geriatrics

Article

Proof of Concept of Novel Visuo-Spatial-Motor Fall Prevention Training for Old People

Henk Koppelaar [1,*], **Parastou Kordestani-Moghadam** [2], **Sareh Kouhkani** [3], **Farnoosh Irandoust** [4], **Gijs Segers** [5], **Lonneke de Haas** [6], **Thijmen Bantje** [6] and **Martin van Warmerdam** [7]

[1] Faculty of Electric and Electronic Engineering, Mathematics and Computer Science, Delft University of Technology, 2628 CD Delft, The Netherlands
[2] Social Determinants of Health Research Center, Lorestan University of Medical Sciences, Korramabad, Iran; kparastou@yahoo.com
[3] Department of Mathematics, Islamic University Shabestar Branch, Shabestar, Iran; skouhkani@yahoo.com
[4] Department of Ophtalmology, Lorestan University of Medical Sciences, Korramabad, Iran; Farnoosh.Irandoost@yahoo.com
[5] Gymi Sports & Visual Performance, 4907 BC Oosterhout, The Netherlands; gijs.segers@ziggo.nl
[6] Monné Physical Care and Exercise, 4815 HD Breda, The Netherlands; Lonneke@Monne-ZorgenBeweging.nl (L.d.H.); valpreventiebreda@gmail.com (T.B.)
[7] Optometry van Warmerdam, 5211 KA 's-Hertogenbosch, The Netherlands; Martin@vanwarmerdam.nl
* Correspondence: Koppelaar.Henk@GMail.com; Tel.: +31-6246-92331

Abstract: Falls in the geriatric population are one of the most important causes of disabilities in this age group. Its consequences impose a great deal of economic burden on health and insurance systems. This study was conducted by a multidisciplinary team with the aim of evaluating the effect of visuo-spatial-motor training for the prevention of falls in older adults. The subjects consisted of 31 volunteers aged 60 to 92 years who were studied in three groups: (1) A group under standard physical training, (2) a group under visuo-spatial-motor interventions, and (3) a control group (without any intervention). The results of the study showed that visual-spatial motor exercises significantly reduced the risk of falls of the subjects.

Keywords: balance disorder; older adults; falls; visuo-spatial-motor training

check for updates

Citation: Koppelaar, H.; Kordestani-Moghadam, P.; Kouhkani, S.; Irandoust, F.; Segers, G.; de Haas, L.; Bantje, T.; van Warmerdam, M. Proof of Concept of Novel Visuo-Spatial-Motor Fall Prevention Training for Old People. *Geriatrics* **2021**, *6*, 66. https://doi.org/10.3390/geriatrics6030066

Academic Editors: Jane E. Alty and K. Ray Chaudhuri

Received: 27 February 2021
Accepted: 22 June 2021
Published: 29 June 2021

1. Introduction

Most fall accidents that occur to seniors happen at home, not during leisure but during domestic task behavior, i.e., by goal-directed behavior, with the exception of slips [1–4]. Home are filled with objects that are supposed to be in usual places, however if they are not then harm can be caused regarding non-perception of the trusted daily environment: Distraction/inattention by absence of mind, or stressed blinding of eyes by too many blinks and saccades.

The societal impact of this research is commonly understood from the cost of falling among older people (over 65) and subsequent hospital uptake. In the Netherlands, over 474 million Euros was spent in 2008 [5], which surged in 2018 to 960 million Euros [6], with over 6000 deaths. In other countries the picture is not different [7–10].

The societal impact to one's psychological well-being is rarely embedded in frailty indices [11] and thus implicitly neglected, while it is in research on fear of falling [12–17] indicated to be of great importance

1.1. Falling of Older People: Dual Causes

A fall is unintentionally coming to the ground [18,19]. Delbare et al. [20] define 'falling elderly' as having had at least one injurious fall or at least two non-injurious falls during a 12-month follow-up period [21]. Most reported outcomes of falling [5,22] are: Concussion and broken bones (both 50%) and 20% loss of smell. A separate Physiopedia has been made for the problem [23]. The Journal of Safety's special issue [24–28] and other journals on falls in older adults [21,29–32] reported many risk factors such as disability, medication, poor performance on physical tests, depressive symptoms, and memory of previous falls. The Cochrane Database reported reviews on interventions for preventing falls in older people living in the community in 2012 [33] and in hospitals in 2020 [34]. Memory may be a less obvious cause of falling, as it regards the fear of falling again [16,35]. Memories may change and can exaggerate fear [36].

Forgetfulness, i.e., the failing short term or immediate memory, is an independent risk factor for recurrent falls in persons aged 75 years [37,38]. Social life, posture, and balance disorders are related to health problems such as postural recovery [39,40].

The best test selection concerns balance-related impairments as critical predictors of falls [20]. Unfortunately, even old people with good balance may also become vulnerable to future fall risk because of disability by too low or exaggerated exercise level [20,41,42]. Merely asking one's own risk of fall has predictive validity for the occurrence of repeated falls in older adults [43]. Yamada et al. [19] found the highest risk in 75–79 year interval, thereafter chances of falling decline and determine the usefulness of the trail walking test for predicting a fall. Lundin-Olsen [44] observed failing dual tasking of walking and talking as a predictor of falls, similar to Shumway-Cook in two papers [41,45]. Kim et al. [46] conclude that the SPPB and two dynamic balance test items of the Berg Balance Scale (BBS) can be used in screening for the risk of falls in an ambulatory older adult population. Singh et al. [42] tested physical performance against psychological factors [42] and found weak correlation results between PPA and physical performance tests such as TST, SPPB, FRT, TUG, and SBT. They conclude that physical performance may not be useful as a stand-alone test to screen for falls risk among community-dwelling older adults. This ties in with needed visual-spatial agility for older adults, as is the subject of this research.

The many correct ways to do the same movement [47,48] inhibits to single out one specific test movement as the best predictor for falls. Possible redundancy in learning new movements or improvements were studied by Furuki et al. [49] by using their decomposition method into relevant and irrelevant sub movements. These are the determinants of locomotor assessment in [50]. The difficulties of singling out best predictors is seconded by Balzer et al. [51] in a review of 184 publications selected from a database of 12,000 papers on fall prevention. They concluded that meta-analyses are not appropriate because of differences in research methods (for fall prevention in general). Previously in 2004, Chang et al. [52] had identified—from a number of health-related databases with thousands of papers—40 trials of interventions to prevent falls in older adults. They concluded that the most effective intervention was a multifactorial falls-risk assessment and management program. Pure exercise programs were less effective in reducing the risk of falling. The multifactor issue in this study caused by the neural system was foreseen by Woollacott in her editorial [53] on systems contributing to balance disorders.

Notwithstanding substantial differences between causes of falling as reported in the literature by scholars and self-report causes by 477 seniors, Zecevic [54] concluded that loss of balance was the leading cause of falls because in daily tasks such as cleaning the home, both the eyes and muscles have to perform simultaneously [55–68]. That is the visuo-spatial-motor system and motor system are operating concurrently [69,70]. However, the cerebellum uses both time and space separately, i.e., it has two systems for movements: A system for when to act and a system for where to act [71]. They are dual or even multiple, in the sense of cognitive loading [55]. Other Dual Tasks (DTs) studied in the research are verbal fluency [57], fine-motor movements [72], and arithmetic [73–75], with a review in [60]. Pijnappels et al. and Kannape et al. [76–78] pointed to gait changes during dual tasking, as a marker for age-related decline because these changes are more pronounced in older adults with fall risk. Currently, the gait is not used as such by physiatrists because of the rather lengthy series of measurements needed to get a precise diagnosis of instabilities, though EMGs can be helpful here [79].

Talking while walking is also dual tasking and therefore different [44,80] from solely walking [81]. Surprisingly, Kannape et al. [77] found that cognitive loading did not affect trajectory formation and its deviations, although it interfered with the participants' walking velocity. This is because of the two different tasks of recognizing space versus navigating through it. This processing is performed by the same neural system [82]; the brain does not have dedicated and dissociable systems for each of these tasks. Only one system is to be trained, which is advantageous for old brains with some loss of connectivity between the eyes and brain. This confluence was conjectured by Jana et al. [83] and studied via simulation research [84,85].

1.2. A Medical Geriaters Wake-Up Call

Customarily do trainers exclude subjects with cognitive impairments because of the impact of even mild cognitive impairment or strokes on gait and balance [30,48,78,86–89]. Their argument is that movements requiring more information from the environment could be inhibited by sensory or cognitive impairment [90]. This common exclusion of impairments is under fire since the statement [91]—three years in succession—by gathered medical neurologists, geriaters, and other specialists that see frailty of older adults as caused by underlying symptoms and have stated not to treat aging as an independent process.

Earlier in 2007, Van der Velde et al. reported the effects of frailty in older adults if medications are stopped [92]. In 2013, Lee et al. [93] suggested interventions in cases of the TUG test giving abnormal results. In accordance with the medical geriaters call is the D-SCOPE (Detection, Support, and Care for Elderly) project [94] to identify factors that might influence the relation between frailty and positive outcome variables. An interesting proof of the geriaters' viewpoint in the context of fall prevention can be inferred from Selinger et al. [95], whose team discovered that gait is optimized in real time. The inference is that a gait deviation has an underlying biological cause, which could be reverse engineered from the behavioral output. The geriaters viewpoint is also sustained by Arnadottir et al. [11] who found that sensory frailty is independent from motor ability associated with falls and problems in self-care. The sensorimotor system deteriorates with age and should be trained [96]. These results support our idea to complement the customary motor intervention by visuo-spatial-motor intervention.

Woollacott [53] foresaw that fall prevention not only is a motor activity but is also a cognitive activity, enabled by the plasticity of the brain. Saccades have evolved to help us protect from blurry images and keep our sight accurate, they have not yet adapted to the speed of our moving in the modern, motorized world [97,98]. To focus, our eyes typically shift in the direction of the object, which is a saccade. This causes a moment of inattentional blindness because the saccade masks sight [99]. While walking this poses few problems, but when driving down the roadway at 45 mph, the period of poor, peripheral sight, combined with saccadic masking can result in (even in the most conscientious driver) overlooking an object or a person. Magicians use this phenomenon to let even large objects 'disappear' [100]. This is a frequent problem with smaller objects, such as bicyclists who are hit by cars. Cyclists and other vehicles moving slowly in relation to the background are not salient in a driver's peripheral vision and briefly disappear during the saccade. Metrics to detect older adults' driver errors even for impaired cognition older adults are in [101], accompanied by an assessment of eye-tracking methods and technologies [102]. Elderly brains are even better equipped to discern movement at a further distance. Younger brains, however, are better at distinguishing movement nearby in the foreground because a younger brain is less sensible to motion in the larger background [103,104].

The medical 2018 wake-up call could lead to new training programs for old adults and patients with conditions such as schizophrenia, which has been linked to weaker motion segregation. Prior neural work paved the way to distinguish neural fields competing in visual perception versus dexterous command [105]. Such new training from motor to visuo-spatial-motor by DeLoss improved near acuity in older adults [106], sustained by later arguments from Nemoto et al. [107]. Pedroli et al. [108] combine cognitive and physical exercises in a VR biking test environment to successfully reduce the frailty of older adults. Ayed et al. [109] assessed via a case study the feasibility and effectiveness of prototype games on postural control and balance rehabilitation in a group of old people.

The first attempt to treat underlying symptoms of frailty by developing and evaluating whether mental combinatorial exercises confirm the geriatrics 2018 announcement was by Nemoto et al. [107]. Their study improved the visuospatial ability in older adults with and without frailty by pure cognitive training. Noohu [110] is exceptional in taking vision as a pillar of fall prevention. This is the basic tenet of this paper. The opposite issue has also been studied, with DeLoss [106] who aimed to prevent falling by improving vision via behavioral training. In this study, researchers do the opposite, with an introduction to visuo-spatial-motor training to prevent falls, supported by Feng's research findings [70] that specialized neurons do violate our prejudice that movement comes after perception. These specialized neurons are activated by the intervention reported below as accessed by Diamond et al. [111].

1.3. A Visuo-Spatial-Motor Tool for Fall Prevention

Adults lose balance when their eyes are closed and space crew may lose their knowledge of limb and body position [112]. Eye reflexes (saccades) help the vestibular system to maintain balance [113–117] by rapid updates of the position and/or environment of the body to complete a push-off reaction [118]. Eyes have the fastest muscles of our body and express saccades are on top of these for rapid updates [113–115,117,119].

The neural system is so versatile that fear may cause an alteration of memories regarding falls, accidents, and movements [16,36,120,121], even if a subject has full balance, for instance a seated driver, eye movements with and without anxiety differ [122].

Selective impairment of balance if old people turn their head while walking [123,124] is another example of cognitive processing. The ability to distinguish inputs that are a consequence of our own actions (active motion) from changes in the external world (unexpected motion) is essential for perceptual stability and accurate motor control, but becomes worse in an older brain. At old age, balance is lost much more often than at a younger age because control of old vestibular systems might hamper [125,126]. Woollacott [53] explains experiments to induce a postural sway by a visual flow effect to test older adults' balance stability. In general, does dual task complexity create a decision problem [127] for old brains and to what of the dual tasks does the brain give priority? For example, in the instance of if an older adult stops walking if they start talking. Diminished capability of dual tasking is one reason why Sherrington recommends walking for balance training, followed up by other researchers]. Recently, ref. [128] found that walking even enhances peripheral vision. Given that the lowest threshold is related to the vestibular system, deciding to choose the proprioception, somatosensory, and vestibular inputs is not a difficult task [129].

1.4. Blinks and Saccades Induce Perception Errors

It is known that old adults have greater eye movements than young people and there is, to a lesser degree, a corresponding pattern in brain activity, i.e., loss of cognition and interplay between gait, falls, and cognition is in [64,130]. On the other hand, saccades and micro saccades are well preserved in aging [131]. Visuo-spatial-motor training is to strengthen the connection of eyes with motor areas of the brain [75,132]. In addition, blinks contribute to the instability of a gaze during fixation because the eyes after a blink are not at the same spot [133–140]. Post-saccadic target blanking affects the detection of stimulus displacements across saccades in this way: Displacement detection is improved by blanks between views [133,137,138,141,142]. This contra-intuitive phenomenon is gratefully exploited in our visuo-spatial-motor training by carefully adjusting shutter frequencies. With each saccade do internal object representations change their retinal position and spatial resolution, which misleads peripheral views [132,143–145]. Perceptual continuity is a mental construct of the brain [146–148], even if eyes follow an object by smooth pursuit [149]. Perceptual illusion [150] occurs if the head moves, then heading is compressed [151–153]. The mature brain endows perspective upon space, with the role of foreshortening cues [154,155]. If, however, sight deteriorates with declines in contrast sensitivity and visual acuity [106,156,157] the continuity of perception and smooth pursuit decreases and the risk of falling increases, specifically if targets happen to move [158–160].

Fear of falling and memory of falls [161,162] interacts with perception by inducing restless saccades [122,163]. It is not the motor system that hampers because older adult eye muscles do this almost as well as younger adults, except for the stride which might become adapted for the fear of falling [13,164,165], recent studies of gait parameters [17,166,167] showed their importance. Restless saccades need optimization to reduce oversampling by viewers' eyes, which hampers perception [168]. It should be noted that this is a potential achievement of our study.

1.5. Evaluation of Balance, Motor Skills, and Cordination

Both the exercise programs 'Functional Walking' and 'In Balance' were shown to be improving the scores on Tinetti's Performance Oriented Mobility Assessment (POMA) [169] in the subgroup of pre-frail older adults. Faber et al. [170] tested the responsiveness of the POMA test for the prediction of falls with positive result. Besides the POMA, other tests have been advanced, such as the BBS [171], Functional Reach Test [172], Timed Up and Go [4,30,173,174], and a Clinical Test of Sensory Integration for Balance [175] to examine subjects' ability to maintain quiet upright standing when sensory inputs change, and the Postural Sway measurements or Center of Pressure [176]. Podsiadlo and Richardson [177] introduced the timed version of the "Get-Up and Go" (TUG) in the original test by Mathias et al. [178].

To test capacity of predictability of the risk of falls in Northridge et al. [179] include vigorous subjects. Graafmans et al. [180], however concluded that mobility impairment is a predictor of falling. Shumway-Cook et al. [45] concluded TUG to be a sensitive and specific measure to discriminate fallers from non-fallers. This contrasts to the result in [42] that measuring postural sways (objectively using a balance board) is the only significant predictor of physiological falls risk among six tests. The cause argued in [176] is that the hypothesis of an intermittent velocity-based control of posture is more relevant than position-based control. To include velocities in tests goes back to Dzhafarov's work [181–184] revealing that perception of velocity is a very different parameter from all other visuo-spatial-motor observations, which is the same with acceleration [97]. Kim et al. [46] concluded that the SPPB and two dynamic balance test items of the BBS can be used in screening for risk of falls in an ambulatory elderly population. Concluding from these pro and cons: TUG, POMA, SPPB, and HHD were included in the motor tests of this research.

2. Materials and Methods

2.1. Subjects

Participants were 31 volunteers, aged 60–92, from the client base of Monné Physical Care and Exercise and from the Pellikaan Fitness Center, both in the municipality of Breda, with a mean age of 77.85 ± 6.6 years and were assigned to three independent groups. Participants were free to decline any part of the protocol, except the tests. Most participants completed the interventions. Seven subjects left the program early, due to low motivation and personal problems, such as hospital uptake (2). The resulting group sizes were: No training (10), physical training (6), and visuo-spatial and motor training (11), during 12 weeks as in [107], extending the 8-week term of Paquette's program [185].

2.2. Training and Test Instruments

For the visuo-spatial-motor intervention group and tests, we applied the wireless RGB LED powered lights that are included in the FitLight® training system. These lights are used as targets for the user to deactivate as per the reaction training routine. Moreover, we used the Primary 2MJ® stroboscopic spectacles (Figure 1, below) to train the sensorimotor system of subjects in the visuo-spatial-motor intervention group.

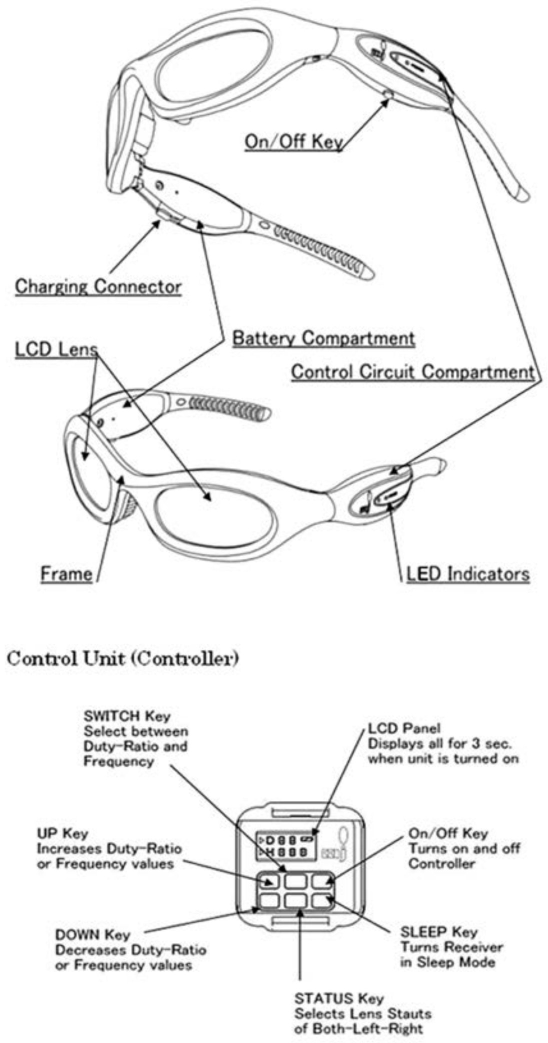

Figure 1. Shutterglass Primary 2MJ® with a wireless control unit to enable visual resetting.

2.3. Data Collection

We applied a translation in Dutch of the MMSE recording information to the older adult subjects who participated voluntarily, and had not been diagnosed with dementia. We collected participants socio-demographic and health characteristics, as well as information about their past, including age, gender, marital status, presence of illnesses, disability status, fall history, fear of falling, drugs used, and walking habits. This form was created by the investigators and filled in by senior researcher LdeH together with every participant from all three groups of participants.

This study was performed in strict accordance with the recommendations of the Netherlands' National Health and Medical Research Council statement on Ethical Conduct in Human Research. All procedures were approved by the Institutional Human Research Ethics Committees of the Lorestan University of Medical Sciences: Approval ID IR.LUMS.REC.1399.146, Korramabad, Iran. All participants gave written informed consent in accordance with the Declaration of Helsinki.

The tests before and after the chosen interventions were logged in Excel [186] and analyzed using Maple 2020 [187].

2.4. Research Development

Monné Physical Care and Exercise decided to introduce a renovated training program with embedded accredited training interventions for older adults in the Breda municipality, plus an experimental visuospatial module to specifically beat balance disorders for older adults. The idea of the visuospatial module is to evaluate the feasibility of such training as an add-on for accredited physiatrics treatment of balance disorders for older adults in the Netherlands (and abroad). We improved upon Nemoto et al. [107] by introducing a third group, a control group, on top of his locomotive and visuo-spatial-motor group. The control group is obviously not subjected to any intervention.

The visuo-spatial-motor-motor intervention in this research was performed upon invitation by the sport training expert (GS), because of his expertise in such training for athletes [105]. The research into effectivity of this renovated training program took place in 2019 and comprised of three groups: An observational control group, a group of trained by physical therapy (named the 'motor group'), and a group trained by physical therapy + visuo-spatial-motor training (named the 'visuo-motor group').

The motor parts of the research program are based upon the Royal Netherlands Society of Physiatrics (KNGF) accredited many mobility programs [32] for older adults after a fall [188], from proven interventions [25–28,170,189,190] to effectively reduce the risk of falling, with exercises at least 3 h per week [191], even for the visually impaired [192]. Adapted names in the Netherlands are "In Balans", "Vallen verleden tijd", "Zicht op evenwicht", "Bewegen valt goed", and "Otago training". The group training "In Balans" includes an explanation of causes of falling and reflection upon own movements, inspired by Tai Chi. We decided to take a mix from all of these for motor intervention.

2.4.1. The Eyes as a Tool for Maintaining Balance

In this research were applied the Japanese Shutterglass Primary 2MJ® (Figure 1). A support for our visuo-spatial-motor approach was from Coubard et al. [193]: Fall prevention modulates decisional saccadic behavior in aging. For instance, the 60-s test in Figure 2 collects the reaction times of quick hand movements aimed at extinguishing FitLights® mounted at a window.

Figure 2. FitLight®s mounted on a window for testing reaction time. The specification of the experimental set-up is in Appendix A.

For multisensory experiments, video toolboxes were designed e.g., to transform numbers into movies [194,195]. This fulfills in a simpler way our need, than virtual reality (VR) equipment would for our new training, see for specification Figure 3 and Appendix B, below. Molina et al. [196] and Mirelman et al. [197] applied the idea in an immersed virtual reality, also introduced as Exergaming [198,199]. Our rationale was that traffic signs are of a different nature than other images in everyday life. This perception was trained by our team specifically by way of a set-up with FitLight®s on a table, if one of them lights up then it has, as fast as possible, to be touched by a hand. Then the visual focus had to change swiftly to the lights and numbers in the distance, as depicted in the photographs of

Figure 3 (or Figure A2 of Appendix B). The distant lightning color had to be named and directly thereafter the number beneath it. The swift change of view distance entrained fusion flexibility of sight.

Figure 3. FitLight®s for testing eyes' fusion flexibility by the reaction time of saccades from the table redirected to the distant lights and numbers. The specification of this set-up is in Appendix B below.

2.4.2. Peripheral Sight

To train peripheral sight FitLight®s were used on the front view of a window (Figure 2), on a table (Figure 3), and on the floor as photographed in Figure 4. The peripheral sight is challenged because of the demand to look forward and to perceive the lights in the periphery (Figure 2), on the table (Figure 3), or floor (Figure 4, below).

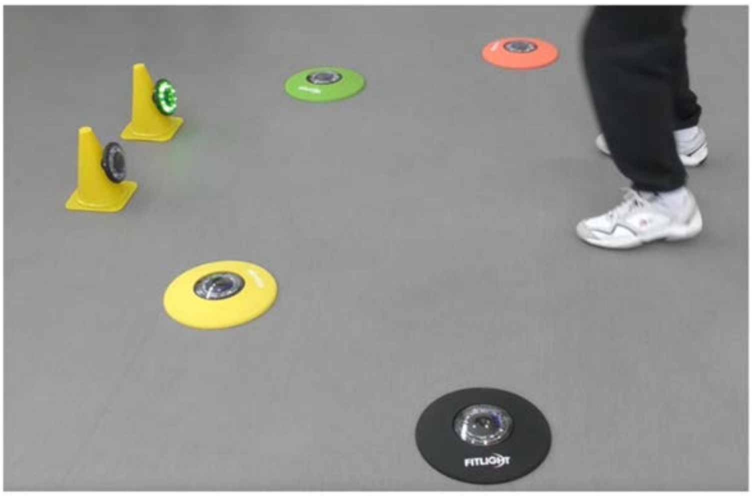

Figure 4. FitLight®s embedded in colored rings. Subjects stand in between to dampen a light by moving a leg over it or close to it. The experimental set-up is displayed in Appendix C.

2.5. The Interventions

A 12-week program from January 2019 to April 2019 included a mix of the trainings given in the accredited Netherlands programs, plus our new visuo-spatial-motor program. The arguments for the set-up are in this section and in more detail in Appendices A–C. The participation and small sample size are in Section 2.1.

2.5.1. Physical Exercises, the Motor Program

Motor-based tests as discussed in Section 2.2 for the ability to prevent a fall by keeping balance and control [1,47,48,110,200–202] or by improving postures and attitudes [2,203] are embedded in traditional motor training programs. Balance-impaired older subjects were assessed by Cho et al. [4]. Associations between performance in the TUG and the Six-Minute Walk Distance (6MWD) with physiological characteristics were researched by Montgomery et al. [204]. The result was an appendicular lean muscle mass percentage indicator for women in the TUG performance and for men, their jump power. The subjects in this research were in the mean 77.8 years. The set-up of the motor part of this research is a mixture of exercises embeddable for the tests in Section 2.2.

2.5.2. Visual Plus Physical Exercises: Visuo-Spatial-Motor Intervention

If supplemented by stroboscopic spectacles, trainees alter their perception of movement [165]. This enabled the starting point for the newly-developed intervention. Heindorf et al. [205] demonstrate that the motor cortex mediates corrective behavioral responses to unexpected visual perturbations by not 'simply' controlling movement, but the sensory guide control of movement in instances where the sensory processing was unknown and therefore dependent of cortical processing. Though keeping balance is automatic and/or anticipatory, aging and vision loss both decrease fitness to tell if we are moving or if we see a moving object.

In our study the researchers [206] designed an entropy index to distinguish eye movements between erratic saccades or normally wandering eyes. The entropy index enables discrimination between erratic and common saccades. It is understood that from sports training, expert players have lesser eye movements than unexperienced players [207,208]. The same holds for older adults, therefore was the intervention interspersed with short exercises of throwing balls while wearing the Primer 2MJ stroboscopic spectacles. A few minutes suffices to enhance the sensorimotor stamina of older adults. For tests of the achieved performance, we applied FitLight® signaling in two ways: With static time delay and with dynamic (changing) time delay.

2.6. Statistical Analysis

To exclude bias among the grouping of trainees, we analyzed the grouping in Section 2.6.1. by a Chi-Square independence test for all groups to find that for the statistically significant independence sampling of all three groups the significance level was 0.05 ($p < 0.05$). In Sections 2.6.2 and 2.6.3, the effects of the experiments are reported via the differences between the pre-tests T_0 and the post-tests T_1.

2.6.1. Testing Independence of the Three Intervention Groups

The three different groups named, motor, visuo-spatial-motor, and control, of older adults with about the same ability and age were tested against the null hypothesis that the three groups are the same, i.e., sampled from the same population, i.e., statistically characterized by one multinomial distribution. The independence is needed for the three groups w.r.t. the administered interventions: Motor, visuo-spatial-motor, and control.

For independent testing of the groups assigned to the interventions, we required both the mean pre-test scores in Table 1 and the mean post-test scores in Table 2.

Table 1. The mean pre-test measurements T_0 for the three groups [1].

SPPB	TUG	POMA
7.67 (±2.65)	8.66 (±2.60)	24.2 (±3.07)
5.17 (±2.64)	10.3 (±5.51)	20.7 (±4.50)
8.44 (±2.01)	7.40 (±2.23)	24.1 (±2.93)

[1] The rows are: Visuo-spatial-motor group, pure motor group, and control group.

Table 2. The mean post-test measurements T_1 for the three groups [1].

SPPB	TUG	POMA
10.8 (±1.30)	6.90 (±1.95)	26.2 (±2.82)
9.00 (±2.53)	9.62 (±3.89)	24.2 (±3.19)
10.8 (±1.72)	6.16 (±1.81)	26.0 (±1.32)

[1] The rows are: Visuo-spatial-motor group, pure motor group, and control group.

The outcomes T_0 in Table 1 of the prior SPPB, TUG, and POMA tests and the subsequent posteriors T_1 in Table 2 of these interventions are statistically tested by the Chi^2 independence test [209] at a 5% significance level, up to 5 decimals of accuracy, for readability maximally two decimals are displayed in Tables 1 and 2. Three intervention groups had SPPB, TUG, and POMA for pre- and post-tests both. This makes together (3–1) times (6–1) = 10 degrees of statistical freedom. The computed statistic is 2.71210, far below its critical value 18.3070, with a probability of $p = 0.987411$. Which does not provide enough evidence to conclude that the null hypothesis is false. The independence test of the three groups of our subjects w.r.t. to visuo-spatial-motor tests is similarly done by the Chi^2 independence test [209] at a 5% significance level, up to 5 decimals of accuracy. The summary of outcomes is displayed in Table 3.

Table 3. Overview of outcomes of group independence testing for the Visuo-spatial-motor tests.

Test	Statistic	Critical Value	Probability
FitLight®Static	0.542256	12.5916	0.997286
FitLight®Dyn.	0.838832	12.5916	0.990992
Periph. Step	0.148314	12.5916	0.999936
Fusion Flex.	0.345730	12.5916	0.999243

All four groups have the same outcome: This statistical test does not provide enough evidence to conclude that the null hypothesis of similar groups is false. Or conclusion in other words; for the visuo-spatial-motor tests, is random allocation of subjects to the groups not refuted. Therefore: the groups are independent.

2.6.2. Comparison of Intervention Groups w.r.t. the SPPB, TUG, and POMA Motor Tests

The motor intervention as tested by SPPB, TUG, and POMA requires the number of hits or seconds of time elapse. The TUG is the timing test among the three motor tests. This explains why the fitted regression lines are in Figure 5 below the neutral line: If the intervention has a positive effect then the resulting regression line has a direction coefficient lower than 1, i.e., below the black neutral line in Figure 5.

2.6.3. Comparison of the Interventions w.r.t. the Visuo-Spatial-Motor Tests

Instead of absolute measurements (hit counts and/or timing values) such as the above for the SPPB, TUG, and POMA in Figures 4–6, we display the differences between successive scores of the visuo-spatial-motor performances of subjects. This gives an immediate picture of progress, or deterioration, as shown in Figures 7–10. To use differences instead of the raw measurements is a method borrowed from physics to display states of ensembles of particles as it gives an immediate overview of what has happened.

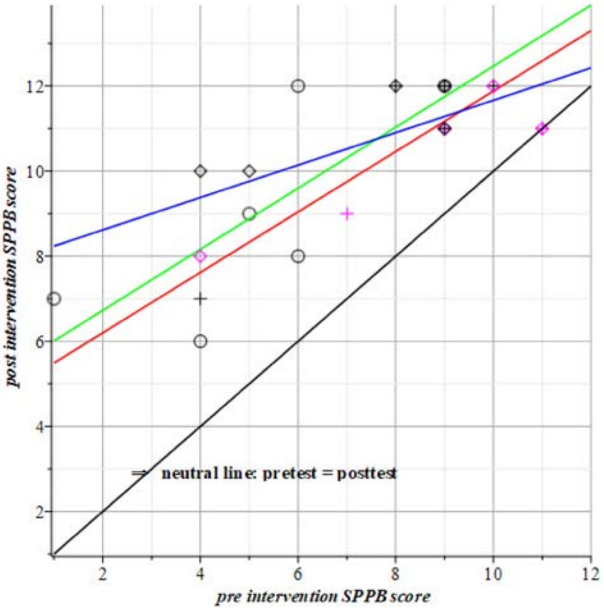

Figure 5. The mean results of the motor intervention are green; the visuo-spatial-motor intervention mean line is blue; the red line is the control group; the no-results, or neutral line is black. All groups are above the black line, so they all made progress, compared to their respective pre-intervention scores. The visuo-spatial-motor group performs better until break even (SPPB = 8). The motor group performs better after SPPB = 8. Red datapoints represent male subjects. Circles and green line: Motor group, $T_1 = 5.29$ (±1.81) + 0.72 (±0.31) $T_0(SPPB)$. Rhombus pts., blue: Visuo-spatial-motor group, $T_1 = 7.86$ (±0.95) + 0.38 (±0.12) $T_0(SPPB)$. Plus signs, red line: Control group, $T_1 = 4.78$ (±1.56) + 0.71 (±0.18) $T_0(SPPB)$.

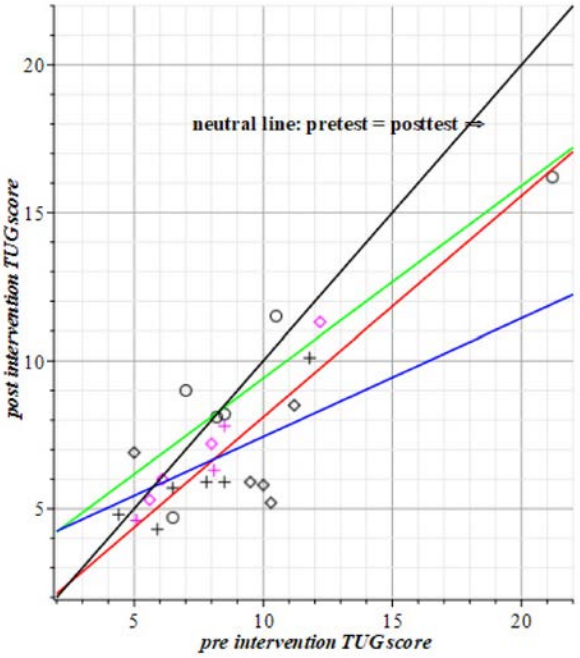

Figure 6. The mean results of the motor intervention are green; the visuo-spatial-motor intervention mean line is blue; the red line is the control group; the no-results, or neutral line is black. All groups are below the black line, so they all made progress, compared to their respective pre-intervention scores. The visuo-spatial-motor group performs the fastest (in the mean). Red datapoints represent male subjects. Circles and green line: Motor group, $T_1 = 2.92$ (±1.60) + 0.65 (±0.14) $T_0(TUG)$. Rhombus pts., blue: Visuo-spatial-motor group, $T_1 = 3.44$ (±2.17) + 0.40 (±0.24) $T_0(TUG)$. Plus signs, red line: Control group, $T_1 = 0.63$ (±0.94) + 0.75 (±0.12) $T_0(TUG)$.

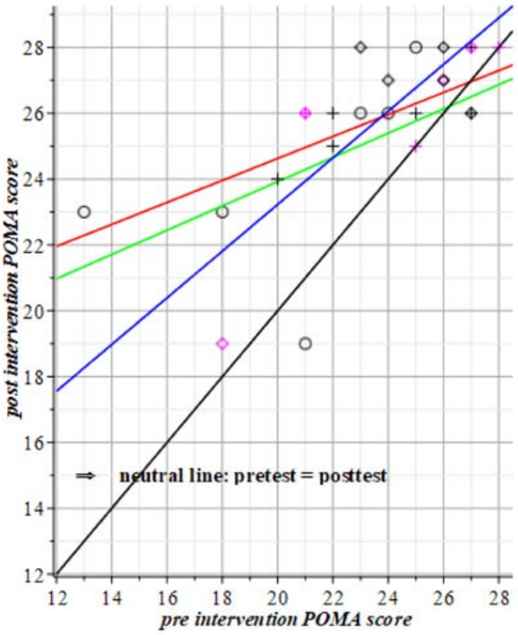

Figure 7. The results of the three groups in green, blue, and red lines. The no-results, or neutral line is black. All groups are above the black line, so they all made progress, compared to their respective pre-intervention scores. The visuo-spatial-motor group performance shows a break-even point at about T_0 = 22. This means that initially, vigorous subjects perform better at POMA after the visuo-spatial-motor intervention than vigorous subjects would profit from the only motor intervention. For frail subjects w.r.t. the POMA score result is opposite: Until intake score T_0 = 22, the motor intervention only is more beneficial than the visuo-spatial-motor intervention. Red datapoints represent male subjects. Circles and green line: Motor group $T_1 = 16.55\ (\pm 1.82) + 0.37\ (\pm 0.31)\ T_0(POMA)$. Rhombus pts., blue: Visuo-spatial-motor group, $T_1 = 9.05\ (\pm 5.36) + 0.71\ (\pm 0.22)\ T_0(POMA)$. Plus signs, red line: Control group, $T_1 = 17.95\ (\pm 0.77) + 0.33\ (\pm 0.33)\ T_0(POMA)$.

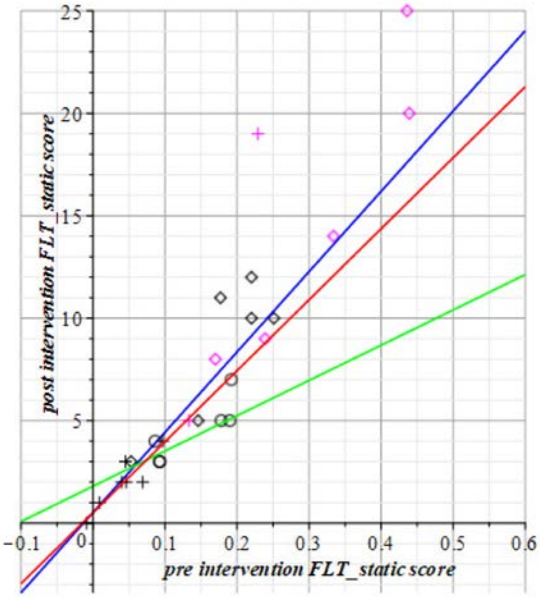

Figure 8. This depicts the results of the static FitLight$^{®}$s test in the number of hits per unit time interval. The + points are the control group (Red line); diamond points are the vision group (blue line); and circles are the motor group (green line). Both the visuo-spatial-motor and control group have an outlier. Red datapoints represent male subjects. Circles and green line: Motor group $T_1 =$ 1.80 (±1.09) +17.2 (±7.4) T_0. Rhombus pts., blue: Visuo-spatial-motor group, $T_1 = 0.52\ (\pm 1.59) + 39.2$ $(\pm 5.9)\ T_0$. Plus signs, red line: Control group, $T_1 = 0.51\ (\pm 1.14) + 34.7\ (\pm 11.4)\ T_0$.

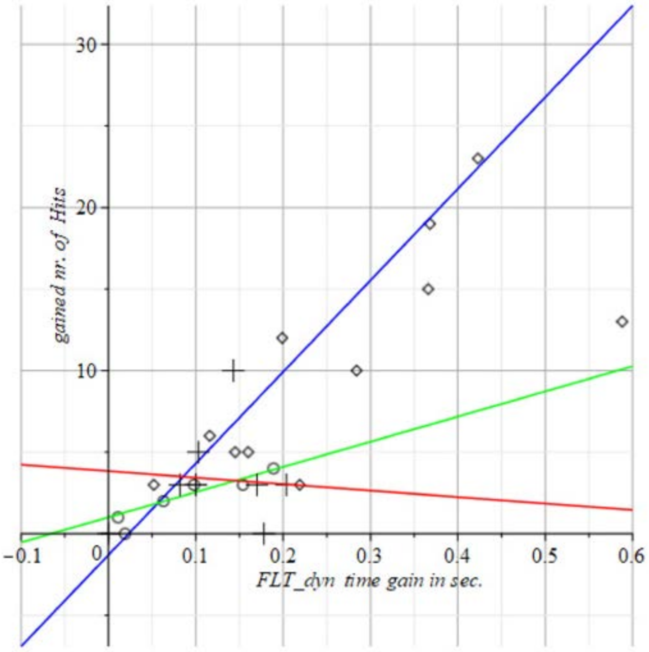

Figure 9. Depicts the results of the dynamic FitLight®s test. This test requires rapid eye movements, hence the results of the blue line are best. Circles and green line: Motor group, $T_1 = 1.80$ (±1.60) + 17.2 (±0.14) T_0. Rhombus pts., blue: Visuo-spatial-motor group, $T_1 = 0.52$ (±2.17) + 39.2 (±0.24) T_0. Plus signs, red line: Control group, $T_1 = 0.51$ (±0.94) + 34.7 (±0.12) T_0.

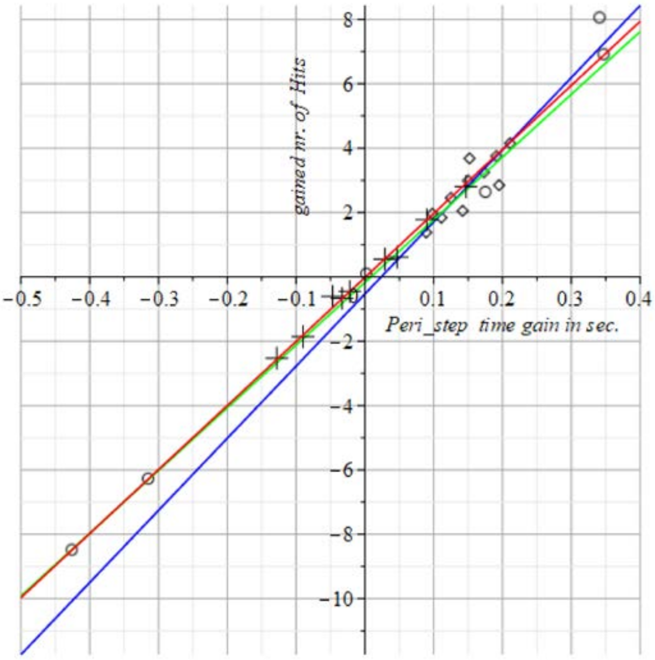

Figure 10. The results of the peripheral step test. The results discriminate between the motor group and the visuo-spatial-motor group: Three subjects in the motor group improved performance, one remained neutral (=the circle at the origin) and two scored less than prior to the motor intervention. The control group also shows a mixed picture. In the visuo-spatial-motor group all subjects improved performance. Circles and green line: Motor group, $T_1 = -1.73$ (±0.30) + 19.5 (±0.99) T_0. Rhombus pts., blue: Visuo-spatial-motor group, $T_1 = -0.52$ (±0.67) + 22.4 (±2.4) T_0. Plus signs, red line: Control group, $T_1 = -0.02$ (±0.06) + 19.9 (±0.67) T_0.

To review this idea at the hand of the tests with static FitLight®s: Figure 4 shows at the horizontal axis the elapsed time in the post-test minus the elapsed time in the pre-test, i.e., $T_1 - T_0$. The vertical axis displays the count of the number of hits at time T_1 minus the count of the number of hits at time T_0. So, vertically it has the improvement (or decline) of the number of hits within the time gain depicted at the horizontal axis.

We scored improvement of gain with positive numbers. So, in Figures 8–11 are the improvements of reaction times is depicted to reach a number of hits. Then at the horizontal axis, there is the gain (i.e., the reduction) in the Reaction Time (RT), against the vertical display of the gained number of hits within time.

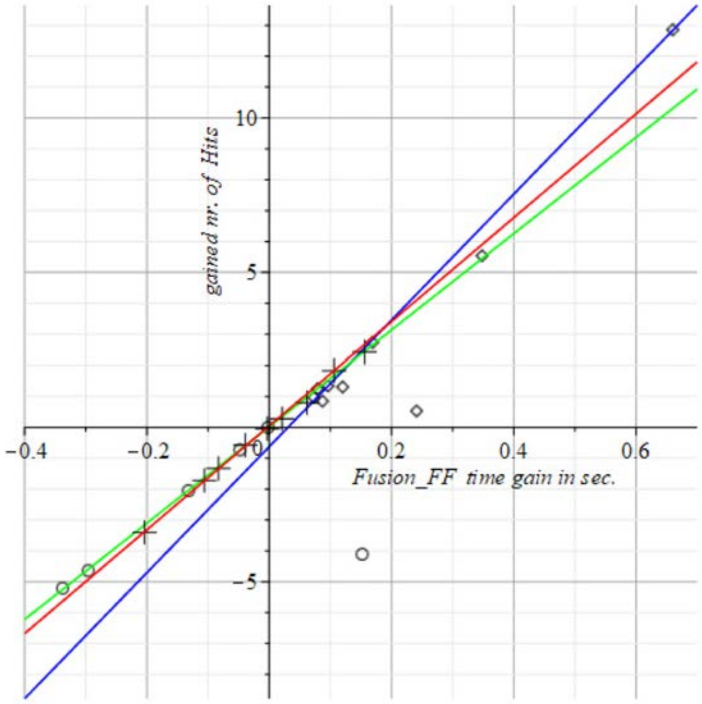

Figure 11. This depicts the results of the Fusion Flexibility test. The control group shows subjects with and without improvement; the motor group's subjects performance declined while in the visuo-spatial-motor group all subjects show improvement. Circles: Motor intervention, green $T_1 = 0.02$ (±1.04) + 15.6 (±5.15) T_0. Rhombus pts: Visuo-spatial-motor intervention, blue $T_1 = -0.63$ (±0.67) + 20.4 (±2.4) T_0. Plus signs: The control group, red $T_1 = 0.05$ (±0.03) + 16.8 (±0.31) T_0.

A neglected parameter in tests of fall risk is the visuo-spatial-motor component of acting to prevent falling. We tested the research hypothesis that a visuo-spatial extension of training to prevent falling did not have any effect.

The data of these small groups were fitted with regression lines according the trimmed least squares method. This method optimizes the residual error in the fitting procedure to the least possible given value for the dataset at hand.

3. Results

A concise and precise description of the experimental results, their interpretation as well as the experimental conclusions will be drawn in this chapter. We did not group or adjust for age and sex or corresponding baseline values of data.

3.1. Independence of the Groups

In our analysis in Section 2.6.1 we tested the hypothesis H_0 that the three groups showed no difference effect with regard to the motor testing methods SPPB, TUG, HHD, and/or POMA (see Tables 1 and 2). The researchers of this study left out the HHD measurements because they were invariant over prior- and posterior testing, with the exception of only one subject with a small deviation between pre- and post-test.

We tested the hypothesis H_0 that the three groups showed no difference effect with regard to the visuo-spatial-motor testing methods with FitLight$^{®}$s, peripheral view, and fusion flexibility. The outcomes are listed in Table 3.

Overall, the result for all the tests, without exception, is that the null hypothesis is not rejected under 5% level of significance, and the groups are not dissimilar.

In conclusion, the hypothesis showed that the grouping of clients is effective and cannot be refuted on basis of these pre- and post-intervention tests.

3.2. *Summary of Section*

Comparison of the Intervention w.r.t. SPPB, TUG, and POMA

In the SPPB test of Figure 5 is the motor group, i.e., the green regression coefficient, lower than the blue line of the visuo-spatial-motor group. This says that the motor group is slower than the other groups up to a pre-test score 8. From this we conclude that the break-even point of motor versus visuo-spatial-motor intervention lies at the SPPB initial score of about 8. For the POMA test in Figure 7, it seems to reign the opposite with a break-even point at a score of 24.

3.3. *Comparison of Interventions and Subjects with Help of Testing with FitLight*$^{®}$*s*

The visuo-spatial-motor interventions were also tested. Output is in Figures 8–11.

The curves of the three subject groups in Figures 8–11 depict the gained speed on the horizontal axis and the gained nr. of hits on the vertical axis. The best performances are by visuo-spatial-motor training. A maximum score is achieved by a female subject of 92 years (at the top of the diagram in Figure 8).

The peripheral step test has about the same slopes for groups with the slopes in Figures 9 and 10 close. We measure the angle beteen slopes s_1, s_2 pairwise by the mathematical cosine measure $\cos(s_1, s_2)$. If the cosine is 1, the interventions are similar w.r.t. the administered test. If the cosine is 0, the interventions are dissimilar w.r.t. the administered test. This degree of similarity is a diagnostic tool for the interventions as a whole, not for the individuals subjected to it. The subjects might individually score very poor on a test, such as in Figure 11, the motor group only had deteriorated visual stamina after the intervention (see the circles all in the third quadrant of Figure 11), while the visuo-spatial-motor group only had an improved visual stamina after the intervention (see the rhombus points all in the first quadrant of Figure 11).

This is remarkable and clear because of the very discriminatory trait of the two interventions for the subjects, as the interventions itself indifferent with respect to the Peripheral Vision test (Figure 10) and the Fusion Flexibility test (Figure 11).

Concluding, both the Peripheral Vision and the Fusion Flexibility test are equally applicable for motor intervention and visuo-spatial-motor intervention. Moreover, the two tests are very discriminatory for subject performances.

Both the fusion flexibility and peripheral test splits the performance of subjects in the motor group and the visuo-spatial-motor group in two very different regimes, as can be seen in Figures 10 and 11: Motor intervention and control subjects score on the negative horizontal and vertical axes, i.e., the third quadrant of the coordinate plane. This means that the gained number of hits in the post-intervention test is lower than in the pre-intervention test. This result is quite the opposite of the result of the subjects of our novel visuo-spatial-motor training. These subjects only score in the first quadrant at the top right of Figures 10 and 11, i.e., along the positive coordinate axes. The logic of this opposed effect is evident, as seen from the literature.

4. Discussion

If, in the absence of stress, the perception of objects is uncertain then ‘rehearsing’ by repeated saccades [210–213] is to reduce uncertainty in perception. To remember a phone number, we may rehearse the digits mentally. Eyes do automatically something similar to help recall what we see in sequence when we are old [214,215]. When remembering becomes difficult, eye movements also help to see the world as an external memory [216]. This postulated embodied cognition [217] assumes that instead of storing visual information in working memory, information is retrieved by appropriate eye movements [100,214,218]. These reflexive saccades for sensory attenuation [219] increase with age. As a result, older adults have a greater reliance on predictive than on sensory signals [220–222]. It becomes predictive because of fear [16,35,64,93,121,161,162,223,224]. This is a reason to do visuo-spatial-motor training as it improves perception, which becomes at rest after such training. The study of eye movements helps one to know if such movements become erratic and the brain loses ‘sight’ [202,225]. This is known from stressful situations, such as in athletic field games (hockey, baseball, and football) and from disturbances during space flight [112,226]. To this end we initiated an entropy tool for the visuo-spatial toolbox [206].

Visuo-spatial-motor training is nowadays ubiquitous in enhancing athletes’ abilities [105]. The asset of visuo-spatial-motor training is: shutting down the view has the effect of saccades performing slightly poorer, which increases the saccade size [227]. Wilkins and Appelbaum [228] review the variants of the trainings as performed over the globe, however, their application of Senaptec spectacles is not fully embeddable for training of older adults because of its small range in shutter frequencies.

The visuo-spatial-motor training evokes hidden and/or underdeveloped signal queuing by forcing the older adults brain out of its comfort zone, as reviewed by Liu et al. [130], though they recommend pure cognitive regimens (e.g., video game training) to reduce the incidence of falls. The research and results presented here follow a motor-based avenue and add to the results by and confirm Nemoto et al.’s [107] conclusion that motor plus visuo-spatial exercise is a feasible exercise program to potentially improve visuo-spatial ability and overall cognition in older adults with and without frailty. Nemoto et al. compared their visuo-spatial intervention to 13 other programs. Only gait speed did not improve by their visuo-spatial intervention. This is seconded by Pijnappels, Rispens, and van Schooten et al. [229–231] because the capacity to generate maximum extension force by the whole leg (e.g., in a leg press apparatus or during jumping) results in the best discrimination rule between older fallers and non-fallers. This capacity is out of reach for visuo-spatial-motor training as reflected in our result in Figure 4 where vigorous subjects above SPPB is 8 and do not profit as much as from the visuo-spatial-motor intervention compared to subjects of motor intervention.

5. Conclusions

The results in Section 3.1 all indicate that the groups as stratified between physiological training, visuo-spatial-motor training, and a control group do not differ w.r.t. the administered tests.

Our approach to augment the reality of trainees during brief time intervals from 3 to 15 min by visuo-spatial-motor intervention, and to not replace reality, worked well to raise the agility of subjects’ mind and eyes. This confirms earlier findings with athlete subjects [105]: The phenomenon of a quiet view as if traffic is moving slower than seen before the training. In general, this lasted about 24 h. We enhanced their reaction time and visual stamina (Section 3.3) and subsequently reduced the risk of falling to a large extent by enhancing the sensorimotor system of older adults by our new type of visuo-spatial-motor add-on to complement traditional omniscient physical training. From the initial inspection, subjects had a hampered stride, however after 12 weeks of the visuo-spatial-motor intervention they walked freely and independently.

Author Contributions: Conceptualization, L.d.H. and G.S.; methodology of training, L.d.H., T.B., and G.S.; software, H.K.; validation, G.S., T.B., and H.K.; data analysis and modeling, H.K., G.S., and S.K.; investigation, H.K., P.K.-M., S.K., and F.I.; resources, L.d.H., G.S., M.v.W. and H.K.; data curation, G.S., and H.K.; writing—original draft preparation, H.K., P.K.-M.; writing—review and editing, H.K., P.K.-M., and S.K.; visualization, P.K.-M., H.K., and G.S.; supervision, G.S.; project administration, T.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding. The project costs for material, exercise rooms, and the APC was funded by Monné Physical Care and Exercise and Gymi Sports.

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Institutional Human Research Ethics Committees of the Lorestan University of Medical Sciences: Approval ID IR.LUMS.REC.1399.146, Korramabad, Iran.

Informed Consent Statement: All subjects participated voluntary with informed consent signed on a Participant Consent Form.

Data Availability Statement: All data are available in Excel Document sheets (the numerical data) and in Maple (the statistics) from: Koppelaar.Henk@GMail.com.

Acknowledgments: We are grateful to our subjects who were willing to participate in this project. For text corrections we thank the two anonymous referees and the Editors of the journal, Nedra Church, Han Sips, and Jack Micner. For opthalmologic support, we thank Bert Bakker and Carlo Jenniskens.

Conflicts of Interest: The first five authors declare that for her/him no competing interests exists. The remaining authors declare interest in applying the results eventually in their respective companies.

Appendix A. Experimental Set-Up for Testing Reaction Times

Figure A1. FitLight®s for testing Reaction Time. The specification of this experimental set-up.

Hand/eye coordination set up

- Runtime exercise: 60 s
- Timeout: 3 s
- Light delay: 0.05 s
- Touch sensor mode: Distance 20 cm
- Led mode: Standard
- Light mode: Full light

- The lights come on “haphazardly”;
- The subject must deactivate the illuminated disc as soon as possible;
- The moment the light is extinguished, another light switches on immediately. The subject must also turn off this light, etc.

Purpose of the exercise:

- Measure the subject's average reaction time in relation to the visual stimulation;
- Measure the number of hits, the subject is able to score in 60 s.

The results will show you:

a. How quickly the subject's eyes detect the lights;
b. How quickly the brain processes provide a response to that information;
c. How fast and efficient is the motor movement towards the target and how fast to be ready for the next action.

What is measured:

- How many lights did you take out in 60 s?
- Missed lights?
- Average reaction time?

Appendix B. Test and Set-Up for Fusion Flexibility of the Eyes

Figure A2. FitLight®s for testing eyes' fusion flexibility by the reaction time of saccades from looking at the lights on the table, and redirecting the eyes to the distant lights and numbers. The specification of this set-up is: The ability to diverge and converge with the eyes is trained with this set-up and specification.

Runtime exercise 16 lights

- Time out: 5 s
- Light Delay: 0.05 s
- Impact sensitivity: 1
- Lamps: 10
- Color lamps: Varying: Blue, Red, Green, Yellow, Cyan, and Magenta
- Led mode: Standard
- Light mode: Full light

- 4 lamps on a table and 6 lamps are mounted on a tripod;
- The subject sits on a chair at that table;
- The exercise begins: First a lamp on the table lights up;
- The subject must deactivate the illuminated disc as soon as possible and at that moment a lamp on one of the stands switches on;
- The subject names the number associated with that lamp and the color of the lamp that came on, in that order;
- An assistant turns out the lamp that came on, after which the subject names the number and color;
- When that lamp is turned off, another lamp lights up on the table and the subject at the table repeats the exercise.

Purpose of the exercise:

- Measure the subject's average reaction time in relation to the visual stimulation;
- Measure how long it takes the subject to turn off the 16 lights.

The results will show how:

a. Quickly the subject's eyes detect the lights?
b. Quickly the brain processes provide a response to that information?
c. Fast and efficient is the motor movement towards the target and how fast to be ready for the next action?

What is measured:

- How much time do you need to turn off 16 lights?
- Missed lights?
- Average reaction time?

Appendix C. Test and Set-Up of Leg Movements

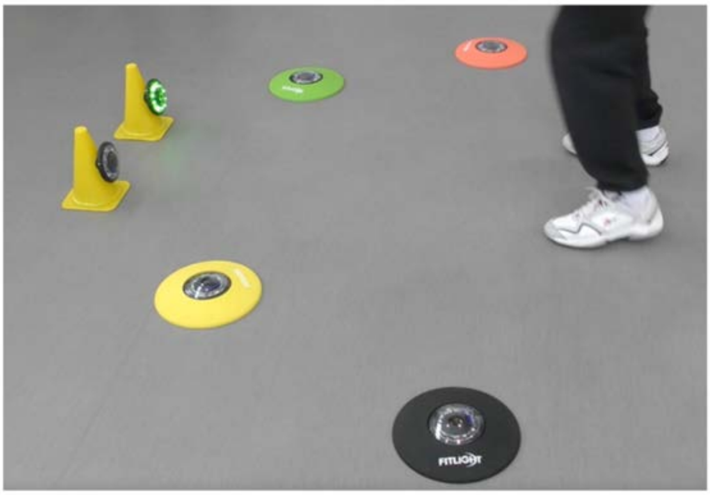

Figure A3. FitLight®s embedded in colored rings on the floor. Subjects stand in between to dampen a light by moving a leg over it. The experimental set-up and specification are as follows.

Peripheral vision training by feet/hand/eye coordination

- Runtime exercise: 24 lights
- Timeout: 4 s
- Light delay: Dynamic from 0.05 to 2.10 s
- Impact sensitivity: 1
- Lamps: 6
- Color lamps: Varying: Blue, Red, Green, Yellow, Cyan, and Magenta
- Led mode: Standard
- Light mode: Full light

- The lights come on "haphazardly";
- The subject must deactivate the illuminated disc as soon as possible;
- The moment the light is extinguished, another light will turn on. The lights are not switched on after an equal interval, but this interval varies;
- The subject must also turn off this light, etc.

Purpose of the exercise:

- Measure the subject's average reaction time in relation to the visual stimulation;
- Measure how long it takes the subject to turn off the 24 lights.

The results will show how:

a. Quickly the subject's eyes detect the lights?

b. Quickly the brain processes provide a response to that information?
c. Fast and efficient is the motor movement towards the target and how fast to be ready for the next action?

What is measured:

- How much time do you need to turn off 24 lights?
- Missed lights?
- Average reaction time?

References

1. Tang, P.F.; Woollacott, M.H. Inefficient postural responses to unexpected slips during walking in older adults. *J. Gerontol. Ser. A Biol. Sci. Med. Sci.* **1998**, *53A*, M471–M480. [CrossRef] [PubMed]
2. Tang, P.F.; Woollacott, M.H. Phase-dependent modulation of proximal and distal postural responses to slips in young and older adults. *J. Gerontol. Ser. A Biol. Sci. Med. Sci.* **1999**, *54A*, M89–M102. [CrossRef] [PubMed]
3. Okubo, Y.; Sturnieks, D.L.; Brodie, M.A.; Duran, L.; Lord, S.R. Effect of Reactive Balance Training Involving Repeated Slips and Trips on Balance Recovery Among Older Adults: A Blinded Randomized Controlled Trial. *J. Gerontol. Ser. A* **2019**, *74*, 1489–1496. [CrossRef] [PubMed]
4. Cho, B.L.; Scarpace, D.; Alexander, N.B. Tests of stepping as indicators of mobility, balance, and fall risk in balance-impaired older adults. *J. Am. Geriatr. Soc.* **2004**, *52*, 1168–1173. [CrossRef] [PubMed]
5. Hartholt, K.A.; van Beeck, E.F.; Polinder, S.; van der Velde, N.; van Lieshout, E.M.M.; Panneman, M.J.M.; van der Cammen, T.J.M.; Patka, P. Societal consequences of falls in the older population: Injuries, healthcare costs and long term reduced quality of life. *J. Trauma* **2011**, *71*, 748–753. [CrossRef] [PubMed]
6. Van der Does, H.; Baan, A.; Panneman, M. *Privé-Valongevallen Bij Ouderen*; Report 812; Report 870; Veiligheid: Amsterdam, The Netherlands, 2020; pp. 1–22. Available online: www.Veiligheid.nl (accessed on 25 June 2021).
7. Scuffham, P.; Chaplin, S.; Legood, R. Incidence and costs of unintentional falls in older people in the United Kingdom. *J. Epidemiol. Community Health* **2003**, *57*, 740–744. [CrossRef] [PubMed]
8. Nurmi, I.; Lüthje, P. Incidence and costs of falls and fall injuries among elderly in institutional care. *Scand. J. Prim. Health Care* **2002**, *20*, 118–122. [CrossRef] [PubMed]
9. Haddad, Y.K.; Bergen, G.; Florence, C.S. Estimating the Economic Burden Related to Older Adult Falls by State. *J. Public Health Manag. Pract.* **2019**, *25*, E17–E24. [CrossRef] [PubMed]
10. Florence, C.S.; Bergen, G.; Atherly, A.; Burns, E.; Stevens, J.; Drake, C. Medical Costs of Fatal and Nonfatal Falls in Older Adults. *J. Am. Geriatr. Soc.* **2018**, *66*, 693–698. [CrossRef] [PubMed]
11. Arnadottir, S.A.; Bruce, J.; Lall, R.; Withers, E.J.; Underwood, M.; Shaw, F.; Sheridan, R.; Hossain, A.; Lamb, S.E.; Martin, F.; et al. The importance of different frailty domains in a population based sample in England. *BMC Geriatr.* **2020**, *20*, 1–10. [CrossRef]
12. Luukinen, H.; Koski, K.; Laippala, P.; Kivelä, S.-L. Factors Predicting Fractures During Falling Impacts Among Home-Dwelling Older Adults. *J. Am. Geriatr. Soc.* **1997**, *45*, 1302–1309. [CrossRef]
13. Maki, B.E. Gait Changes in Older Adults: Predictors of Falls or Indicators of Fear? *J. Am. Geriatr. Soc.* **1997**, *45*, 313–320. [CrossRef]
14. Hill, K.D.; Schwarz, J.A.; Kalogeropoulos, A.J.; Gibson, S.J. Fear of falling revisited. *Arch. Phys. Med. Rehabil.* **1996**, *77*, 1025–1029. [CrossRef]
15. Roaldsen, K.S.; Halvarsson, A.; Sahlström, T.; Ståhle, A. Task-specific balance training improves self-assessed function in community-dwelling older adults with balance deficits and fear of falling: A randomized controlled trial. *Clin. Rehabil.* **2014**, *28*, 1189–1197. [CrossRef]
16. Lavedán, A.; Viladrosa, M.; Jürschik, P.; Botigué, T.; Nuín, C.; Masot, O.; Lavedán, R. Fear of falling in community-dwelling older adults: A cause of falls, a consequence, or both? *PLoS ONE* **2018**, *13*, e0194967. [CrossRef]
17. Wollesen, B.; Wanstrath, M.; Van Schooten, K.S.; Delbaere, K. A taxonomy of cognitive tasks to evaluate cognitive-motor interference on spatiotemoporal gait parameters in older people: A systematic review and meta-analysis. *Eur. Rev. Aging Phys. Act.* **2019**, *16*, 1–27. [CrossRef]
18. Buchner, D.M.; Hornbrook, M.C.; Kutner, N.G.; Tinetti, M.E.; Ory, M.G.; Mulrow, C.D.; Schechtman, K.B.; Gerety, M.B.; Fiatarone, M.A.; Wolf, S.L.; et al. Development of the Common Data Base for the FICSIT trials. *J. Am. Geriatr. Soc.* **1993**, *41*, 297–308. [CrossRef]
19. Yamada, M.; Ichihashi, N. Predicting the probability of falls in community-dwelling elderly individuals using the trail-walking test. *Environ. Health Prev. Med.* **2010**, *15*, 386–391. [CrossRef]
20. Delbaere, K.; Close, J.C.T.; Heim, J.; Sachdev, P.S.; Brodaty, H.; Slavin, M.J.; Kochan, N.A.; Lord, S.R. A multifactorial approach to understanding fall risk in older people. *J. Am. Geriatr. Soc.* **2010**, *58*, 1679–1685. [CrossRef]
21. Rossat, A.; Fantino, B.; Nitenberg, C.; Annweiler, C.; Poujol, L.; Herrmann, F.R.; Beauchet, O. Risk factors for falling in community-dwelling older adults: Which of them are associated with the recurrence of falls? *J. Nutr. Health Aging* **2010**, *14*, 787–791. [CrossRef]
22. Lecuyer Giguère, F.; Frasnelli, A.; De Guise, É.; Frasnelli, J. Olfactory, cognitive and affective dysfunction assessed 24 h and one year after a mild Traumatic Brain Injury (mTBI). *Brain Inj.* **2019**, *33*, 1184–1193. [CrossRef] [PubMed]

23. Physiopedia. Available online: https://www.physio-pedia.com/ (accessed on 4 September 2020).
24. Special Issue on Elderly Falls. *J. Saf.* **2011**, *42*, 415–542. Available online: https://www.sciencedirect.com/journal/journal-of-safety-research/vol/42/issue/6 (accessed on 25 June 2021).
25. Fixsen, D.; Scott, V.; Blase, K.; Naoom, S.; Wagar, L. When evidence is not enough: The challenge of implementing fall prevention strategies. *J. Saf. Res.* **2011**, *42*, 419–422. [CrossRef] [PubMed]
26. Goodwin, V.; Jones-Hughes, T.; Thompson-Coon, J.; Boddy, K.; Stein, K. Implementing the evidence for preventing falls among community-dwelling older people: A systematic review. *J. Saf. Res.* **2011**, *42*, 443–451. [CrossRef]
27. Haines, T.P.; Waldron, N.G. Translation of falls prevention knowledge into action in hospitals: What should be translated and how should it be done? *J. Saf. Res.* **2011**, *42*, 431–442. [CrossRef]
28. Noonan, R.K.; Sleet, D.A.; Stevens, J.A. Closing the gap: A research agenda to accelerate the adoption and effective use of proven older adult fall prevention strategies. *J. Saf. Res.* **2011**, *42*, 427–430. [CrossRef]
29. Beauchet, O.; Allali, G.; Berrut, G.; Dubost, V. Is low lower-limb kinematic variability always an index of stability? *Gait Posture* **2007**, *26*, 327–328. [CrossRef]
30. Muir, S.W.; Beauchet, O.; Montero-Odasso, M.; Annweiler, C.; Fantino, B.; Speechley, M. Association of executive function impairment, history of falls and physical performance in older adults: A cross-sectional population-based study in Eastern France. *J. Nutr. Health Aging* **2013**, *17*, 661–665. [CrossRef]
31. Muir, J.W.; Kiel, D.P.; Hannan, M.; Magaziner, J.; Rubin, C.T. Dynamic Parameters of Balance Which Correlate to Elderly Persons with a History of Falls. *PLoS ONE* **2013**, *8*, e70566. [CrossRef]
32. Cuevas-Trisan, R. Balance Problems and Fall Risks in the Elderly. *Clin. Geriatr. Med.* **2019**, *35*, 173–183. [CrossRef]
33. Gillespie, L.D.; Robertson, M.C.; Gillespie, W.J.; Sherrington, C.; Gstes, S.; Clemson, L.M.; Lamb, S.E.; Gates, S.; Clemson, L.M.; Lamb, S.E. Environmental interventions for preventing falls in older people living in the community (Review). *Cochrane Database Syst. Rev.* **2012**, *2012*, 1–416.
34. Cameron, I.D.; Dyer, S.M.; Panagoda, C.E.; Murray, G.R.; Hill, K.D.; Cumming, R.G.; Kerse, N. *Interventions for Preventing Falls in Older People in Care Facilities and Hospitals (Review)*; John Wiley and Sons Ltd.: Hoboken, NJ, USA, 2020.
35. Veuas, B.J.; Wayne, S.J.; Romero, L.J.; Baumgartner, R.N.; Garry, P.J.P.; Vellas, B.J.; Wayne, S.J.; Romero, L.J.; Baumgartner, R.N.; Garry, P.J.P. Fear of falling and restriction of mobility in elderly fallers. *Age Ageing* **1997**, *26*, 189–193.
36. Van Moorselaar, D.; Olivers, C.N.L.; Theeuwes, J.; Lamme, V.A.F.; Sligte, I.G. Forgotten but Not Gone: Retro-Cue Costs and Benefits in a Double-Cueing Paradigm Suggest Multiple States in Visual Short-Term Memory. *J. Exp. Psychol. Learn. Mem. Cogn.* **2015**, *41*, 1755–1763. [CrossRef]
37. Lipsitz, L.A.; Jonsson, P.V.; Kelley, M.M.; Koestner, J.S. Causes and Correlates of Recurrent Falls in Ambulatory Frail Elderly. *J. Gerontol.* **1991**, *46*, M114–M122. [CrossRef]
38. Van Schoor, N.M.; Smit, J.H.; Pluijm, S.M.F.F.; Jonker, C.; Lips, P. Different cognitive functions in relation to falls among older persons Immediate memory as an independent risk factor for falls. *J. Clin. Epidemiol.* **2002**, *55*, 855–862. [CrossRef]
39. Brown, L.A.; Shumway-Cook, A.; Woollacott, M.H. Attentional demands and postural recovery: The effects of aging. *J. Gerontol. Ser. A Biol. Sci. Med. Sci.* **1999**, *54*, 165–171. [CrossRef]
40. Baris Deger, T.; Fulden Saraç, Z.; Sumru Sava, E.; Fehmi Akçiçek, S. The Relationship of Balance Disorders with Falling, the Effect of Health Problems, and Social Life on Postural Balance in the Elderly Living in a District in Turkey. *Geriatrics* **2019**, *4*, 1–10.
41. Shumway-Cook, A.; Baldwin, M.; Polissar, N.L.; Gruber, W. Predicting the probability for falls in community-dwelling older adults. *Phys. Ther.* **1997**, *77*, 812–819. [CrossRef]
42. Singh, D.K.A.; Pillai, S.G.K.; Tan, S.T.; Tai, C.C.; Shahar, S. Association between physiological falls risk and physical performance tests among community-dwelling older adults. *Clin. Interv. Aging* **2015**, *10*, 1319–1326. [CrossRef]
43. Rodríguez-Molinero, A.; Galvez-Barrón, C.; Narvaiza, L.; Miñarro, A.; Ruiz, J.; Valldosera, E.; Gonzalo, N.; Ng, T.; Sanguino, M.J.; Yuste, A. A two-question tool to assess the risk of repeated falls in the elderly. *PLoS ONE* **2017**, *12*, e0176703. [CrossRef]
44. Lundin-Olsson, L.; Nyberg, L.; Gustafson, Y. "Stops walking when talking" as a predictor of falls in elderly people. *Lancet* **1997**, *349*, 617. [CrossRef]
45. Shumway-Cook, A.; Brauer, S.; Woollacott, M. Predicting the probability for falls in community-dwelling older adults using the Timed Up & Go Test. *Phys. Ther.* **2000**, *80*, 896–903. [PubMed]
46. Kim, J.C.; Chon, J.; Kim, H.S.; Lee, J.H.; Yoo, S.D.; Kim, D.H.; Lee, S.A.; Han, Y.J.; Lee, H.S.; Lee, B.Y.; et al. The association between fall history and physical performance tests in the community-dwelling elderly: A cross-sectional analysis. *Ann. Rehabil. Med.* **2017**, *41*, 239–247. [CrossRef] [PubMed]
47. Van Hooren, B.; Venner, P.; Bosch, F. De dynamische systeemtheorie in fysieke training. Deel I: Onderliggende concepten. *Sportgericht* **2017**, *71*, 12–19.
48. Van Hooren, B.; Meijer, K.; McCrum, C. Attractive gait training: Applying dynamical systems theory to the improvement of locomotor performance across the lifespan. *Front. Physiol.* **2019**, *9*, 1–5. [CrossRef]
49. Furuki, D.; Takiyama, K. Decomposing motion that changes over time into task-relevant and task-irrelevant components in a data-driven manner: Application to motor adaptation in whole-body movements. *Sci. Rep.* **2019**, *9*, 1–17. [CrossRef]
50. Runge, M.; Hunger, G. Determinants of musculoskeletal frailty and the risk of falls in old age. *J. Musculoskelet. Neuronal Interact.* **2006**, *6*, 167–173.

51. Balzer, K.; Bremer, M.; Schramm, S.; Lühmann, D.; Raspe, H. Falls prevention for the elderly. *GMS Health Technol. Assess.* **2012**, *8*, 1–8.
52. Chang, J.T.; Morton, S.C.; Rubenstein, L.Z.; Mojica, W.A.; Maglione, M.; Suttorp, M.J.; Roth, E.A.; Shekelle, P.G. Interventions for the prevention of falls in older adults: Systematic review and meta-analysis of randomised clinical trials. *Br. Med. J.* **2004**, *328*, 680–683. [CrossRef]
53. Woollacott, M.H. Editorial: Systems Contributing to Balance Disorder in Older adults. *J. Gerontol. Med. Sci.* **2000**, *55A*, M424–M428. [CrossRef]
54. Zecevic, A.A.; Salmoni, A.W.; Speechley, M.; Vandervoort, A.A. Defining a fall and reasons for falling: Comparisons among the Views of Seniors, Health Care Providers, and the Research Literature. *Gerontologist* **2006**, *46*, 367–376. [CrossRef]
55. Beauchet, O.; Dubost, V.; Aminian, K.; Gonthier, R.; Kressig, R.W. Dual-task-related gait changes in the elderly: Does the type of cognitive task matter? *J. Mot. Behav.* **2005**, *37*, 259–264.
56. Beauchet, O.; Berrut, G. Marche et double tâche: Définition, intérêts et perspectives. *Psychol. Neuropsychiatr. Vieil.* **2006**, *4*, 215–225.
57. Yogev-Seligmann, G.; Hausdorff, J.M.; Giladi, N. Do we always prioritize balance when walking? Towards an integrated model of task prioritization. *Mov. Disord.* **2012**, *27*, 765–777. [CrossRef]
58. Yogev-Seligmann, G.; Giladi, N.; Gruendlinger, L.; Hausdorff, J.M. The contribution of postural control and bilateral coordination to the impact of dual tasking on gait. *Exp. Brain Res.* **2013**, *226*, 81–93. [CrossRef]
59. Yogev-Seligmann, G.; Sprecher, E.; Kodesh, E. The Effect of External and Internal Focus of Attention on Gait Variability in Older Adults. *J. Mot. Behav.* **2017**, *49*, 179–184. [CrossRef]
60. Shumway-Cook, A.; Woollacott, M. Attentional demands and postural control: The effect of sensory context. *J. Gerontol. Ser. A Biol. Sci. Med. Sci.* **2000**, *54*, M10–M16.
61. Dubost, V.; Kressig, R.W.; Gonthier, R.; Herrmann, F.R.; Aminian, K.; Najafi, B.; Beauchet, O. Relationships between dual-task related changes in stride velocity and stride time variability in healthy older adults. *Hum. Mov. Sci.* **2006**, *25*, 372–382. [CrossRef]
62. Priest, A.W.; Salamon, K.B.; Hollman, J.H. Age-related differences in dual task walking: A cross sectional study. *J. Neuroeng. Rehabil.* **2008**, *5*, 1–8. [CrossRef]
63. Hausdorff, J.M.; Schweiger, A.; Herman, T.; Yogev-Seligmann, G.; Giladi, N. Dual-task decrements in gait: Contributing factors among healthy older adults. *J. Gerontol. Ser. A Biol. Sci. Med. Sci.* **2008**, *63*, 1335–1343. [CrossRef]
64. Zijlstra, A.; Ufkes, T.; Skelton, D.A.; Lundin-Olsson, L.; Zijlstra, W. Do dual tasks have an added value over single tasks for balance assessment in fall prevention programs? A mini-review. *Gerontology* **2008**, *54*, 40–49. [CrossRef]
65. Yogev-Seligmann, G.; Hausdorff, J.M.; Giladi, N. The role of executive function and attention in gait. *Mov. Disord.* **2008**, *23*, 329–342. [CrossRef]
66. Yogev-Seligmann, G.; Rotem-Galili, Y.; Mirelman, A.; Dickstein, R.; Giladi, N.; Hausdorff, J.M. How Does Explicit Prioritization Alter Walking During Dual-Task Performance? Effects of Age and Sex on Gait Speed and Variability. *Phys. Ther.* **2010**, *90*, 177–186. [CrossRef]
67. Beauchet, O.; Annweiler, C.; Dubost, V.; Allali, G.; Kressig, R.W.; Bridenbaugh, S.; Berrut, G.; Assal, F.; Herrmann, F.R. Stops walking when talking: A predictor of falls in older adults? *Eur. J. Neurol.* **2009**, *16*, 786–795. [CrossRef]
68. Segev-Jacubovski, O.; Herman, T.; Yogev-Seligmann, G.; Mirelman, A.; Giladi, N.; Hausdorff, J.M. The interplay between gait, falls and cognition: Can cognitive therapy reduce fall risk? *Expert Rev. Neurother.* **2011**, *11*, 1057–1075. [CrossRef]
69. Classen, J.; Gerloff, C.; Honda, M.; Hallett, M. Integrative Visuomotor Behavior Is Associated with Interregionally Coherent Oscillations in the Human Brain. *J. Neurophysiol.* **1998**, *79*, 1567–1573. [CrossRef]
70. Feng, G. Is there a common control mechanism for anti-saccades and reading eye movements? Evidence from distributional analyses. *Vis. Res.* **2012**, *57*, 35–50. [CrossRef]
71. Honda, T.; Nagao, S.; Hashimoto, Y.; Ishikawa, K.; Yokota, T.; Mizusawa, H.; Ito, M. Tandem internal models execute motor learning in the cerebellum. *Proc. Natl. Acad. Sci. USA* **2018**, *115*, 7428–7433. [CrossRef]
72. Yang, Y.R.; Chen, Y.C.; Lee, C.S.; Cheng, S.J.; Wang, R.Y. Dual-task-related gait changes in individuals with stroke. *Gait Posture* **2007**, *25*, 185–190. [CrossRef]
73. Van Iersel, M.B.; Ribbers, H.; Munneke, M.; Borm, G.F.; Olde Rikkert, M.G. The Effect of Cognitive Dual Tasks on Balance During Walking in Physically Fit Elderly People. *Arch. Phys. Med. Rehabil.* **2007**, *88*, 187–191. [CrossRef]
74. Makizako, H.; Kaneko, F.; Aoki, N.; Ihira, H. Age-related Differences in Reaction Time Responses under Simple- and Dual-task Conditions in Middle-aged Ski Marathon Amateur Males. *Int. J. Sport Health Sci.* **2013**, *11*, 33–38. [CrossRef]
75. Hinault, T.; Larcher, K.; Bherer, L.; Courtney, S.M.; Dagher, A. Age-related differences in the structural and effective connectivity of cognitive control: A combined fMRI and DTI study of mental arithmetic. *Neurobiol. Aging* **2019**, *82*, 30–39. [CrossRef] [PubMed]
76. Pijnappels, M.; Reeves, N.D.; Maganaris, C.N.; van Dieën, J.H. Tripping without falling; lower limb strength, a limitation for balance recovery and a target for training in the elderly. *J. Electromyogr. Kinesiol.* **2008**, *18*, 188–196. [CrossRef] [PubMed]
77. Kannape, O.A.; Barré, A.; Aminian, K.; Blanke, O. Cognitive loading affects motor awareness and movement kinematics but not locomotor trajectories during goal-directed walking in a virtual reality environment. *PLoS ONE* **2014**, *9*, e85560. [CrossRef]
78. Punt, M.; Bruijn, S.M.; Van Schooten, K.S.; Pijnappels, M.; Van De Port, I.G.; Wittink, H.; Van Dieën, J.H. Characteristics of daily life gait in fall and non fall-prone stroke survivors and controls. *J. Neuroeng. Rehabil.* **2016**, *13*, 1–6. [CrossRef]
79. Nashner, L.M.; Woollacott, M.; Tuma, G. Organization of rapid responses to postural and locomotor-like perturbations of standing man. *Exp. Brain Res.* **1979**, *36*, 463–476. [CrossRef]

80. Camicioli, R.; Howieson, D.; Lehman, S.; Kaye, J. Talking while walking: The effect of a dual task in aging and Alzheimer's disease. *Neurology* **1997**, *48*, 955–958. [CrossRef]
81. Aivar, M.P.; Brenner, E.; Smeets, J.B.J. Hitting a target is fundamentally different from avoiding obstacles. *Vis. Res.* **2015**, *110*, 166–178. [CrossRef]
82. Persichetti, A.S.; Dilks, D.D. Dissociable Neural Systems for Recognizing Places and Navigating through Them. *J. Neurosci.* **2018**, *38*, 10295–10304. [CrossRef]
83. Jana, S.; Gopal, A.; Murthy, A. Evidence of common and separate eye and hand accumulators underlying flexible eye-hand coordination. *J. Neurophysiol.* **2017**, *117*, 348–364. [CrossRef]
84. Jana, S.; Gopal, A.; Murthy, A. A Computational Framework for Understanding Eye-Hand Coordination. *J. Indian Inst. Sci.* **2017**, *97*, 543–554. [CrossRef]
85. Gopal, A.; Jana, S.; Murthy, A. Contrasting speed-accuracy tradeoffs for eye and hand movements reveal the optimal nature of saccade kinematics. *J. Neurophysiol.* **2017**, *118*, 1664–1676. [CrossRef]
86. Di Carlo, A.; Baldereschi, M.; Amaducci, L.; Maggi, S.; Grigoletto, F.; Scarlato, G.; Inzitari, D. Cognitive impairment without dementia in older people: Prevalence, vascular risk factors, impact on disability. The Italian Longitudinal Study on Aging. *J. Am. Geriatr. Soc.* **2000**, *48*, 775–782. [CrossRef]
87. Bahureksa, L.; Najafi, B.; Saleh, A.; Sabbagh, M.; Coon, D.; Mohler, M.J.; Schwenk, M. The Impact of Mild Cognitive Impairment on Gait and Balance: A Systematic Review and Meta-Analysis of Studies Using Instrumented Assessment. *Gerontology* **2016**, *63*, 67–83. [CrossRef]
88. Annweiler, C.; Beauchet, O.; Bartha, R.; Montero-Odasso, M. Slow gait in MCI is associated with ventricular enlargement: Results from the Gait and Brain Study. *J. Neural Transm.* **2013**, *120*, 1083–1092. [CrossRef]
89. Myint, P.K.; Welch, A.A. Healthier ageing. *Br. Med. J.* **2012**, *344*, 42–45. [CrossRef]
90. Gorniak, S.L. The relationship between task difficulty and motor performance complexity. *Atten. Percept. Psychophys.* **2018**, *81*, 12–19. [CrossRef]
91. Carpenter, C.R.; McFarland, F.; Avidan, M.; Berger, M.; Inouye, S.K.; Karlawish, J.; Lin, F.R.; Marcantonio, E.; Morris, J.C.; Reuben, D.B.; et al. Impact of Cognitive Impairment Across Specialties: Summary of a Report from the U13 Conference Series. *J. Am. Geriatr. Soc.* **2019**, *67*, 2011–2017. [CrossRef]
92. Van Der Velde, N.; Stricker, B.H.C.; Pols, H.A.P.; Van Der Cammen, T.J.M. Risk of falls after withdrawal of fall-risk-increasing drugs: A prospective cohort study. *Br. J. Clin. Pharmacol.* **2006**, *63*, 232–237. [CrossRef]
93. Lee, A.; Lee, K.W.; Khang, P. Preventing falls in the geriatric population. *Perm. J.* **2013**, *17*, 37–39. [CrossRef]
94. Dury, S.; Dierckx, E.; Van Der Vorst, A.; Van Der Elst, M.; Fret, B.; Duppen, D.; Hoeyberghs, L.; De Roeck, E.; Lambotte, D.; Smetcoren, A.-S.; et al. Detecting frail, older adults and identifying their strengths: Results of a mixed-methods study. *BMC Public Health* **2018**, *18*, 1–13. [CrossRef]
95. Selinger, J.C.; O'Connor, S.M.; Wong, J.D.; Donelan, J.M. Humans Can Continuously Optimize Energetic Cost during Walking. *Curr. Biol.* **2015**, *25*, 2452–2456. [CrossRef]
96. Vachon, C.M.; Modchalingam, S.; 't Hart, B.M.; Henriques, D.Y.P. The effect of age on visuomotor learning processes. *PLoS ONE* **2020**, *15*, e0239032. [CrossRef]
97. Brenner, E.; Abalo Rodriguez, I.; Muñoz, V.E.; Schootemeijer, S.; Mahieu, Y.; Veerkamp, K.; Zandbergen, M.; Van Der Zee, T.; Smeets, J.B.J. How Can People Be so Good at Intercepting Accelerating Objects if They Are so Poor at Visually Judging Acceleration? *i-Perception* **2016**, *7*, 1–13. [CrossRef]
98. Dostalek, M.; Fliegel, K.; Dusek, L.; Lukes, T.; Hejda, J.; Duchackova, M.; Hozman, J.; Autrata, R. Influence of artificially generated interocular blur difference on fusion stability under vergence stress. *J. Eye Mov. Res.* **2019**, *12*, 1–15.
99. Kolers, P.A.; Rosner, B.S. On visual masking (metacontrat): Dichoptic observation. *Am. J. Psychol.* **1960**, *73*, 2–21. [CrossRef]
100. Tatler, B.W.; Kuhn, G. Don't look now: The Magic of Misdirection. In *Eye Movements: A Window on Mind and Brain*; van Gompel, R.P.G., Fischer, M.H., Murray, W.S., Hill, R.L., Eds.; Elsevier Ltd.: Amsterdam, The Netherlands, 2007; pp. 697–714. ISBN 9780080449807.
101. Davis, J.; Wang, S.; Festa, E.; Luo, G.; Moharrer, M.; Bernier, J.; Ott, B. Detection of Risky Driving Behaviors in the Naturalistic Environment in Healthy Older Adults and Mild Alzheimer's Disease. *Geriatrics* **2018**, *3*, 13. [CrossRef]
102. Carr, D.B.; Grover, P. The role of eye tracking technology in assessing older driver safety. *Geriatrics* **2020**, *5*, 36. [CrossRef] [PubMed]
103. Priya Venkataraman, A.; Lewis, P.; Unsbo, P.; Lundström, L. Peripheral resolution and contrast sensitivity: Effects of stimulus drift. *Vis. Res.* **2017**, *133*, 145–149. [CrossRef] [PubMed]
104. Tadin, D.; Park, W.J.; Dieter, K.C.; Melnick, M.D.; Lappin, J.S.; Blake, R. Spatial suppression promotes rapid figure-ground segmentation of moving objects. *Nat. Commun.* **2019**, *10*, 2732. [CrossRef] [PubMed]
105. Koppelaar, H.; Kordestani-Moghadan, P.; Khan, K.; Kouhkani, S.; Segers, G.; van Warmerdam, M. Reaction Time Improvements by Neural Bistability. *Behav. Sci.* **2019**, *9*, 28. [CrossRef]
106. DeLoss, D.J.; Watanabe, T.; Anderson, G.J. Improving Vision Among Older Adults: Behavioral Training to Improve Sight. *Psychol. Sci.* **2015**, *26*, 456–466. [CrossRef]

107. Nemoto, M.; Sasai, H.; Yabushita, N.; Tsuchiya, K.; Hotta, K.; Fujita, Y.; Kim, T.; Tsujimoto, T.; Arai, T.; Tanaka, K. A Novel Exercise for Enhancing Visuospatial Ability in Older Adults with Frailty: Development, Feasibility, and Effectiveness. *Geriatrics* **2020**, *5*, 29. [CrossRef]
108. Pedroli, E.; Greci, L.; Colombo, D.; Serino, S.; Cipresso, P.; Arlati, S.; Mondellini, M.; Boilini, L.; Giussani, V.; Goulene, K.; et al. Characteristics, Usability, and Users Experience of a System Combining Cognitive and Physical Therapy in a Virtual Environment: Positive Bike. *Sensors* **2018**, *18*, 2343. [CrossRef]
109. Ayed, I.; Ghazel, A.; Jaume-I-Capó, A.; Moya-Alcover, G.; Varona, J.; Martínez-Bueso, P. Feasibility of Kinect-Based Games for Balance Rehabilitation: A Case Study. *J. Healthc. Eng.* **2018**, *2018*, 1–8. [CrossRef]
110. Noohu, M.M.; Dey, A.B.; Hussain, M.E. Relevance of balance measurement tools and balance training for fall prevention in older adults. *J. Clin. Gerontol. Geriatr.* **2014**, *5*, 31–35. [CrossRef]
111. Diamond, J.S.; Wolpert, D.M.; Flanagan, J.R. Rapid target foraging with reach or gaze: The hand looks further ahead than the eye. *PLoS Comput. Biol.* **2017**, *13*, e1005504. [CrossRef]
112. Clément, G.; Reschke, M.F. Neurosensory and sensory-motor functions. In *Biological and Medical Research in Space*; Moore, D., Bie, P., Oser, H., Eds.; Springer: Berlin/Heidelberg, Germany, 1996; pp. 178–258.
113. Fisher, B.; Ramsperger, E.; Fischer, B.; Ramsperger, E. Human express saccades: Extremely short reaction times of goal direction eye movements. *Exp. Brain Res.* **1984**, *57*, 191–195. [CrossRef]
114. Fischer, B.; Weber, H. Express saccades and visual attention. *Behav. Brain Sci.* **1993**, *16*, 553–610. [CrossRef]
115. Kingstone, A.; Klein, R.M. What are human express saccades? *Percept. Psychophys.* **1993**, *54*, 260–273. [CrossRef]
116. Paré, M.; Munoz, D.P.; Pare, M.; Munoz, D.P. Saccadic reaction time in the monkey: Advanced preparation of oculomotor programs is primarily responsible for express saccade occurrence. *J. Neurophysiol.* **1996**, *76*, 3666–3681. [CrossRef]
117. Marino, R.A.; Levy, R.; Munoz, D.P. Linking express saccade occurance to stimulus properties and sensorimotor integration in the superior colliculus. *J. Neurophysiol.* **2015**, *114*, 879–892. [CrossRef]
118. Pijnappels, M.A.G.M.M.; Bobbert, M.F.M.F.; van Dieen, J.H.; van Dieën, J.H. Push-off reactions in recovery after tripping discriminate young subjects, older non-fallers and older fallers. *Gait Posture* **2005**, *21*, 388–394. [CrossRef]
119. Peel, T.R.; Dash, S.; Lomber, S.G.; Corneil, B.D. Frontal Eye Field Inactivation Diminishes Superior Colliculus Activity, But Delayed Saccadic Accumulation Governs Reaction Time Increases. *J. Neurosci.* **2017**, *37*, 11715–11730. [CrossRef] [PubMed]
120. Nibbeling, N.; Oudejans, R.R.D.; Daanen, H.A.M. Effects of anxiety, a cognitive secondary task, and expertise on gaze behavior and performance in a far aiming task. *Psychol. Sport Exerc.* **2012**, *13*, 427–435. [CrossRef]
121. Richardson, L. Fear of Falling. *Qual. Inq.* **2014**, *20*, 1133–1140. [CrossRef]
122. Gotardi, G.C.; Polastri, P.F.; Schor, P.; Oudejans, R.R.D.; Van Der Kamp, J.; Savelsbergh, G.J.P.; Navarro, M.; Rodrigues, S.T. Adverse effects of anxiety on attentional control differ as a function of experience: A simulated driving study. *Appl. Ergon.* **2019**, *74*, 41–47. [CrossRef] [PubMed]
123. Duijnhouwer, J. Studies on the Rotation Problem in Self-Motion Perception. Ph.D. Thesis, Radboud University, Nijmegen, The Netherlands, 2013. Available online: https://repository.ubn.ru.nl/handle/2066/121139 (accessed on 25 June 2021).
124. Duijnhouwer, J.; Krekelberg, B. Evidence and counterevidence in motion perception. *Cereb. Cortex* **2016**, *26*, 4602–4612. [CrossRef] [PubMed]
125. Cullen, K.E.; Brooks, J.X.; Jamali, M.; Carriot, J.; Massot, C. Internal models of self-motion: Computations that suppress vestibular reafference in early vestibular processing. *Exp. Brain Res.* **2011**, *210*, 377–388. [CrossRef]
126. Cullen, K.E.; Taube, J.S. Our sense of direction: Progress, controversies and challenges. *Nat. Neurosci.* **2017**, *20*, 1465–1473. [CrossRef]
127. Fait, P.E.; McFadyen, B.J.; Zabjek, K.; Reed, N.; Taha, T.; Keightley, M. Increasing task complexity and ice hockey skills of youth athletes. *Percept. Mot. Skills* **2011**, *112*, 29–43. [CrossRef]
128. Cao, L.; Händel, B. Walking enhances peripheral visual processing in humans. *PLoS Biol.* **2019**, *17*, e3000511. [CrossRef]
129. Ceylan, H.I.; Saygin, O. Examining the effects of proprioceptive training on coincidence anticipation timing, reaction time and hand-eye coordination. *Anthropologist* **2015**, *20*, 437–445. [CrossRef]
130. Liu, Y.; Chan, J.S.Y.; Yan, J.H.; Sharma, H.S. Neuropsychological mechanisms of falls in older adults. *Front. Neurosci.* **2014**, *6*, 1–8. [CrossRef]
131. Gao, Y.; Huber, C.; Sabel, B.A. Stable microsaccades and microsaccade-induced global alpha band phase reset across the life span. *Investig. Ophthalmol. Vis. Sci.* **2018**, *59*, 2032–2041. [CrossRef]
132. Poth, C.H.; Herwig, A.; Schneider, W.X. Breaking Object Correspondence Across Saccadic Eye Movements Deteriorates Object Recognition. *Front. Syst. Neurosci.* **2015**, *9*, 1–10. [CrossRef]
133. Irwin, D.E. Where does attention go when you blink? *Atten. Percept. Psychophys.* **2011**, *73*, 1374–1384. [CrossRef]
134. Costela, F.M.; Otero-Millan, J.; McCamy, M.B.; Macknik, S.L.; Troncoso, X.G.; Jazi, A.N.; Crook, S.M.; Martinez-Conde, S. Fixational eye movement correction of blink-induced gaze position errors. *PLoS ONE* **2014**, *9*, e110889. [CrossRef]
135. Khazali, M.F.; Pomper, J.K.; Thier, P. Blink associated resetting eye movements (BARMs) are functionally complementary to microsaccades in correcting for fixation errors. *Sci. Rep.* **2017**, *7*, 1–8. [CrossRef]
136. Wu, C.C.; Cao, B.; Dali, V.; Gagliardi, C.; Barthelemy, O.J.; Salazar, R.D.; Pomplun, M.; Cronin-Golomb, A.; Yazdanbakhsh, A. Eye movement control during visual pursuit in Parkinson's disease. *PeerJ* **2018**, *6*, e5442. [CrossRef]

137. Irwin, D.E.; Robinson, M.M. Perceiving a continuous visual world across voluntary eye blinks. *J. Exp. Psychol. Hum. Percept. Perform.* **2016**, *42*, 1490–1496. [CrossRef] [PubMed]
138. Irwin, D.E.; Robinson, M.M. How post-saccadic target blanking affects the detection of stimulus displacements across saccades. *Vis. Res.* **2018**, *142*, 11–19. [CrossRef] [PubMed]
139. Zimmermann, E. Visual mislocalization during double-step saccades. *Front. Syst. Neurosci.* **2015**, *9*, 1–6. [CrossRef] [PubMed]
140. Zimmermann, E.; Morrone, M.C.; Binda, P. Perception during double-step saccades. *Sci. Rep.* **2018**, *8*, 1–9. [CrossRef] [PubMed]
141. Atsma, J.; Maij, F.; Koppen, M.; Irwin, D.E.; Medendorp, W.P. Causal Inference for Spatial Constancy across Saccades. *PLoS Comput. Biol.* **2016**, *12*, e1004766. [CrossRef] [PubMed]
142. Cronin, D.A.; Irwin, D.E. Visual working memory supports perceptual stability across saccadic eye movements. *J. Exp. Psychol. Hum. Percept. Perform.* **2018**, *44*, 1739–1759. [CrossRef]
143. Herwig, A. Transsaccadic integration and perceptual continuity. *J. Vis.* **2015**, *15*, 1–6. [CrossRef]
144. Paeye, C.; Collins, T.; Cavanagh, P.; Herwig, A. Calibration of peripheral perception of shape with and without saccadic eye movements. *Atten. Percept. Psychophys.* **2018**, *80*, 723–737. [CrossRef]
145. Poth, C.H.; Schneider, W.X. Breaking object correspondence across saccades impairs object recognition: The role of color and luminance. *J. Vis.* **2016**, *16*, 1–12. [CrossRef]
146. White, A.L.; Rolfs, M. Oculomotor inhibition covaries with conscious detection. *J. Neurophysiol.* **2016**, *116*, 1507–1521. [CrossRef]
147. Wurtz, R.H. Corollary Discharge Contributions to Perceptual Continuity Across Saccades. *Annu. Rev. Vis. Sci.* **2018**, *4*, 215–237. [CrossRef]
148. Puntiroli, M.; Kerzel, D.; Born, S. Perceptual enhancement prior to intended and involuntary saccades. *J. Vis.* **2015**, *15*, 1–20. [CrossRef]
149. Bozhkova, V.P.; Surovicheva, N.S.; Nikolaev, D.P.; Nikolaev, I.P.; Bolshakov, A.S. Smooth Pursuit in Elderly Adults Studied with Apparent Motion. *Perception* **2015**, *44*, 1040–1053. [CrossRef]
150. Braun, J.; Mattia, M. NeuroImage Attractors and noise: Twin drivers of decisions and multistability. *Neuroimage* **2010**, *52*, 740–751. [CrossRef]
151. Bremmer, F.; Churan, J.; Lappe, M. Heading representations in primates are compressed by saccades. *Nat. Commun.* **2017**, *8*, 1–13. [CrossRef]
152. Schmitt, C.; Klingenhoefer, S.; Bremmer, F. Preattentive and Predictive Processing of Visual Motion. *Sci. Rep.* **2018**, *8*, 1–12. [CrossRef]
153. Matziridi, M.; Brenner, E.; Smeets, J.B.J. Moving your head reduces perisaccadic compression. *J. Vis.* **2016**, *16*, 1–8. [CrossRef]
154. Ivanov, I.V.; Kramer, D.J.; Mullen, K.T. The role of the foreshortening cue in the perception of 3D object slant. *Vis. Res.* **2014**, *94*, 41–50. [CrossRef]
155. Gabbard, C.; Robinson, K.; Fox, A. A Program to Improve Reach Estimation and Reduce Fall Risk in the Elderly. *Geriatrics* **2016**, *1*, 14. [CrossRef]
156. Maruta, J.; Spielman, L.A.; Rajashekar, U.; Ghajar, J. Visual Tracking in Development and Aging. *Front. Neurol.* **2017**, *8*, 1–9. [CrossRef]
157. Saftari, L.N.; Kwon, O.S. Ageing vision and falls: A review. *J. Physiol. Anthropol.* **2018**, *37*, 1–14. [CrossRef]
158. Fischer, J.; Whitney, D. Serial dependence in visual perception. *Nat. Neurosci.* **2014**, *17*, 1–9. [CrossRef]
159. Fritsche, M.; Mostert, P.; de Lange, F.P. Opposite Effects of Recent History on Perception and Decision. *Curr. Biol.* **2017**, *27*, 590–595. [CrossRef]
160. Alais, D.; Kong, G.; Palmer, C.; Clifford, C. Eye gaze direction shows a positive serial dependency. *J. Vis.* **2018**, *18*, 1–12. [CrossRef]
161. Thiamwong, L.; Suwanno, J. Effects of simple balance training on balance performance and fear of falling in rural older adults. *Int. J. Gerontol.* **2014**, *8*, 143–146. [CrossRef]
162. Gusi, N.; Carmelo Adsuar, J.; Corzo, H.; del Pozo-Cruz, B.; Olivares, P.R.; Parraca, J.A. Balance training reduces fear of falling and improves dynamic balance and isometric strength in institutionalised older people: A randomised trial. *J. Physiother.* **2012**, *58*, 97–104. [CrossRef]
163. Ebitz, R.B.; Platt, M.L. Neuronal activity in primate dorsal anterior cingulate cortex signals task conflict and predicts adjustments in pupil-linked arousal. *Neuron* **2015**, *85*, 628–640. [CrossRef]
164. Maki, B.E.; McIlroy, W.E. Control of rapid limb movements for balance recovery: Age-related changes and implications for fall prevention. *Age Ageing* **2006**, *35*, ii12–ii18. [CrossRef]
165. Liu, L.D.; Pack, C.C. The Contribution of Area MT to Visual Motion Perception Depends on Training. *Neuron* **2017**, *95*, 436–446. [CrossRef]
166. Wollesen, B.; Wildbredt, A.; Van Schooten, K.S.; Lim, M.L.; Delbaere, K. The effects of cognitive-motor training interventions on executive functions in older people: A systematic review and meta-analysis. *Eur. Rev. Aging Phys. Act.* **2020**, *17*, 1–22. [CrossRef]
167. Rodríguez-Molinero, A.; Herrero-Larrea, A.; Miñarro, A.; Narvaiza, L.; Gálvez-Barrón, C.; León, N.G.; Valldosera, E.; De Mingo, E.; Macho, O.; Aivar, D.; et al. The spatial parameters of gait and their association with falls, functional decline and death in older adults: A prospective study. *Sci. Rep.* **2019**, *9*, 1–9. [CrossRef] [PubMed]
168. Vandormael, H.; Herce Castañón, S.; Balaguer, J.; Li, V.; Summerfield, C. Robust sampling of decision information during perceptual choice. *Proc. Natl. Acad. Sci. USA* **2017**, *114*, 2771–2776. [CrossRef] [PubMed]
169. Köpke, S.; Meyer, G. The Tinetti test: Babylon in geriatric assessment. *Z. Gerontol. Geriatr.* **2006**, *39*, 288–291. [CrossRef] [PubMed]

170. Faber, M.J.; Bosscher, R.J.; van Wieringen, P.C.W. Clinimetric Properties of the Performance-Oriented Mobility Assessment. *Phys. Ther.* **2006**, *86*, 944–954. [CrossRef]
171. Steffen, T.M.; Hacker, T.A.; Mollinger, L. Age- and gender-related test performance in community-dwelling elderly people: Six-Minute Walk Test, Berg Balance Scale, Timed Up & Go Test, and Gait Speeds. *Phys. Ther.* **2002**, *82*, 128–137.
172. Milanovic, Z.; Pantelic, S.; Milanović, Z.; Pantelić, S.; Trajković, N.; Sporiš, G.; Kostić, R.; James, N. Age-related decrease in physical activity and functional fitness among elderly men and women. *Clin. Interv. Aging* **2013**, *3*, 549–556. [CrossRef]
173. Siu, K.C.; Woollacott, M.H. Attentional demands of postural control: The ability to selectively allocate information-processing resources. *Gait Posture* **2007**, *25*, 121–126. [CrossRef]
174. Mirelman, A.; Weiss, A.; Buchman, A.S.; Bennett, D.A.; Giladi, N.; Hausdorff, J.M. Association between performance on timed up and go subtasks and mild cognitive impairment: Further insights into the links between cognitive and motor function. *J. Am. Geriatr. Soc.* **2014**, *62*, 673–678. [CrossRef]
175. Cohen, H.; Blatchly, C.A.; Laurie, L.C. A Study of the Clinical Test of Sensory Interaction and Balance. *Phys. Ther.* **1993**, *73*, 346–351. [CrossRef]
176. Delignières, D.; Torre, K.; Bernard, P.L. Transition from persistent to anti-persistent correlations in postural sway indicates velocity-based control. *PLoS Comput. Biol.* **2011**, *7*, e1001089. [CrossRef]
177. Podsiadlo, D.; Richardson, S. The Timed Up and Go: A Test of Basic Functional Mobility for Frail Elderly Persons. *J. Am. Geriatr. Soc.* **1991**, *39*, 142–148. [CrossRef]
178. Mathias, S.; Nayak, U.S.; Isaacs, B. Balance in Elderly Patients: The “Get-Up and Go” Test. *Arch. Phys. Med. Rehabil.* **1986**, *67*, 387–389.
179. Northridge, M.E.; Nevitt, M.C.; Kelsey, J.L.; Link, B. Home hazards and falls in the elderly: The role of health and functional status. *Am. J. Public Health* **1995**, *85*, 509–515. [CrossRef]
180. Graafmans, W.C.; Ooms, M.E.; Hofstee, H.M.A.; Bezemer, P.D.; Bouter, L.M.; Lips, P. Falls in the elderly: A Prospective Study of Risk Factors and Risk Profiles. *Am. J. Epidemiol.* **1996**, *143*, 1129–1136. [CrossRef]
181. Dzhafarov, E.N. The Structure of Simple Reaction Time to Step-Function Signals. *J. Math. Psychol.* **1992**, *36*, 235–268. [CrossRef]
182. Dzhafarov, E.N. Visual Kinematics I. Visual Space Metric in Visual Motion. *J. Math. Psychol.* **1992**, *36*, 471–497. [CrossRef]
183. Dzhafarov, E.N. Visual Kinematics II. Space Contraction in Motion and Visual Velocity. *J. Math. Psychol.* **1992**, *36*, 498–523. [CrossRef]
184. Dzhafarov, E.N. Visual Kinematics III. Transformation of Spatiotemporal Coordinates in Motion. *J. Math. Psychol.* **1992**, *36*, 524–546. [CrossRef]
185. Paquette, M.R.; Li, Y.; Hoekstra, J.; Bravo, J. An 8-week reactive balance training program in older healthy adults: A preliminary investigation. *J. Sport Health Sci.* **2015**, *4*, 263–269. [CrossRef]
186. Excel. Available online: https://office.com/ (accessed on 7 June 2021).
187. Maple. Available online: https://www.maplesoft.com/products/Maple/ (accessed on 7 June 2021).
188. Liu-Ambrose, T.; Donaldson, M.G.; Ahamed, Y.; Graf, P.; Cook, W.L.; Close, J.; Lord, S.R.; Khan, K.M. Otago home-based strength and balance retraining improves executive functioning in older fallers: A randomized controlled trial. *J. Am. Geriatr. Soc.* **2008**, *56*, 1821–1830. [CrossRef]
189. Gardner, M.M.; Robertson, M.C.; McGee, R.; Campbell, A.J. Application of a falls prevention program for older people to primary health care practice. *Prev. Med.* **2002**, *34*, 546–553. [CrossRef]
190. Faber, M.J.; Bosscher, R.J.; Chin A Paw, M.J.; van Wieringen, P.C. Effects of Exercise Programs on Falls and Mobility in Frail and Pre-Frail Older Adults: A Multicenter Randomized Controlled Trial. *Arch. Phys. Med. Rehabil.* **2006**, *87*, 885–896. [CrossRef]
191. Sherrington, C.; Tiedemann, A. Physiotherapy in the prevention of falls in older people. *J. Physiother.* **2015**, *61*, 54–60. [CrossRef]
192. Gleeson, M.; Sherrington, C.; Keay, L. Exercise and physical training improve physical function in older adults with visual impairments but their effect on falls is unclear: A systematic review. *J. Physiother.* **2014**, *60*, 130–135. [CrossRef]
193. Coubard, O.A.; Coto-Montes, A.M.; Gowen, E. Fall prevention modulates decisional saccadic behavior in aging. *Front. Aging Neurosci.* **2012**, *4*, 1–20. [CrossRef]
194. Harrison, W.J.; Bex, P.J. Integrating Retinotopic Features in Spatiotopic Coordinates. *J. Neurosci.* **2014**, *34*, 7351–7360. [CrossRef]
195. Ruff, D.A.; Brainard, D.H.; Cohen, M.R. Neuronal population mechanisms of lightness perception. *J. Neurophysiol.* **2018**, *120*, 2296–2310. [CrossRef]
196. Molina, K.I.; Ricci, N.A.; Albuquerque De Moraes, S.; Rodrigues Perracini, M. Virtual reality using games for improving physical functioning in older adults: A systematic review. *J. Neuroeng. Rehabil.* **2014**, *11*, 1–20. [CrossRef]
197. Mirelman, A.; Rochester, L.; Maidan, I.; Del Din, S.; Alcock, L.; Nieuwhof, F.; Rikkert, M.O.; Bloem, B.R.; Pelosin, E.; Avanzino, L.; et al. Addition of a non-immersive virtual reality component to treadmill training to reduce fall risk in older adults (V-TIME): A randomised controlled trial. *Lancet* **2016**, *388*, 1170–1182. [CrossRef]
198. Van Diest, M.; Lamoth, C.J.; Stegenga, J.; Verkerke, G.J.; Postema, K. Exergaming for balance training of elderly: State of the art and future developments. *J. Neuroeng. Rehabil.* **2013**, *10*, 1–12. [CrossRef]
199. Willaert, J.; De Vries, A.W.; Tavernier, J.; Van Dieen, J.H.; Jonkers, I.; Verschueren, S. Does a novel exergame challenge balance and activate muscles more than existing off-the-shelf exergames? *J. Neuroeng. Rehabil.* **2020**, *17*, 1–13. [CrossRef] [PubMed]
200. Hess, J.A.; Woollacott, M. Effect of high-intensity strength-training on functional measures of balance ability in balance-impaired older adults. *J. Manip. Physiol. Ther.* **2005**, *28*, 582–590. [CrossRef] [PubMed]

201. Pan, X.; Bai, J.J. Balance training in the intervention of fall risk in elderly with diabetic peripheral neuropathy: A review. *Int. J. Nurs. Sci.* **2014**, *1*, 441–445. [CrossRef]
202. Schoene, D.; Valenzuela, T.; Lord, S.R.; De Bruin, E.D. The effect of interactive cognitive-motor training in reducing fall risk in older people: A systematic review. *BMC Geriatr.* **2014**, *14*, 1–22. [CrossRef] [PubMed]
203. Inglin, B.; Woollacott, M. Age-related changes in anticipatory postural adjustments associated with arm movements. *J. Gerontol.* **1988**, *43*, M105–M113. [CrossRef]
204. Montgomery, G.; McPhee, J.; Pääsuke, M.; Sipilä, S.; Maier, A.B.; Hogrel, J.-Y.; Degens, H. Determinants of Performance in the Timed Up-and-Go and Six-Minute Walk Tests in Young and Old Healthy Adults. *J. Clin. Med.* **2020**, *9*, 61. [CrossRef]
205. Heindorf, M.; Arber, S.; Keller, G.B. Mouse Motor Cortex Coordinates the Behavioral Response to Unpredicted Sensory Feedback. *Neuron* **2018**, *99*, 1040–1054.e5. [CrossRef]
206. Kordestani-Moghadam, P.; Koppelaar, H.; Kouhkani, S.; Segers, G. When does the Brain Ask for Help from the Eyes? *J. Phys. Med. Rehabil.* **2020**, *2*, 1–6.
207. Fogt, N.F.; Zimmerman, A.B. A Method to Monitor Eye and Head Tracking Movements in College Baseball Players. *Optom. Vis. Sci.* **2014**, *91*, 200–211. [CrossRef]
208. Fogt, N.; Kuntsch, E.; Zimmerman, A. Horizontal Head and Eye Rotations of Non-Expert Baseball Batters. *Optom. Vis. Perform.* **2019**, *7*, 29–46.
209. Hogg, R.V.; Craig, A.T. *Introduction to Mathematical Statistics*, 7th ed.; The Macmillan Company: London, UK, 1972.
210. McSorley, E.; Morriss, J. What you see is what you want to see: Motivationally relevant stimuli can interrupt current resource allocation. *Cogn. Emot.* **2017**, *31*, 168–174. [CrossRef]
211. McSorley, E.; Morriss, J.; van Reekum, C.M. Eye spy with my little eye: Motivational relevance of visual stimuli guide eye-movements at different processing stages. *Biol. Psychol.* **2017**, *123*, 8–14. [CrossRef]
212. Morriss, J.; Mcsorley, E.; Van Reekum, C.M. I don't know where to look: The impact of intolerance of uncertainty on saccades towards non-predictive emotional face distractors. *Cogn. Emot.* **2017**, *32*, 1–11. [CrossRef]
213. Morriss, J.; McSorley, E. Intolerance of uncertainty is associated with reduced attentional inhibition in the absence of direct threat. *Behav. Res. Ther.* **2019**, *118*, 1–6. [CrossRef]
214. Liu, Z.X.; Shen, K.; Olsen, R.K.; Ryan, J.D. Age-related changes in the relationship between visual exploration and hippocampal activity. *Neuropsychologia* **2018**, *119*, 81–91. [CrossRef]
215. Wynn, J.S.; Olsen, R.K.; Binns, M.A.; Buchsbaum, B.R.; Ryan, J.D. Fixation reinstatement supports visuospatial memory in older adults. *J. Exp. Psychol. Hum. Percept. Perform.* **2018**, *44*, 1119–1127. [CrossRef]
216. Melnik, A.; Schüler, F.; Rothkopf, C.A.; König, P. The World as an External Memory: The Price of Saccades in a Sensorimotor Task. *Front. Behav. Neurosci.* **2018**, *12*, 1–8. [CrossRef]
217. Clark, A.; Chalmers, D. The extended mind. *Analysis* **1998**, *58*, 10–23. [CrossRef]
218. Ryan, J.D.; Shen, K.; Liu, Z.X. The intersection between the oculomotor and hippocampal memory systems: Empirical developments and clinical implications. *Ann. N. Y. Acad. Sci.* **2020**, *1464*, 115–141. [CrossRef]
219. Hopf, S.; Liesenfeld, M.; Schmidtmann, I.; Ashayer, S.; Pitz, S. Age dependent normative data of vertical and horizontal reflexive saccades. *PLoS ONE* **2018**, *13*, e0204008. [CrossRef]
220. Sherback, M.; Valero-Cuevas, F.J.; D'Andrea, R. Slower visuomotor corrections with unchanged latency are consistent with optimal adaptation to increased endogenous noise in the elderly. *PLoS Comput. Biol.* **2010**, *6*, e1000708. [CrossRef]
221. Fiehler, K.; Brenner, E.; Spering, M. Prediction in goal-directed action. *J. Vis.* **2019**, *19*, 1–21. [CrossRef]
222. Klever, L.; Voudouris, D.; Fiehler, K.; Billino, J. Age effects on sensorimotor predictions: What drives increased tactile suppression during reaching? *J. Vis.* **2019**, *19*, 1–17. [CrossRef]
223. Tinetti, M.E.; Richman, D.; Powell, L. Falls efficacy as a measure of fear of falling. *J. Gerontol.* **1990**, *45*, 239–243. [CrossRef]
224. Tinetti, M.E.; Williams, C.S. Falls, Injuries due to falls, and the Risk of Admission to a Nursing Home. *N. Engl. J. Med.* **2015**, *337*, 1279–1284. [CrossRef]
225. Harezlak, K.; Kasprowski, P. Searching for Chaos Evidence in Eye Movement Signals. *Entropy* **2018**, *20*, 32. [CrossRef]
226. Reschke, M.F.; Kolev, O.I.; Clément, G. Eye-Head Coordination in 31 Space Shuttle Astronauts during Visual Target Acquisition. *Sci. Rep.* **2017**, *7*, 1–9. [CrossRef]
227. Wilkins, A.J.; Nimmo-Smith, I.; Slater, A.I.; Bedocs, L. Fluorescent lighting, headaches and eyestrain. *Light. Res. Technol.* **1989**, *21*, 11–18. [CrossRef]
228. Wilkins, L.; Appelbaum, L.G. An early review of stroboscopic visual training: Insights, challenges and accomplishments to guide future studies. *Int. Rev. Sport Exerc. Psychol.* **2019**, *13*, 1–16. [CrossRef]
229. Pijnappels, M.A.G.M.; van der Burg, J.C.E.; Reeves, N.D.; van Dieen, J.H. Identification of elderly fallers by muscle strength measures. *Eur. J. Appl. Physiol.* **2008**, *102*, 585–592. [CrossRef] [PubMed]
230. Rispens, S.M.; van Schooten, K.S.; Pijnappels, M.; Daffertshofer, A.; Beek, P.J.; van Dieën, J.H. Do extreme values of daily-life gait characteristics provide more information about fall risk than median values? *JMIR Res. Protoc.* **2015**, *4*, e4. [CrossRef]
231. Van Schooten, K.S.; Pijnappels, M.; Rispens, S.M.; Elders, P.J.M.; Lips, P.; Daffertshofer, A.; Beek, P.J.; van Dieën, J.H. Daily-Life Gait Quality as Predictor of Falls in Older People: A 1-Year Prospective Cohort Study. *PLoS ONE* **2016**, *11*, e0158623. [CrossRef]