Risk of falls in relation to visual and hearing impairments

(overview essay)

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Abstract: *The contribution presents a literary review of the facts about the risk of falls in association with visual and hearing impairments from current studies. Fall is the potential risk for persons with visual and hearing impairments, regardless of age. Stability is influenced by integration and evaluation of visual, vestibular, and somatosensory information. Visually and hearing-impaired people are a potentially weakened target group regarding the disturbed keeping of the postural stability, posture, and balance. The aim of the contribution is to summarize studies that show experiences with problem of falls among individuals with sensory loss.*

Keywords: *fall, stability, balance, vision, hearing, impairment*

1 Introduction

Falls are a health hazard for the elderly patient. Annually, approximately 30 percent or more of elderly patients will experience such a problem. Seventy percent of deaths from falls occur in the elderly population. Morbidity from falls includes fractures, soft tissue trauma, anxiety about further falls, and loss of confidence. Falls are due to environmental factors; neurologic illness including dementia, drop attacks, and sensory loss; alcohol and drug use; orthostatic; cardiac arrhythmias; and acute illnesses such as infection, heart failure, and gastrointestinal bleeding (Duthie, 1989). As stated Tománková (2019) vision loss and blindness are almost always accompanied with feelings of imbalance and disturbed gait. Similarly, with congenital visual impairment can be recorded in some individuals fear of movement or worry while walking in an unknown space, accompanied by an unsteady walk. The body posture and walking quality are subsequently connected with complex lifestyle, as well as with question of different visual perception of body in space.

Increased incidence of unbalance among people with hearing impairment is primarily on the deaf who have sensory-neural hearing loss. Fault accuracy of kinetic features of foot, static (standing upright stance) and dynamic (movement, walking) leads to significant changes of gait stereotype and individual modifications of the motor assumptions. Throughout the life of impaired persons it is required to take care of the spatial orientation and movement in space, upright body posture training. Also, stability problems of people with hearing impairment are not rare because adequate postural stability requires the integration and evaluation of visual, vestibular, and somatosensory information. Healthy body posture and gait has unimaginable importance in terms of quality of life and social integration of the individuals.

2 Selected research surveys in the issue

Gopinath, McMahon, Burlutsky et al. (2016) assessed the association between dual sensory impairment and incidence of falls. We examined the influence of self-perceived hearing handicap and hearing aid use and risk of falls in cohort study of participants followed over 5 years among one thousand four hundred and seventy-eight participants aged 55 and older at baseline were included in longitudinal analyses. Visual impairment was defined as presenting or best-corrected visual acuity less than 20/40 (better eye), and hearing impairment as average pure-tone air conduction threshold > 25 dB HL (500–4,000 Hz, better ear). The shortened version of the hearing handicap inventory for the elderly was administered. Incident falls were assessed over the 12 months before each visit. Cognitive impairment was determined using the Mini-Mental State Examination. Five-year incidence of falls was 10.4%. Participants with severe self-perceived hearing handicap versus no hearing handicap had increased risk of incident falls, multivariable-adjusted OR 1.93 (95% confidence intervals, CI, 1.02–3.64). Hearing aid users versus non-users had 75% increased likelihood of incident falls. Participants with co-existing best-corrected visually impairment and mild hearing loss (> 25 to ≤ 40 dB HL) had higher odds of incident falls, OR 2.19 (95% CI 1.03–4.67). After excluding persons with cognitive impairment, this association did not persist. These epidemiological data show that dual sensory impairment in older adults could significantly increase their risk of falling. Grue, Ranhoff, Noro et al. (2009) were looking for prevalence of hearing and vision impairment and their associations with risk of falling in patients aged 75 years or older, admitted to a medical ward in an acute hospital in each of the five Nordic countries. Premorbid data, admission data and history of falls over 3 months were obtained on admission by interview and observation. Hearing impairment was present if the patient required a quiet setting to be able to hear normal speech. Vision impairment was defined as unable to read regular print in a newspaper. Bivariate and logistic regression analyses were performed. 48% of the patients had a hearing

impairment, 32.3% had vision impairment and 20.1% had both. Hearing impairment was associated with falling but not in the logistic regression model.

Hearing and vision impairments were frequent among older patients in the medical wards. Falling was associated with hearing loss, vision, and combined impairments. Sensory loss was also associated with fear of falling. Grue, Kirkevold, & Ranhoff (2009) examined the prevalence of hearing and vision impairments in 65+ year-old patients with hip fractures. They were screened for study of 332 patients. Impairments were defined as problems with seeing, reading regular print, or hearing normal speech. Sixteen per cent of the patients had no sensory impairments, 15.4% had vision impairments, 38.6% had hearing impairments and 30.1% had combined sensory impairments. Results showed the prevalence of combined sensory impairments was: 32.8% none; 52.2% moderate/severe; and 15.1% severe. Patients with hip fractures frequently have hearing, vision, and combined impairments. Lach, Lozano, Hanlon et al. (2020) explored factors associated with fear of falling in 225 patients with vision, hearing, or dual sensory impairment. Fear of falling is associated with vision and hearing impairment. Fifty-one percent of patients was afraid of falling. Residents who were afraid reported better cognition, lower falls self-efficacy, and higher outcome expectancy in the total sample and in most impairment groups. Falls outcome expectancy predicted fear of falls in the total sample and in the visual and hearing sensory impairment groups. Lopez, McCaul, Hankey et al. (2011) were determined if there are gender differences in the associations between visual and hearing impairment and these outcomes. 2340 men and 3014 women aged 76–81 years were followed for an average of 6.36 years. Dependent variables were self-reported vision and hearing impairment. Outcome variables were falls, injuries from falls, physical and mental components of HRQOL (SF-36 physical and mental components) and all-cause mortality. Vision impairment was more common in women and hearing impairment was more common in men. Vision impairment was associated with increased falls risk (odds ratio (OR) = 1.77, 95% CI = 1.35–2.32 in men; OR = 1.82, 95% CI = 1.44–2.30 in women), injuries from falls (OR = 1.69, 95% CI = 1.23–2.34 in men, OR = 1.79, 95% CI = 1.38–2.33 in women), and mortality (hazard ratio (HR) = 1.44; 95% CI = 1.17–1.77 in men; HR = 1.50, 95% CI = 1.24–1.82 in women) and declines in SF-36 PCS and MCS. Hearing impairment was associated with increased falls risk (OR = 1.38, 95% CI = 1.08–1.78 in men; OR = 1.45, 95% CI = 1.08–1.93 in women) and declines in SF-36 physical and mental components. Overall, there were no gender differences in the association between vision and hearing impairment and the outcomes. Skalska, Wizner, Piotrowicz et al. (2013) assessed the prevalence of falls, their circumstances and consequences in the Polish population aged 65 years and older in comparison to younger respondents aged 55–59 years, and the relation of falls to visual and hearing deficits. Mean age of the 4920 elderly subjects (51.6% men) was 79.4 ±8.7 years. Falls in the past year were

reported by 10.4% of the younger and 19.1% of the older subjects. In both groups falls occurred more frequently in women (11.9% vs. 8.7%, $p = 0.03$ in the younger and 22.7% vs. 13.2%, $p < 0.001$ in the older group). In the group of older subjects falls occurred most often during walking (66.7% vs. 50.7% in the group of 55–59 years old), $p = 0.005$), while the younger more often fell while practicing sports (5.48% vs. 0.8% in the group 65+, $p < 0.001$) and risky activities (respectively: 13.7% vs. 4.9%, $p = 0.002$). A similar percentage of younger and older fallers reported one (44.0% and 46.1% respectively) or more falls (56.1% and 53.9%; $p = 0.6$). The percentage of recurrent fallers grew with increasing age ($Cc = 0.177$; $p < 0.001$).

The prevalence of injurious falls was similar in the younger and older groups (45.4% and 42.8%, $p = 0.53$). In both genders fall-related injuries were more frequent in younger elderly (65–74 years old) and in subjects 90 years old and older. In the non-standardized analysis and after adjustment for age and gender visual and hearing impairments and its degree were associated with falls but both relations lost statistical significance after adjustment for a set of explanatory variables. Despite somewhat lower estimates, falls in older Poles are no less an important factor influencing overall health than in their populations. As a stated Viljanen, Kaprio, Pyykkö et al. (2009) mobility decline, the coexistence of several sensory difficulties and fear of falling are all common concerns in older people. Data on self-reported fear of falling, difficulties in hearing, vision, balance, and walking 2 km were gathered with a structured questionnaire among 434 women aged 63–76 years at baseline and after a 3-year follow-up. Logistic regression models were used for analyses. Every third participant reported difficulties in walking 2 km at baseline. In cross-sectional analysis, the odds ratio for difficulties in walking 2 km was higher among persons who reported fear of falling compared with persons without fear of falling and the odds increased with the increasing number of sensory difficulties. Persons who reported fear of falling and who had three sensory difficulties had almost fivefold odds (odds ratio = 4.7, 95% confidence interval = 1.9–11.7) for walking difficulties compared with those who reported no fear of falling and no sensory difficulties. Among the 290 women without walking difficulties at baseline, 54 participants developed difficulty in walking 2 km during the 3-year follow-up. Odds ratio for incident walking difficulty was 3.5 (95% confidence interval = 1.6–7.8) in participants with fear of falling and with 2–3 sensory difficulties compared with persons without fear of falling and with at most one sensory difficulty at baseline. Older women who have several coexisting sensory difficulties combined with fear of falling are particularly vulnerable to mobility decline. Avoidance of walking because of fear of falling is likely to be reinforced when multiple sensory difficulties hinder reception of accurate information about the environment, resulting in accelerated decline in walking ability. Yamada, Vlachova, Richter et al. (2014) examine the prevalence of sensory impairment in nursing home residents, and whether sensory impairment is related to

other common clinical problems in nursing homes, mediated by functional disability, cognitive impairment, and depressive symptoms. Cross-sectional data of 4007 nursing home residents in 59 facilities in 8 countries from the SHELTER study were analyzed. Visual and hearing impairments were assessed by trained staff using the interRAI instrument for Long-Term Care Facilities. Generalized linear mixed models adjusted for functional disability, cognitive impairment, and depressive symptoms were used to analyze associations of sensory impairments with prevalence of clinical problems, including behavioral symptoms, incontinence, fatigue, falls, problems with balance, sleep, nutrition, and communication. Of the participants, 32% had vision or hearing impairment (single impairment) and another 32% had both vision and hearing impairments (dual impairment). Residents with single impairment had significantly higher rates of communication problems, fatigue, balance problems, and sleep problems, as compared with residents without any sensory impairment. Those with dual impairment had significantly higher rates of all clinical problems assessed in this study as compared with those without sensory impairment. For each clinical problem, the magnitude of the odds ratio for specific clinical problems was higher for dual impairment than for single impairment. Visual and hearing impairments are associated with higher rates of common clinical problems among nursing home residents, independent of functional disability, cognitive impairment, and depressive symptoms.

The study of Campos, Ramkhalawansingh, Pichora-Fuller et al. (2018) explore the role of hearing in self-motion perception across a range of mobility-related behaviors. They assessed age-related changes in auditory self-motion perception and the potential consequences to performance on mobility-related tasks. They describe age-related changes to other sensory and cognitive functions and that may interact with hearing loss in ways that affect mobility (falls). Jiam & Agrawal (2016) evaluated the current evidence for an association between hearing loss and falls risk. Twelve eligible studies were identified. The odds of falling were 2.39 times greater among older adults with hearing loss than older adults with normal hearing (pooled odds ratio 2.39, 95% confidence interval [CI]: 2.11–2.68). In sensitivity analyses, we restricted the meta-analysis to studies where hearing loss was audiometrically defined (N = 6) and observed hearing loss to be associated with a 69% increase in the odds of falling (pooled odds ratio 1.69, 95% CI: 1.18–2.19). When we further limited to studies that also performed multivariate regression analyses (N = 4), the overall effect size did not appreciably change (pooled odds ratio 1.72, 95% CI: 1.07–2.37). We observed a potential positive publication bias in the literature. Limitations of the systematic review and meta-analysis are the cross-sectional designs of most studies and the heterogeneity across studies ($Q = 631$, $P < .05$, $I2 = 98.1\%$). In the published literature, hearing loss is associated with significantly increased odds of falling in older adults. As a stated Lichtenstein (1992) visual loss is a common age-associated disability that

has effects in multiple domains of function. Visual loss especially increases the risk of falls and hip fractures and may limit the ability of an older individual to safely operate a car. The ability to remediate visual disability depends on the cause of the underlying impairments and the relative effectiveness of treatment for each. Sight restoration can be dramatic for selected patients with cataracts. Sight preservation is also excellent for persons with diabetic retinopathy. For those with macular degeneration, the data are hopeful but less compelling. Although persons with glaucoma should receive medications to lower their intraocular pressure, experimental evidence that this, in fact, preserves vision is currently lacking. The geriatrician's role in visual rehabilitation consists of the identification of the impairments, determination of the impact of visual loss on other functional domains, and appropriate referral to an ophthalmologist for full assessment and treatment. If severely limited by permanent visual losses, the patient should be referred for appropriate support services. Viljanen, Kulmala, Rantakokko et al. (2012) examined whether hearing acuity predicts falls and whether the potential association is explained by postural balance and examined whether shared genetic or environmental effects underlie these associations. Hearing was measured using a clinical audiometer as a part of the Finnish Twin Study on Aging in 103 monozygotic and 114 dizygotic female twin pairs aged 63–76 years. Postural balance was indicated as a center of pressure movement in semi-tandem stance, and participants filled in a fall-calendar daily for an average of 345 days after the baseline. Mean hearing acuity (better ear hearing threshold level at 0.5–4 kHz) was 21 dB. Means of the center of pressure velocity moment for the best to the poorest hearing quartiles increased linearly from 40.7 $mm^{(2)}/s$ (SD 24.4) to 52.8 $mm^{(2)}/s$ (SD 32.0) (p value for the trend = .003). Altogether 199 participants reported 437 falls. Age-adjusted incidence rate ratios for falls, with the best hearing quartile as a reference, were 1.2 (95% CI = 0.4–3.8) in the second, 4.1 (95% CI = 1.1–15.6) in the third, and 3.4 (95% CI = 1.0–11.4) in the poorest hearing quartiles. Adjustment for center of pressure velocity moment decreased incidence rate ratios markedly. Twin analyses showed that the association between hearing acuity and postural balance was not explained by genetic factors in common for these traits. People with poor hearing acuity have a higher risk for falls, which is partially explained by their poorer postural control. Auditory information about environment may be important for safe mobility.

Impaired vision is highly prevalent and commonly unreported in the elderly population particularly in women and those living in nursing homes. Measurement of visual functions such as visual acuity, contrast sensitivity and depth perception may identify older people at risk of falls and hip fracture. Visual loss in older people is correctable in most cases. Intervention strategies, for example, change of glasses or cataract extraction may have the potential of improving visual function and preventing falls in older people (Abdelhafiz & Austin, 2003). Coleman, Stone, Ewing et al. (2004) determined the association between changes in visual acuity and frequent

falls in older women in prospective cohort study. Two thousand two elderly community-residing women participating in the Study of Osteoporotic Fractures with measurements of visual acuity at baseline and a follow-up examination 4 to 6 years later (mean of 5.6 years). Binocular visual acuity with habitual correction was measured under standard illumination using Bailey-Lovie charts at baseline and fourth examinations. Change in visual acuity was stratified into 5 categories: no change or visual acuity gain, loss of 1 to 5 letters, loss of 6 to 10 letters, loss of 11 to 15 letters, and loss of > 15 letters. A separate analysis considered decline in visual acuity as the loss of > or = 10 letters (> or = 2 lines) on the Bailey-Lovie acuity measure between baseline and follow-up examinations. Data on falls were obtained from postcards sent every 4 months after the follow-up examination. Frequent falling was defined as > or = 2 falls during a 1-year period after the follow-up examination. Compared with women with stable or improved visual acuity, women with declining acuity had significantly greater odds of experiencing frequent falling during the subsequent year. Odds ratios after adjustment for baseline acuity and other confounders were 2.08 (95% confidence interval [CI]: 1.39–3.12) for loss of 1 to 5 letters, 1.85 (95% CI: 1.16–2.95) for loss of 6 to 10 letters, 2.51 (95% CI: 1.39–4.52) for loss of 11 to 15 letters, and 2.08 (95% CI: 1.01–4.30) for loss of >15 letters. In the analysis of visual decline defined as a loss of > or = 10 letters, heightened risk of frequent falling was evident in each of 2 subgroups defined by splitting the sample on baseline visual acuity, with borderline significant evidence of a more pronounced effect in those women with baseline visual acuity of 20/40 or worse (P value for interaction, 0.083). Loss of vision among elderly women increases the risk of frequent falls. Prevention or correction of visual loss may help reduce the number of future falls. Coleman, Cummings, Yu et al. (2007) examined the relationship between binocular visual field loss and the risk of incident frequent falls in older white women in multicenter, prospective cohort study among four thousand seventy-one community-dwelling white women aged 70 and older participating in the study of osteoporotic fractures. Primary outcome was incident frequent falls, defined as two or more falls within 1 year. Primary risk factors were binocular visual field loss, distance visual acuity in the better eye, and contrast sensitivity at low spatial frequency in the better eye. Of 4,071 women, 409 (10%) had severe binocular visual field loss at the eye examination, and 643 (16%) experienced frequent falls within 1 year after their eye examination. Severe binocular visual field loss was significantly associated with frequent falls when adjusting for age, study site, and cognitive function (odds ratio=1.50, 95% confidence interval=1.11–2.02). The data showed a trend for increasing odds of two or more falls with greater binocular visual field loss (P < .001). In older white women with severe binocular visual field loss, 33.3% of frequent falls were attributable to visual field loss. Women with binocular visual field loss are at greater risk of future frequent falls. Screening for binocular visual field loss may identify individuals at high risk

of falling. Cumming, Ivers, Clemson et al. (2007) determined the efficacy of vision and eye examinations, with subsequent treatment of vision problems, for preventing falls and fractures in frail older people in randomized, controlled trial among six hundred sixteen men and women aged 70 and older (mean age 81) recruited mainly from people attending outpatient aged care services. The intervention group received comprehensive vision and eye examinations conducted by a study optometrist. The optometrist arranged for new eyeglasses for 92 subjects and referred 24 for a home visit with an occupational therapist, 17 for glaucoma management, and 15 for cataract surgery. The control group received usual care. Falls and fractures during 12 months of follow-up were ascertained according to self-report using a monthly postcard system. Fifty-seven percent of subjects fell at least once during follow-up. Falls occurred more frequently in the group randomized to receive the vision intervention (65% fell at least once; 758 falls in total) than in the control group (50% fell at least once; 516 falls in total). The falls rate ratio using the negative binomial model was 1.57 (95% confidence interval (CI) = 1.20–2.05, P = .001). Fractures were also more frequent in the intervention group (31 fractures) than the control group (18 fractures; relative risk from proportional hazards model 1.74, 95% CI = 0.97–3.11, P = .06). In older people, comprehensive vision, and eye assessment, with appropriate treatment, does not reduce, and may even increase, the risk of falls and fractures.

The relationship between several aspects of vision and falling/fractures examined de Boer, Pluijm, Lips et al. (2004) in a prospective cohort study in 1,509 older men and women. The analyses showed that impaired vision is an independent risk factor for both recurrent falling and fractures. A total of 1,509 people was examined in 1995–1996. Contrast sensitivity was assessed with the VCTS_6000-1 chart for near vision. In addition, self-reported visual impairment was assessed by questions on recognizing faces from 4 m, reading the small print in the newspaper, and problems with glare. Furthermore, many potential confounders and mediators were assessed. Falls and fractures were assessed prospectively during a 3-year follow-up period. The associations between the vision variables and falls and fractures were examined using Cox proportional hazards analyses. After adjustment for potential confounders, contrast sensitivity was shown to be associated with recurrent falling (hazard ratio is 1.5), and the question on recognizing faces was shown to be associated with fractures (hazard ratio is 3.1). Furthermore, functional limitations and physical performance were shown to be mediators in the relationship between vision variables and recurrent falling/fractures. The results indicate that impaired vision is an independent risk factor for falling and fractures, but different aspects of visual functioning may have different relationships to falling and fractures. Dhital, Pey & Stanford (2010) summarized the current literature and point to further studies which need to be undertaken. Changes in visual components such as visual field, acuity, contrast sensitivity and stereopsis all have a part and the co-existence of other sensory impairments

certainly increases the risk of falls. However there remain considerable gaps in our knowledge of the relationship between visual loss and falls, for example in patients with diabetic eye disease. Furthermore, there is also conflicting data as to the importance of different visual components. Various interventions, such as programmed inter-disciplinary involvement, have shown promise, however these need further confirmation of their efficacy and cost effectiveness. An added confounder may be that an intervention (e.g., cataract extraction) paradoxically affects an individual's future activity level and behavior, thereby increasing the risk of falling. With an ageing population the importance of this topic is likely to increase. By Harwood (2001) visual impairment is a risk factor for falls, on average approximately doubling falls risk in a wide variety of studies. Falls risk increases as visual impairment worsens. The relationship is almost certainly causal. Vision accounts for perhaps a quarter to a half of all falls, although this estimate is imprecise. Visual impairment in 70% or more of elderly people is remediable with relatively simple interventions (correcting refractive errors and cataract surgery), making it an important potential target for intervention at the population level. However, no intervention has yet been proven to reduce falls risk in a randomized controlled trial. Kulmala, Viljanen, Sipilä (2009) studied visual acuity and co-existing hearing impairment and poor standing balance as predictors of falls in prospective study with 1-year follow-up among 428 women aged 63–76 years from the Finnish Twin Study on Aging. Participants were followed up for incidence of falls over 1 year. Visual acuity, hearing ability and standing balance were assessed at the baseline. The incidence rate ratios for falls were computed using the negative binomial regression model. During the follow-up, 47% of participants experienced a fall. After adjusting for age and interdependence of twin sisters, participants with vision impairment (visual acuity of < 1.0) but no other sensory impairments had a higher, but non-significant, risk for falls compared to persons with normal vision (incidence rate ratios are 1.5, 95% CI 0.6–4.2). Co-existing vision impairment and impaired balance increased the risk (incidence rate ratios are 2.7, 95% CI 0.9–8.0), as also did co-existing vision and hearing impairment (incidence rate ratios are 4.2, 95% CI 1.5–11.3), compared to those with normal vision. Among persons with all three impairments, the incidence rate ratios for falls increased to 29.4 (95% CI 5.8–148.3) compared to participants with good vision. The impact of vision impairment on fall risk was higher when accompanied with other sensory and balance impairments, probably because the presence of other impairments prevented the reception of compensatory information about body posture and environment being received from other sensory sources.

When aiming to prevent falls and their consequences in older people, it is important to check whether poor vision is accompanied with other impairments. Lord, Smith & Menant (2010) claim that multifocal glasses can add to risk of falls by impairing contrast sensitivity, depth perception, and ability to negotiate obstacles.

Vision assessment and provision of new spectacles may not reduce, and may even increase, the risk of falls. Restriction of the use of multifocal glasses may reduce falls in active older people. Other effective fall prevention strategies include maximizing vision through cataract surgery and occupational therapy interventions in visually impaired older people. Lord (2006) notes that most studies have found that poor visual acuity increases the risk of falls. However, studies that have included multiple visual measures have found that reduced contrast sensitivity and depth perception are the most important visual risk factors for falls. Multifocal glasses may add to this risk because their near-vision lenses impair distance contrast sensitivity and depth perception in the lower visual field. This reduces the ability of an older person to detect environmental hazards. There is now evidence that maximizing vision through cataract surgery is an effective strategy for preventing falls. Further randomized controlled trials are required to determine whether individual strategies (such as restriction of use of multifocal glasses) or multi-strategy visual improvement interventions can significantly reduce falls in older people. Loriaut, Boyer, Massin & Cochereau (2014) investigated the relationship between visual impairment and fall-related hip fracture and to determine the etiology of visual impairment in a population of elderly patients with hip fracture. A case-control study compared 96 patients diagnosed with hip fracture to a randomly selected control group of 103 patients without hip fracture. Inclusion criteria for the case group were as follows: patients aged 60 years and over with a hip fracture. Clinical assessment included visual acuity and ophthalmic examination. Forty-three patients with hip fracture had a visual impairment compared to only 12 patients in the control group. Visual impairment was a significant risk factor for hip fracture (OR = 6.15; 95% CI 2.98–12.69). Twenty-seven hip fracture patients had an uncorrected refractive error compared to only 15 controls (OR = 2.78; 95% CI 0.92–8.35). There was no significant difference of dense cataract between both groups (OR = 2.28; 95% CI 0.75–6.93). Fourteen hip fracture patients had a macular degeneration compared to only 8 controls (OR = 5.63; 95% CI 1.57–20.18), and 10 patients had suspicion of glaucoma compared to only 5 controls (OR = 10.65; 95% CI 2.21–51.3). Visual impairment was significantly associated with an increased risk of hip fracture in elderly people. There are many etiologies that may contribute to hip fractures, most notably refractive error, cataract, macular degeneration, and glaucoma. Reed-Jones, Solis, Lawson et al. (2013) assert that falls are a leading cause of mortality among older adults worldwide. With the increasing aging population, falls are rapidly becoming a public health concern. Numerous internal and external factors have been associated with an older adult's increased risk of falling. Most notably visual impairments are gaining recognition for their critical role in fall events, particularly related to trips, slips and falls due to environmental hazards. Wood, Lacherez, Black et al. (2011) state that age-related macular degeneration is the leading cause of irreversible visual impairment among older adults. This study explored the

relationship between age-related macular degeneration, fall risk, and other injuries and identified visual risk factors for these adverse events. Participants included 76 community-dwelling individuals with a range of severity of age-related macular degeneration (mean age, 77.0 ±6.9 years). Baseline assessment included binocular visual acuity, contrast sensitivity, and merged visual fields. Participants completed monthly falls and injury diaries for 1 year after the baseline assessment. Overall, 74% of participants reported having either a fall or a non-fall-related injury. Fifty-four percent of participants reported a fall and 30% reported more than one fall; of the 102 falls reported, 63% resulted in an injury. Most occurred outdoors (52%), between late morning and late afternoon (61%) and when navigating on level ground (62%). The most common non-fall-related injuries were lacerations (36%) and collisions with an object (35%). Reduced contrast sensitivity and visual acuity were associated with increased fall rate, after controlling for age, sex, cognitive function, cataract severity, and self-reported physical function. Reduced contrast sensitivity was the only significant predictor of non-fall-related injuries. Among older adults with age-related macular degeneration, increased visual impairment was significantly associated with an increased incidence of falls and other injuries. Reduced contrast sensitivity was significantly associated with both increased rates of falls and other injuries, while reduced visual acuity was only associated with increased fall rate.

3 Conclusion

Vision loss and blindness are almost always accompanied with problem of falls. Also, problems of falls of hearing-impaired people are not rare because adequate postural stability requires the integration and evaluation of visual, vestibular, and somatosensory information. With an ageing people the importance of this topic is likely to increase. Falls are an important health topic. Vision and hearing are getting worse with age. Sensory problems of people are often overlooked and underestimated. Loss of these senses is associated with increased risk of falls, possible injuries from falls, in the worst case with mortality. The findings of current studies have important meaning for awareness of healthcare professionals with goal to improve of the health care with priority in the future fall prevention of visually and hearing-impaired older adults.

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