of own shoes of increasing heel heights: 2.5cm, 5.0cm, and 7.5cm	Immediate effects	Peak muscle activity of medial gastrocnemius and tibialis anterior recorded using EMG during overground walking at a set cadence	Decrease in gastrocnemius and tibialis anterior muscles peak activity with increasing heel height. High-heel shoe wearing experience might not require greater tibialis anterior muscle activation to enhance foot stability at heel strike as seen in men.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Lee et al (2001) [72]	5 women in their 20's	Cross-over, randomised, controlled comparison	3 pairs of shoes of increasing heel heights: 0cm, 4.5cm and 8cm	Immediate effects	Lumbar flexion angle and body COM vertical displacement, and tibialis anterior, vastus lateralis and erector spinae muscles peak activity during overground walking at set speed, using a motion analysis system and EMG recordings	Increasing heel height reduces lumbar flexion angle, increases erector spinae and tibialis anterior muscles peak activity, and increases COM vertical displacement
Li and Chen (2004) [29]	N/A	Mechanical testing of footwear slip-resistance	4 shoe soling materials (EVA, leather, blown rubber and neolite) tested without or with tread grooves (7mm deep) of different widths: 3mm, 6mm, .9mm and 12mm.	Immediate effects	Relationships between tread groove width and dynamic COF (recorded with a slipmeter) in the different footwear, surface (terrazzo, steel and vinyl) and contamination (wet, water-detergent mix, oil-brushed and oil-poured) conditions.	Best slip-resistance with the 1.2cm tread groove for all footwear on the water contaminated surfaces. No effect of tread groove width on slip resistance on oil-contaminated surfaces for any footwear material.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Li and Chen (2005) [74]	N/A	Mechanical testing of footwear slip-resistance	3 shoe soling materials (EVA, blown rubber and neolite) tested with tread grooves (6mm deep) of different width (3mm or 9m) and orientation (0°, 45° and 90°)	Immediate effects	Relationships between tread groove width and orientation, and dynamic COF (recorded with a slipmeter) in the different footwear, surface (terrazzo, steel and vinyl) and contamination (wet, water-detergent mix, oily) conditions	In most conditions, wide tread groove perpendicular (0°) or oblique (45°) to the direction of friction measurement provides highest slip-resistance. No effect of tread groove width on slip resistance on oil-contaminated surfaces.
Li and Chen (2006) [30]	N/A	Mechanical testing of footwear slip-resistance	Neolite footwear pads with tread grooves of varying depth (1mm-5mm) and widths (3mm or 9mm)	Immediate effects	Relationships between tread groove width and depth, and dynamic COF (recorded with a slipmeter) in the different footwear, surface (terrazzo, steel and vinyl) and contamination (wet, water-detergent mix, oil-brushed and oil-poured) conditions	Highest COF on water-contaminated surfaces for footwear pads with deepest and widest tread grooves; No effect of tread groove depth on slip resistance on oil-contaminated surfaces

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Lindemann et al (2003) [31]	26 older women living in nursing homes and assisted facilities, aged 67-99 years (median age: 87 years)	Cross-over, randomised, controlled comparison	Own habitual closed shoes (mean heel height:3.2 ± 0.7cm) and 2 pairs of senior sports shoes of identical construction but different heel height: 1cm and 2cm.	5 weeks habituation with either senior sports shoes	Mean velocity of COP when standing quietly for 20sec with eyes closed; Maximum gait speed and % double-support time during overground walking	No differences in balance and gait measurements between habitual shoes and senior sports shoes, or between 1-cm and 2-cm high heel senior shoes. No effect of habituation with new senior sports shoes on balance or gait.
Llyod and Stevenson (1989) [75]	N/A	Mechanical testing of footwear slip-resistance	2 protective boots of similar construction but different heel configurations (both with similar tread pattern): squared versus 10°bevel	Immediate effects	Dynamic COF (recorded using a slipmeter) for a range of heel strike angles on 3 surfaces (smooth cement, ceramic floor tile and vinyl floor tile) dry, wet or oily	A bevelled heel provides best slip-resistance on dry and wet surfaces. Neither heel configuration provides safe COF on oily surfaces.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Lord et al (1996) [32]	30 older women (25 hostel residents and 5 community-dwellers) aged 60-89 years (79 ± 9 years)	Cross-over, randomised, controlled comparison	Barefoot, standard walking shoes with low heels (1.6cm), dress shoes with high heels (6cm) and own shoes	Immediate effects	Postural sway, maximal balance range and coordinated stability	Best performance barefoot and or in low-heel shoes and worst in high-heel shoes. Individuals own shoes performed intermediate thus are not optimal for older people stability.
Lord et al (1999) [33]	42 older women (15 hostel residents, 11 from a retirement village and 16 community-dwellers) aged 62-92 years (mean age: 76±9 years)	Cross-over, randomised, controlled comparison	Barefoot, bowls shoes of identical construction but different hardness (soft: shore A-42 vs. hard: shore A-58) and college style shoes of identical construction but different collar height (low: 6.5cm vs. high: 15cm)	Immediate effects	Postural sway, maximal balance range and coordinated stability	Better balance across all tests in high-collar shoe versus low-collar shoes and barefoot. No difference in balance performance between soft sole and hard sole shoes, or between barefoot, or shoes with low-collar, soft soles or hard soles.

Appendix Table. Outline of the included papers (continued)

Authors	Subjects	Study type	Intervention	Follow-up	Outcome measures	Conclusions
Maki et al (1999) [34]	7 young adults (5 women) aged 23-31 years (mean age: 26 years) and 14 older adults (6 women) aged 65-73 years (mean age: 69 years)	Cross-over, randomised, controlled comparison	With or without flexible tubing applied to the boundaries of the plantar foot surface	Immediate effects	Stepping reactions (frequency, extra limb movements, step timing, COM motion, rate of loading and COP displacement) in response to unpredicted transient and/or continuous forward, backward and lateral platform perturbations	Plantar facilitation might improve control compensatory stepping in response to sudden postural perturbation.
Mandato and Nester (1999) [76]	35 women all experienced high-heel shoe wearers, aged 23-32 years (mean age: 25.5 years)	Cross-over, randomised, controlled comparison	Sneakers and 2 pairs of dress shoes with high heels: 2-inch and 3-inch	Immediate effects	Foot plantar pressures during overground walking at self-selected speed, using pressure insoles	Increased peak forefoot pressure from sneakers to medium heels by 63%, from medium to high heel by 30% and from sneakers to high heels by 110%. Shift in peak pressure toward the first metatarsal and the hallux with increasing heel height.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Manning and Jones (2001) [35]	1 test subject	Human testing of footwear slip-resistance with random presentation of footwear	30 pairs of shoes with soles of various material of different roughness and hardness and 41 pairs of manufactured boots	N/A	Dynamic COF during backward walking (walking traction method) on a range of floor surfaces (dry, wet, icy or oily)	Microcellular polyurethane AP66033 safest sole material for ambulation on all surfaces even oily. Increasing new shoes roughness improves slip-resistance. Soles of commercial footwear provide poor slip resistance on ice.
McBride et al (1991) [36]	11 women (mean age: 27±7 years)	Cross-over, controlled comparison	Barefoot and own dress shoes with high heels (mean: 6.8 ± 0.8cm)	Immediate effects	Joint reaction forces at the 1st MTP joint and at the metatarsal-sesamoid joint during overground walking at self-selected speed, using sagittal kinematic, force platform, footprint and radiographic data	Reaction forces at the 1st MTP and metatarsal-sesamoid joints and the resultant force nearly doubled in high heeled gait. High heel shoes alter the loading pattern at the 1st MTP joint at push-off and kinematics at the 1st MTP and metatarsal-sesamoid joints.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
McKiernan (2005) [37]	109 older community-dwellers (66 females) aged 65-96 years (mean: 74.2 years), who fell at least once in the previous year	Prospective, randomized control trial.	Own usual winter footwear (control) versus plastic elastomer netting worn over the sole of outdoors shoes (intervention)	North American Winter	Prospective falls assessment through falls diary. Relationships between wear of gait stabilising device and risk of falls	Reduction in the relative risk of outdoor fall and injurious falls for the intervention group when only considering days walked on snow and ice. A simple gait-stabilizing device can prevent outdoors falls and non-serious injuries in older people at risk of falls.
Menant et al (2008) [86]	29 community-dwelling adults (15 women) aged over 70 years (mean age: 79±4 years)	Cross-over, randomised, controlled comparison	Standard shoe versus 7 identical shoes except for one feature: elevated heel (4.5cm), soft sole (shore A-25), hard sole (shore A-58), flared sole (20°flare), bevelled heel (10°), high collar (11cm) and tread sole.	Immediate effects	Postural sway, maximal balance range, coordinated stability and choice-stepping reaction time test	Elevated heel shoes increase postural sway and worst across standing, leaning and stepping tests versus standard shoes. Hard sole and high collar shoes better than standard shoes across standing, leaning and stepping tests but not significantly.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Menz et al (1999) [38]	N/A	Literature review on footwear and postural stability in older people	N/A	N/A	N/A	Optimal features of shoes for balance in older people still unknown, thus further research required on shoe sole thickness and hardness, high collar and flared sole effects.
Menz et al (2001) [39]	N/A	Mechanical testing of footwear slip-resistance	4 men's Oxford-type shoes of identical construction: standard, or with either: 30° sole flare, 10° heel bevel, or non-slip textured sole; 4 women's high-heel dress shoes of identical construction: with broad or narrow heel, and with or without non-slip textured sole	N/A	Dynamic COF on 4 surfaces (bathroom tile, concrete, vinyl flooring and a terra cotta tile) either dry or water-wet recorded with a slipmeter.	Highest dynamic COF for bevelled heel oxford-type shoes and the broad textured high-heel shoes. Oxford-type shoes with square and bevelled heels provide safe dynamic COF on dry surfaces contrary to narrow heel dress shoe. None of the test shoes reach a safe COF on the oil-contaminated surfaces.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Menz et al (2005) [40]	176 people (120 women) retirement village residents, aged 62–96 (mean age: 80.1±6.4 years)	Cross-sectional study	N/A	N/A	Relationships between characteristics of footwear most often worn indoors and outdoors and prevalence of forefoot problems	Too narrow shoes worn by more than ¾ of the older people. Ill-fitting shoes associated with corns, calluses and toe deformities.
Menz et al (2006) [41]	176 people (120 women) retirement village residents, aged 62–96 (mean age: 80.1±6.4 years)	Case-control study with prospective falls follow-up	N/A	1-year prospective falls follow-up	Relationships between characteristics of footwear most often worn indoors and outdoors (on-site evaluation with standardised form) and risk of indoors and outdoor falls	Going around barefoot or in socks increases the risk of indoor falls; No association between footwear characteristics and risk of indoors or outdoors falls.
Mickle et al (2007) [85]	312 older community-dwelling adults (154 women) aged 60-90 years (mean age: 71.2±7.7 years)	Cross-sectional study	N/A	N/A	Association between type of footwear worn within the home (barefoot, slipper or fastened shoe) and, falls risk score (computed from a series of sensorimotor function tests) and self-reported foot pain.	19% of the subjects walked in or around the home without shoes. Greater falls risk score and foot pain found in those wearing slippers compared to those going around the home barefoot or with shoes.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Munro et al (1999) [42]	128 community-dwelling older adults (68 women) aged over 65 years (mean age: 72±5.9 years)	Cross-sectional study , mail survey	N/A	N/A	Frequency of household footwear types, characteristics of current household footwear, footwear needs and purchasing habits	Less than ½ of the respondents wore shoes with fasteners: slippers most reportedly worn and more than a ¼ of the respondents went around the home shoeless. Choice of household footwear based on comfort and ease of donning. Older people replace household footwear infrequently.
Nigg and Morlock (1987) [77]	14 male runners	Cross-over, randomised controlled comparison	3 pairs of running shoes identical except for their heel design: no flare, 16° lateral heel flare, rounded heel (negative flare).	Immediate effects	Initial and total pronation and impact forces during running at a set speed, using a high-speed camera and a force platform.	Increased initial pronation with increasing heel flare. No effects of heel flare on the magnitude of the total pronation and impact force peaks.

Appendix Table. Outline of the included papers (continued)

Authors	Subjects	Study type	Intervention	Follow-up	Outcome measures	Conclusions
Opila (1988) [43]	19 young students (12 women) aged 21-43 years	Cross-over, controlled comparison	Barefoot and, test stiletto shoes (men) (heel height: 7cm) or own high-heel dress shoes (mean heel height: 6.4cm) (women)	Immediate effects	Distance between anatomical landmarks and line of gravity, pelvis tilt, sagittal segmental angles (thoracic, lumbar, ankle), and lumbar moment loading, during quiet standing	Backward tilting of the pelvis and lumbar spine flattening in high-heel shoes. High-heel shoes increase foot plantarflexion and external rotation and moment loading at the L3 level.
Opila-Correia (1990a) [45]	14 women aged 21 to 54 years (mean age: 35±10.4 years)	Cross-over, controlled comparison	Own shoes with low heels (mean height: 1.6±1.1cm) and own dress shoes with stiletto heels (mean height: 6.1±0.9cm)	Immediate effects	Temporo-spatial variables of gait, 3D kinematics of the tibia, knee, hip, pelvis, trunk and upper trunk during overground walking at self-selected speed, using a motion analysis system	High-heel shoes elicit smaller walking speed and stride length, greater stance time, greater knee flexion at heelstrike and during stance, smaller knee flexion at toe-off, smaller knee and hip flexion during swing, decrease in total range of motion of the pelvis and trunk in the sagittal plane.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Opila-Correia (1990b) [44]	14 women split in 2 age-groups: 7 young (mean age: 26.3 years) and 7 old (mean age: 43.7 years); also split in 2 groups according to high-heel shoe wearing experience: 6 experienced and 8 non-experienced	Cross-over, controlled comparison	Own shoes with low heels (mean height: 1.6±1.1cm) and own dress shoes with stiletto heels (mean height: 6.1±0.9cm)	Immediate effects	Temporo-spatial variables of gait, 3D kinematics of the tibia, knee, hip, pelvis, trunk and upper trunk during overground walking at self-selected speed, using a motion analysis system	Age and experience influence kinematics of high-heeled gait. More anterior pelvic tilt, more posterior upper trunk and increased trunk lordosis in young subjects versus old subjects. Greater increase in knee flexion at heel strike and during stance in experienced versus non-experienced high-heel shoe wearers.
Ottaviani et al (1995) [78]	20 young men (mean age: 22.6±3.1 years)	Cross-over, randomised controlled comparison	Low top basketball shoes and three quarter-top basketball shoes	Immediate effects	Resistance (strength) to inversion and eversion moments at 3 different angles of plantarflexion (0°, 16° and 32°) under unipedal weightbearing conditions	Greater resistance to ankle inversion in three-quarter top shoes at 0° and 16° of ankle plantarflexion. No significant differences in eversion strength between shoe conditions.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Perry et al (2007) [46]	12 young women aged 20-23 years	Cross-over, randomised controlled comparison	Barefoot and 3 simulated foot beds of different midsole material hardness: soft (shore A-15), standard (shore A-33) and hard (shore A-50), firmly attached to the foot	Immediate effects	Medio-lateral COM-BOS and antero-posterior COM-COP differences during single stance, average vertical force loading rate during the first 100ms of foot contact, during unexpected gait termination, using motion analysis and force platforms	Presence and hardness level of midsole (soft especially) impairs dynamic balance control (reduction in medio-lateral COM-BOS range and antero-posterior COM-COP difference, increase in vertical loading rate) during gait termination in young adults.
Priplata et al (2003) [47]	15 young adults (5 women) (mean age: 23±2 years) and 12 older adults (8 women) (mean age: 73±3 years)	Cross-over, randomised controlled comparison	Vibrating gel-based insoles versus the same insoles without mechanical noise	Immediate effects	Measurements of postural sway recorded using motion analysis (shoulder marker) during quiet stance with eyes closed	Larger effect of vibrating insoles on postural sway in older subjects. Potential benefits of wearing vibrating insoles on postural control in older people.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Robbins et al (1992) [48]	25 older men over 60 years (mean age: 69±1 years)	Cross-over, randomised controlled comparison	Barefoot and 6 shoes of identical construction but different midsole thickness (thin or thick: 13 vs. 27mm at the heel and 6.5 vs. 16mm at the 1st MTP joint) and hardness (soft: shore A-15; medium: shore A-33; hard: shore A-50)	Immediate effects	Balance failure frequency (number of falls per 100m) during beam walking at set speed	More balance failures when barefoot than shod. Increased midsole thickness and softness associated with impaired balance during beam walking. Shoes with the softest and thickest midsole perceived most comfortable.
Robbins et al (1994) [50]	17 men aged 19-50 years (mean age: 32.6±11.1 years)	Cross-over, randomised controlled comparison	Same as in Robbins et al., 1992	Immediate effects	Balance failure frequency (number of falls per 100m) during beam walking at set speed	Stability positively related to midsole hardness and negatively related to midsole thickness. Shoes with thick soft midsoles caused most balance failures and rated most comfortable by 15 subjects.

Appendix Table. Outline of the included papers (continued)

Authors	Subjects	Study type	Intervention	Follow-up	Outcome measures	Conclusions
Robbins et al (1995) [51]	36 young men aged 22-37 years (mean age: 30±4 years) and 15 older men aged 65-83 years (mean age: 73±5 years)	Cross-over, randomised controlled comparison	Barefoot and with running-type shoes of standard hardness (shore A-33) and thickness (27mm at the heel and 16 mm at the 1st MTP joint)	Immediate effects	Perceived direction (plantarflexion, dorsiflexion, inversion and eversion) and amplitude (0° to 25° with 2.5° increments) of surface slope during standing	Wearing shoes alters foot position awareness in young and older adults, presumably by attenuating plantar tactile sensitivity.
Robbins et al (1997) [49]	13 young men (mean age: 28.1±4.0 years) and 13 older men (mean age: 72.6±4.5 years)	Cross-over, randomised controlled comparison	Same as Robbins et al., 1992	Immediate effects	Balance failure frequency (number of falls per 100m) and foot position error (rearfoot angle - perceived maximum supination) during beam walking at set speed.	Shoes with thick and soft midsoles impair foot position sense and balance during beam walking.
Robbins et al (1998) [79]	30 young men (mean age: 34±6 years) and 30 old men (mean age: 66±3 years)	Cross-over, randomised controlled comparison	With or without support surface interfaces (shoe sole material) of different thickness (7cm and 14cm) and resiliency (3 high, 1low)	Immediate effects	Postural sway during one-legged stance with eyes open using a force platform and perceived interface comfort using an 11-point ratio scale	Improved postural stability and equal comfort on low resiliency interfaces versus high-resiliency interfaces.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Sekizawa et al (2001) [80]	20 young men (mean age: 25.5±1.3 years)	Cross-over, randomised controlled comparison	Barefoot and with 2 pairs of shoes of similar sole hardness but different thickness (thin: 2.5cm at the heel and 1.5cm at the MTP joint, thick: 5cm at the heel and 3cm)	Immediate effects	Estimate angle error (estimate angle –slope angle) and direction during one-legged stance on a surface board of varying slope direction (plantarflexion / dorsiflexion, inversion / eversion) and angle	No effect of shoe sole thickness on ankle joint position sense except in dorsiflexion where thick sole shoes lead to greater underestimated angle errors versus barefoot.
Sherrington and Menz (2003) [52]	95 older adults (72 women) (mean age: 78.3±7.9 years) who had suffered a fall-related hip fracture	Cross-sectional study	N/A	Up to 5 month recall	Relationships between characteristics of footwear worn at the time of the fall (using a standardised footwear assessment form), location and type of falls	Slippers worn in 22% of falls and most likely presented sub-optimal features: no fastening mechanism, too flexible sole or heel counter, and 75% of the shoes had at least one hazardous feature. Subjects who tripped were more likely to be wearing footwear with no fixation than those who did not trip.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Snow et al (1992) [54]	45 women	Cross-over, randomised controlled comparison	Barefoot and 3 pairs of high-heel dress shoes of similar toe-box design but increasing heel height: 1.91cm, 5.08cm and 8.26cm	Immediate effects	Plantar pressure distribution during overground walking at a set speed, using a pedograph	Increasing heel height increases maximum peak pressure under the metatarsal heads and rate of loading on the metatarsal heads during early support, and decreases time to maximum peak pressure.
Snow and Williams (1994) [53]	11 women all with similar experience of wearing high-heel shoes	Cross-over, randomised controlled comparison	3 pairs of high-heel dress shoes of similar toe-box design but increasing heel height: 1.91cm, 3.81 cm and 7.62cm	Immediate effects	COM position, forefoot loading, postural alignment during quiet standing. Sagittal lower limb kinematics, rearfoot motion, and shoulder and pelvic rotations during treadmill walking at set speed using 3D-cinemaotgraphy. GRF during overground walking at set speed a using force platform.	Increasing heel height increases forefoot loading possibly due to increased anterior displacement of the COM. Greater first peaks in vertical and antero-posterior GRF likely associated with increased ankle plantarflexion and foot supination in high-heel shoes.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Soames and Evans (1987) [55]	24 women aged 18-29 years	Cross-over, controlled comparison	Barefoot and in own 4 pairs of: soft sole and rigid sole shoes without heels, medium heel and high-heel shoes	Immediate effects	Horizontal GRF and lower limb segment displacement using during overground walking at self-selected speed, using a force platform and a goniometer	Increasing heel height and reducing shoe-ground contact area decrease peak medio-lateral GRF at heel strike and toe-off, and segmental limb displacements.
Speksnijder et al (2005) [81]	10 women used to wearing shoes with low and high heels.	Cross-over, controlled comparison	Own shoes with low heel (mean height: 1.95±1.06cm) and own shoes with high heels (mean height: 5.95±1.03cm)	Immediate effects	Plantar pressures distribution during overground walking at controlled cadence (subject's preferred cadence), using pressure insoles	Shift in loading from midfoot and heel to central and medial forefoot and increases in forefoot peak pressure and pressure time integral in high-heel versus low-heel shoes.
Stacoff et al (1996) [82]	12 men (mean age: 25 years)	Cross-over, randomised controlled comparison	Barefoot and 5 sports shoes of different sole configuration, hardness and thickness, collar height and torsional stiffness	Immediate effects	Parameters related to shoe and foot lateral stability (including range of motion in inversion and rearfoot angular velocity) during sideward cutting task	Greater inversion movement in shoes versus barefoot. Improved lateral stability in shoes with a medial sole flare and shoes with a high top versus other shoes.

Appendix Table. Outline of the included papers (continued)

Authors	Subjects	Study type	Intervention	Follow-up	Outcome measures	Conclusions
Stevenson et al (1989) [83]	N/A	Mechanical testing of footwear slip-resistance	14 protective shoes of varying sole materials and tread	N/A	Dynamic COF on 12 surfaces (either dry or contaminated with water, detergent, oil or oil-residue) using a slipmeter	Increasing floor roughness enhances slip-resistance.
Suomi and Koceja (2001) [56]	14 young adults (7 women) (mean age: 24.6±3.5 years) and 14 older adults (7 women) (mean age: 66.7±8 years)	Cross-over controlled counterbalanced comparison	Magnetic foot insoles and nonmagnetic foot insoles of different texture	Immediate effects	Postural sway during quiet standing with eyes open and closed	Significant reduction in postural sway in the older adults on the magnetic versus the nonmagnetic insoles with and without vision.
Tencer et al (2004) [57]	Same as in Koepsell et al 2004	Nested case-control study with prospective falls follow-up	N/A	Footwear assessment conducted at a median 22 days post fall	Relationships between biomechanical measurements of shoes (lateral stability, foot position sense, shoe/surface interface) worn at the time of the fall and risk of fall. In-person footwear assessment	Falls risk nearly doubled in older people wearing shoes with heel higher than 2.5cm. Greater sole/surface contact associated with reduced falls risk.

Appendix Table. Outline of the included papers (continued)

Authors	Subjects	Study type	Intervention	Follow-up	Outcome measures	Conclusions
Waddington and Addams (2004) [58]	20 older community-dwellers aged 65- 85 years	Cross-over, randomised controlled comparison	Barefoot or in own preferred footwear	5-weeks wobble-board training	Ability to differentiate five selected foot positions into inversion (10° to 14° angle) while standing upright with one foot on a moveable foot plate	Wearing shoes improve ankle inversion movement discrimination.
Wang et al (2001) [60]	15 college students aged 21-23 years	Cross-over, controlled comparison	Flat shoes (heel height: 1.3cm), running shoes (heel height: 2.5cm) and high-heel shoes (heel height: 7.5cm)	Immediate effects	GRF at heel-strike and toe-off during overground walking at self-selected speed, using force platform	Longer contact times during heelstrike and toe-off phases and greater walking cadence in the high-heel shoes than in the other shoes.
Whitney and Wrisley (2001) [61]	30 older patients (22 women) undertaking vestibular physical therapy (mean age: 63±17 years)	Cross-over, randomised controlled comparison	Barefoot and with own shoes	Immediate effects	Ability to stand still on firm and a compliant surfaces with eyes open and closed for 30sec	No influence of footwear on standing balance tests scores in older people undertaking vestibular therapy.

Appendix Table. Outline of the included papers (continued)

Authors	**Subjects**	**Study type**	**Intervention**	**Follow-up**	**Outcome measures**	**Conclusions**
Wilson et al (In Press) [87]	40 healthy females (51.1±5.8 years); 3 intervention groups and 1 control group (n=10 per group)	Test–retest randomised clinical trial	Standard shoes worn without (control) or with (intervention) plain, dimpled or grid surfaced foot orthotics	4 weeks habituation	Postural stability during quiet standing with eyes open and closed on a force platform. Base of support during walking at self-selected speed on an instrumented walkway	No effects of 4 weeks wear of foot orthotics in a standardised shoe on postural and walking stability in middle-aged women.
You et al (2004) [62]	10 adults high or low proprioceptive acuity, and normal ankle stability or chronic ankle instability	Cross-over, controlled comparison	Barefoot with or without circumferential ankle pressure using a blood pressure cuff.	Immediate effects	Joint position sense in 5 ankle positions (neutral, inversion, eversion, plantarflexion, dorsiflexion), passive and active ankle stiffness and postural stability (mediolateral and anteroposterior COP displacements) during unipedal stance	Increased proprioceptive acuity and trends toward increased active stiffness in the ankle, hence improved postural stability with circumferential ankle pressure. Effects maybe limited to individuals with poor ankle joint position sense.

Appendix Table. Outline of the included papers (continued)

Authors	Subjects	Study type	Intervention	Follow-up	Outcome measures	Conclusions
Yung-Hui and Wei-Hsien (2005) [63]	10 young females aged 20-28 years (mean age: 23 years), 4 of them were habitual high-heel shoe wearers	Cross-over, randomised controlled comparison	3 pairs of high-heel shoes of similar construction but increasing heel height: 1cm, 5.1cm and 7.6cm with and without inserts	Immediate effects	Plantar pressure distribution and impact force during overground walking at set walking speed, using in-shoe pressure system and 2 force platforms. Perceived shoe comfort	With increasing heel height shift in plantar pressures from the heel and midfoot to the forefoot, increased impact force at heel strike and decreased perceived comfort.